Pipeline

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E OF ENGINEERING

PBLI: The evolution of hands-on education

"Learn by Doing" is central to Cal Poly's new Project Based Learning Institute

IN A SENSE, THE CAL POLY COLLEGE OF Engineering has always been dedicated to hands-on project based learning. But this philosophy was literally set in stone with the recent construction of Bonderson Projects Center and the advent of the Project Based Learning Institute (PBLI).

"Our goal is to build sustainable and mutually beneficial relationships with partners who are willing to invest in project-based learning at Cal Poly," said PBLI Director Dr. **Zahed Sheikh**. Sheikh has secured BAE Systems, Edwards Air Force Base, Northrop Grumman, Parker Aerospace, Raytheon, Solar Turbines, Teradyne and ViaSat as PBLI's first industry partners. "In bringing real world engineering problems and projects to campus, these companies will enjoy increased exposure to our outstanding students and faculty" he said.

"My expectation is that PBLI will provide us with a much wider window into the projects at Cal Poly and may open opportunities that we would not have found otherwise."

Dr. Charles Volk, Chief Technologist at Northrop Grumman, Navigation Systems Division

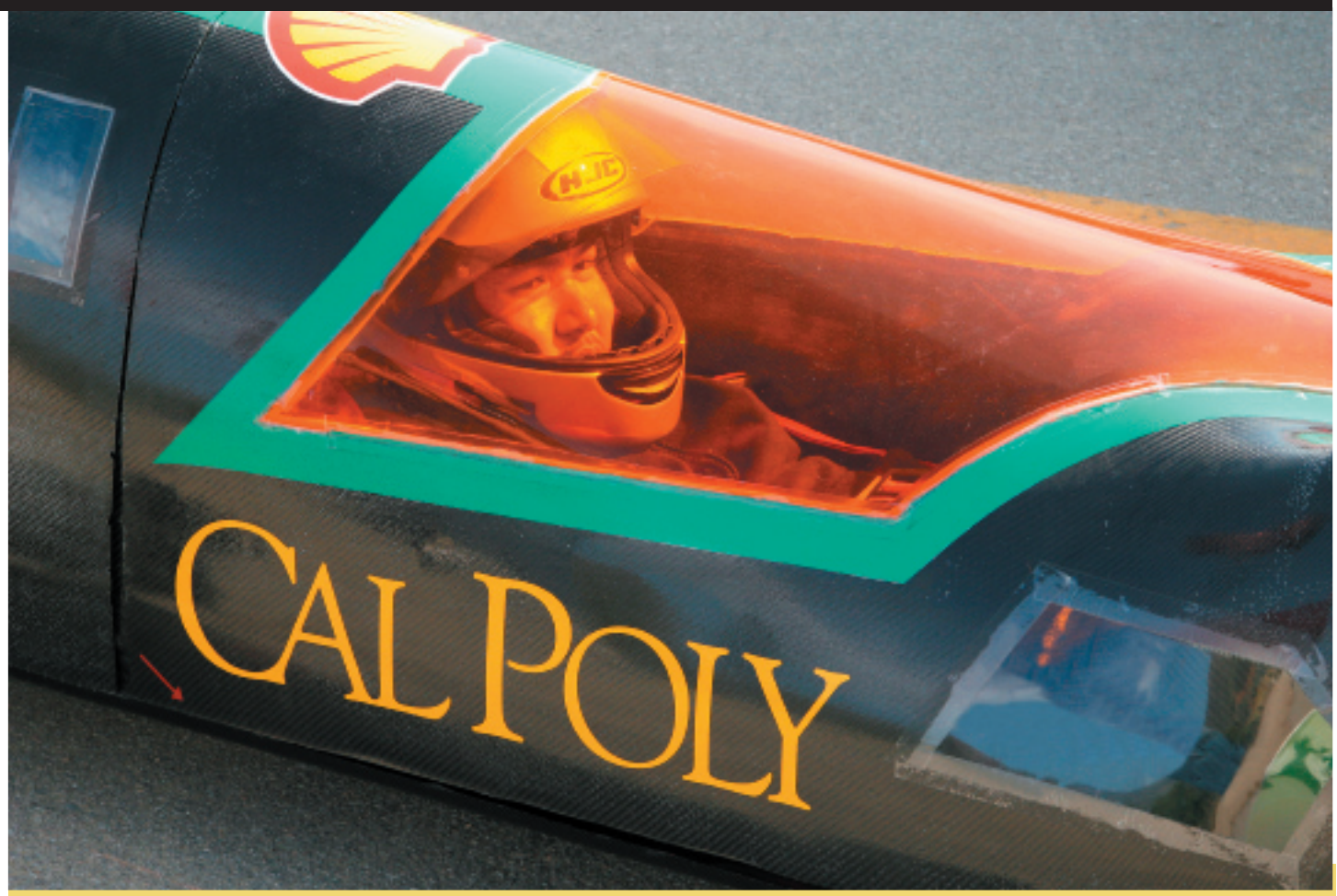
PBLI is a new centralized conduit for industry sponsored projects at Cal Poly. Faculty and industry partners are only beginning to realize the ways in which this innovative process will differ from previous sponsored projects. "We're very excited about the prospects of a continued relationship with Cal Poly," said **Tony Rubino**, Edwards AFB Chief, Weapon Systems Integration Flight.

Dr. **Charles Volk**, Chief Technologist at Northrop Grumman, Navigation Systems Division believes it may still be too early in the process to comment on its merits. "My expectation, however, is that PBLI will provide us with a much wider window into the projects at Cal Poly and may open opportunities that we would not have found otherwise," Volk explained.

Opportunities to collaborate with PBLI are offered at various levels to fit the budget of any company. Once initiated, the streamlined collaboration process is designed to ensure that PBLI successfully facilitates execution of faculty and student projects. Sheikh is committed to making sure that communication is handled smoothly, and that the relationship is efficiently managed so that it may be successfully repeated.

New PBLI partners may propose from one to an unlimited number of design projects, which will involve one faculty member and four or five engineering students. Sheikh arranges a conference call

Please see PBLI on Page 2



1,902 MPG! Cal Poly team wins Shell Eco-Marathon

A TEAM OF CAL POLY ENGINEERING STUDENTS COMPETING IN THE U.S. Shell Eco-Car Challenge took the top prize and $10,000 for the university with their entry, a sleek vehicle which performed at an astounding 1,902 miles per gallon.

The Shell Eco-Marathon Americas competition offered the grand prize to the university whose student team completed the farthest distance using the least amount of fuel. Students from across the U.S. and Canada competed April 14 at the California Speedway in Fontana. Cal Poly's official mpg in the

Please see ECO-CHALLENGE on Page 6

Clockwise from top: CE/ENVE grad student Kevin Fang drove the Cal Poly car to victory at the Shell Eco-Car Challenge; the team preps the car for a test run near the Cal Poly athletic complex; celebrations for winning the event were fueled by a check for $10,000.

2006-07 Sponsored Projects

Multidisciplinary

■ **Centennial Scholars:** The College of Engineering and the College of Science and Mathematics collaborated to support academically talented, financially needy students with project-based, interdisciplinary learning. Throughout the four-year grant period, 22 NSF-funded scholarships will be awarded annually to engineering and science and mathematics Honors Program students.

■ **Enhancing Student Learning Through Systems Level Design and Implementation:** NSF has funded the development of a new electronics packaging course, a systems design course, and incorporation of a scalable solution to project-based learning into the curriculum. The project-based learning experience is aimed at providing a multidisciplinary environment to design the hardware and software components of a system while industrial and manufacturing engineering students fabricate and assemble the boards.

■ **Production of Biodiesel from Algae:** Faculty from Civil & Environmental Engineering, Materials Engineering, Mechanical Engineering, and Dairy Science are supervising graduate students involved in the National Student Design Competition for Sustainability Focusing on People, Prosperity sponsored by the U.S. Environmental Protection Agency. The project goal is to increase the economic feasibility of using algae to produce biodiesel—the project includes a feasibility study of using algae production in conjunction with nutrient management at the Cal Poly Dairy wastewater Lagoon.

Aerospace Engineering

■ **Space Environment Thermal Vacuum Testing & Qualification of a Momentum Powered Timepiece:** This project tests the space qualification of a wristwatch. Dr. **Jordi Puig-Suari** researched whether the watch can withstand thermal cycling while in a vacuum.

■ **The Effect of High Shear on a Blade-Generated Vortex:** This NASA-Ames project involves Cal Poly Wind Tunnel experiments undertaken by Dr. **Jin Tso** and AERO students. Dr. Tso is developing a model to predict unsteady helicopter rotor blade airloads and high rotor noise that are the result of blade-tip vortices trailed in the rotor wake.

■ **Demonstration and Laser Testing Using Particle Image Velocimetry (PIV):** Advance Projects Research collaborated with Dr. **Jin Tso** and an AERO graduate student to demonstrate particle image velocimetry using laser testing inside Cal Poly's wind tunnel. Undergraduate AERO majors also had the opportunity to learn the mechanics of the test and participate in discussions of the results.

Biomedical and General Engineering

■ **Polymeric Splint Testing and Evaluation:** Dr. **Lanny Griffin** received funding

Continued on Page 3

Cal Poly CubeSats launched into space from Kazakhstan

Second try from Russia's Cosodrome is a success

INTERSTELLAR SUCCESS CAME IN THE form of faint beeps and electronic static when Cal Poly students were thrilled to hear the sounds of two CubeSats launched into space in mid-April.

It was the second attempt at a Russian launch campaign after rocket failure hampered the progress of the project in July of 2006. Damaged insulation in the engine's fuel and hydraulic lines caused the rocket to crash just one minute after blast off.

Cal Poly students involved in the CubeSat Project were vindicated with the successful launch and ejection of all seven CubeSats into a 640 km Sun - synchronous orbit from the Baikonur Cosodrome in Kazakhstan on April 17th.

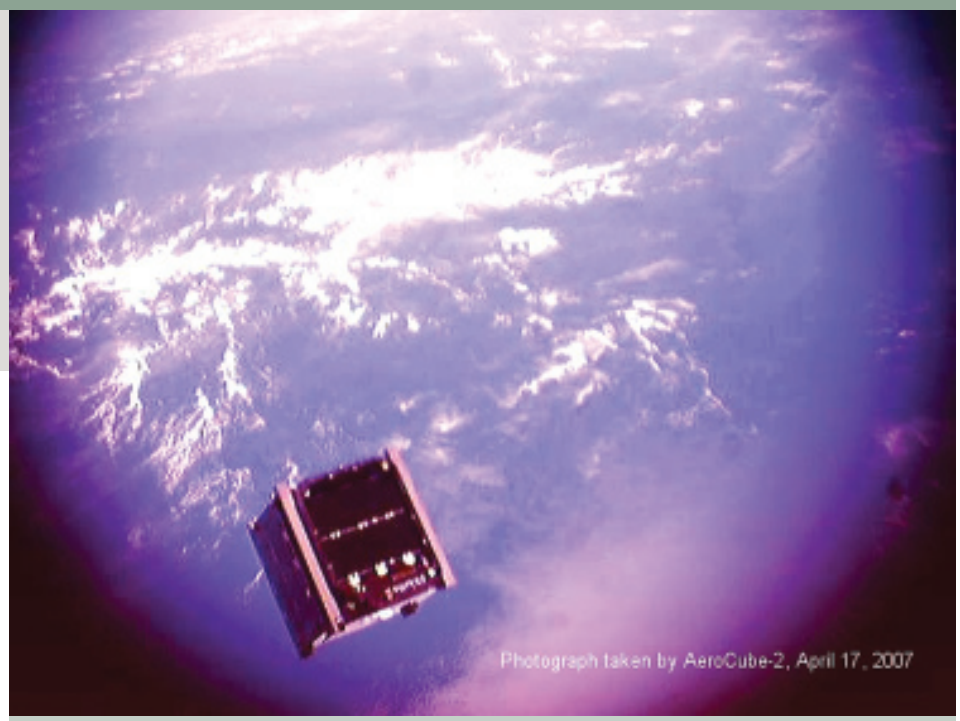
Aerospace graduate student **Roland Coelho**, who traveled to Kazakhstan in March only to be disappointed again when the launch was placed on hold, has remained determined about the CubeSat project: "Following the rocket failure in July 2006, we faced many challenges in continuing to launch satellites, but we made it a point to keep on going."

Coehlo also sees the value in the opportunity to participate in a real world space launch and credits Cal Poly's educational philosophy: "As a student I am very fortunate to be a part of this program and proud to be a student at Cal Poly. This is the perfect example of 'Learn by Doing.'"

The payloads were ejected from a converted RS – 20 (SS – 18) Intercontinental Ballistic Missile (ICBM) known as Dnepr. A total of fourteen CubeSats were dispersed into orbit, two of which were built at Cal Poly. Among the Cal Poly payloads were the EgyptSat – 1 of the Arab Republic of Egypt, SaudiSat – 3 and five SaudiComsats of the Kingdom of Saudi Arabia and five other picosatellites developed by Universities of the United States and Colombia, including Cal Poly.

Cal Poly's contributions to the CubeSat community have been twofold. Not only do they construct picosatellites but have also provided a flight-proven deployment system, the Poly Picosatellite Orbital Deployer (P – POD) that was used to disperse all seven CubeSats in the April 17th launch. In this capacity, the Cal Poly team was instrumental in the successful launch of Colombia's first satellite.

Details about the launch is posted on www.cubesat.org and on the PolySat web site: http://polysat.calpoly.edu ■



"That is what a 10 centimeter box looks like 780 kilometers from the ground. At Cal Poly the sky is no longer the limit — and we have proof!"

Jordi Puig-Suari
CubeSat advisor

WHAT DOES A CUBESAT LOOK LIKE IN ORBIT? NOW THE CAL POLY COLLEGE of Engineering — and the world — knows the answer.

Cal Poly Aerospace Engineering Professor and CubeSat project advisor **Jordi Puig-Suari** shared photos of CP-4 (one of Cal Poly's CubeSats) taken by AeroCube-2 (Aerospace Corporation's CubeSat) shortly after deployment from the P-POD during the successful April launch.

"That is what a 10 centimeter box looks like 780 kilometers from the ground," Puig-Suari said. "At Cal Poly the sky is no longer the limit — and we have proof!"

The CubeSat Project is an international collaboration of over 80 universities, high schools, and private firms developing picosatellites containing scientific, private, and government payloads.

Fourteen CubeSats designed and built by students at various universities in the U.S. and elsewhere in the world were launched into space aboard a Dnepr-1 LV rocket from the Baikonur Cosmodrome in Kazakhstan in April.

Built to specifications developed by Cal Poly and Stanford University's Space Systems Development Laboratory, all the picosatellites were launched from the Poly Picosatellite Orbital Deployer (P-POD) designed and built at Cal Poly. ■

Dr. Zahed Sheikh, the Project Based Learning Institutes interim director, says the institute "will provide a range of unique and valuable services" to its partners in industry.

PBLI from Page 1

between the appropriate faculty and the partner to define the broad scope of the project, and to confirm that it is appropriate for a senior level design course.

Once the faculty member identifies the best students for a particular project, they carry out research and report regularly to the partner. Throughout research and development, Sheikh arranges face to face meetings and on-site visits.

Aerospace Engineering Professor **Eric Mehiel** believes the process will be "an excellent opportunity for students to engage in real world research and receive training for a future in industry."

The College of Engineering encourages companies and agencies to contribute to the hands-on learning of future engineers by partnering with PBLI. ■

For more information about how to become involved with PBLI, call 756-6225 or email zsheikho@calpoly.edu

Team Tech collaboration with Walt Disney Imagineering is a real roller coaster ride

THE CAL POLY SOCIETY OF WOMEN ENGINEERS (SWE) IS building fully functional prototypes of their weld point inspection device in collaboration with Walt Disney Imagineering for the Team Tech Competition sponsored by Boeing.

Thus far, the team has undergone intermediate design reviews and has received encouraging feedback about their design.

Emily Hakun, Team Tech co-director and general engineering senior, is optimistic about the team's progress: "Our Industrial Adviser has been very impressed with our designs. Additionally, our team has been communicating with engineers at several firms to ensure that our design is feasible."

"The students have treated this project just as I would have in my current role at Disney. They clearly identified the problem and started making solutions."

Pat Doyle
Disney project engineer

Pat Doyle, Industrial Adviser to Team Tech and a Disney project engineer was impressed with the team's design innovation: "The students have treated this project just as I would have in my current role at Disney. They clearly identified the problem and started making solutions. Their knowledge and education is a clear advantage when coming up with new and innovative design solutions."

Participating team members developed a modular device to inspect the smoothness of welds on roller coaster tracks at the Disneyland theme park. A sensor will run along the track and note any deflections in the track indicating rough welds. The data collected by the sensor will create a computer-generated graph informing the welder if the welds are smooth or not. Students are designing the device to be easily adaptable for various tracks.

Team members find that the most rewarding aspect of the yearlong Team Tech competition is the opportunity to work with industry. They received an intermediate design review in early April and were given positive feedback from industry experts.

Doyle has been pleased with the students' hard work and attention to project requirements: "They recently gave a very well thought out presentation to several of the engineers and managers in our division. Their progress to date has been very good and very well received." He continued, "This fact coupled with the quality of work they have performed leads me to believe that they will have a bright future in industry."

Cal Poly Society of Women Engineers Team Tech worked on a roller coaster "weld point inspection" vehicle for Disney Imagineering.

The Cal Poly team is comprised of a diverse group of students from all grade levels and from eight different disciplines of engineering. Their project will be evaluated on the criteria of teamwork, use of engineering processes, the product, the quality of the results, and the ability to work side-by-side with Industry. Final presentations will be given in October at the SWE National Conference. For information on Cal Poly's SWE chapter, see: http://www.csc.calpoly.edu/~swe/index.php ■

Cal Poly Human Powered Vehicle team pedals to second place national finish

THE CAL POLY HUMAN POWERED VEHICLE CLUB WON FIRST place in the Female Sprint Competition and second place overall at the 2007 American Society of Mechanical Engineers Human Powered Vehicle Competition, held at the NASA Ames Resear Center in San Jose.

Mechanical engineering senior **Karin Hanzi** piloted a streamlined bicycle constructed with full carbon fiber faring integrated with a carbon fiber frame to blast the competition. She maintained the top speed in both runs, clocking in at nearly 35 mph.

In addition to Hanzi's victory, the HPV Club also took first place in men's and women's mixed sprints, third place in design, and second place overall. The Cal Poly team has historically faired very well at the ASME-sponsored event. In 2005 they took first in the overall competition and rebounded strongly this year from fifth place in 2006.

Kim Shollenberger, associate professor of mechanical engineering and HPV faculty advisor, was pleased with her team's performance. "This year, our bike was judged to have the best aesthetics and had the highest safety score," she said.

Cal Poly placed second overall behind University of Missouri-Rolla. Although Cal Poly and UMR have gone head-to-head for the last five years, the teams have developed a sense of camaraderie. "We shared the celebration with them after the race and duct tape with them during the race," said **George Leone**, technical advisor for Cal Poly HPV. "It's great to have teams help each other, even in the heat of competition."

Continuing its long history of success at the ASME Human Powered Vehicle Competition, the Cal Poly HPV club finished in second place at the 2007 event in San Jose.

The Cal Poly HPV student winners include: **Joseph Levyssohn**, President, **Matthew Scott**, Vice President, **Matthew Boyd**, **Robert Ehrmann**, **Daryll Fletcher**, **Stephen Franco**, **Katherine Gage**, **Kevin Gibbs**, **Gregory Hamm**, **Karin Hanzi**, **Nicolas Hellewell**, **Ryan Helmuth**, **Neil Jansen**, **Thomas Kuhn**, **Nicholas Pullano**, **Andrew Ouellet**, **John Petersen**, **Steven Ricchiazzi**, **Matthew Vaillancourt**, and **Aaron Williams**.

See: http://me.calpoly.edu/projects/1/ ■

2006-07 Sponsored Projects

from the U.S. Army to continue his work on developing a rapidly setting polymeric casting system for use by military personnel who are at risk for extremity injuries due to tactical mission requirements from airborne operations, high mobility, and far-forward deployments.

Civil & Environmental Engineering

■ **Air Pollution Training:** Under a five-year EPA grant, Dr. **Harold Cota** provides instruction in air pollution abatement to air pollution agencies.

■ **Monitoring Instrumentation for Anchorage Regional Landfill:** Dr. **James Hanson** provided instrumentation arrays for measuring temperature within the leachate injection wells at Anchorage Regional Landfill.

■ **Etching Deterioration:** Drs. **Damian Kachlakev** and **Nirupam Pal** have received grants totaling $230,000 from the National Plasterers Council to study etching deterioration of plaster surfaces in swimming pools.

■ **Using a Bayesian Framework to Quantify Parameter Uncertainty and Model Optimization for Strong Ground Motion Attenuation Relationships:** Under a grant from the U.S. Geological Survey, Dr. **Robb Moss** developed an improved estimate of the model standard deviation in ground motion during earthquakes.

■ **Cooperative Research on Soil Liquefaction Prediction:** Dr. **Robb Moss** and researchers from the U.S. Geological Survey and the China Earthquake Administration have been funded by the National Science Foundation to collect in-situ soil parameters in the People's Republic of China that was severely damaged by soil liquefaction in the 2003 Bachu earthquake. The data will bolster the existing worldwide database of liquefaction case histories, and provide comparison of liquefaction predictions methods.

■ **Bioremediation of the Guadalupe Oil Field:** Dr. **Yarrow Nelson** and environmental engineering graduate students continue to study remediation at the Guadalupe San Dunes. Grants provided by Chevron support the researchers' efforts.

■ **Coupling Nutrient Removal and Carbon Dioxide Fixation:** This project helps slow the upward trend of carbon dioxide levels in the atmosphere by developing the process of "fixing" carbon dioxide in biomass and converting the biomass to biofuels. Specifically, Dr. **Yarrow Nelson** and graduate students help develop a carbon dioxide biofixation process involving the production of microalgae biomass using municipal wastewater nutrients.

■ **Liquified Natural Gas Interchangeability Project:** Dr. **Tracy Thatcher** has a two-year study in conjunction with Lawrence Berkeley National Laboratory to provide information on safety, perfor-

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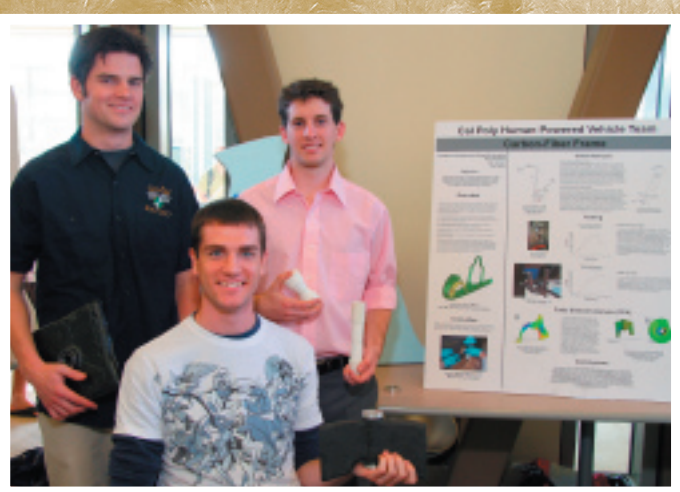
Bonderson: the place for projects

Home to the Project Based Learning Institute, the 1-1/2 story, 19,000-square foot Bonderson Student Projects Center opened to Cal Poly students in the spring. The building features specialized space for individual and collaborative student projects, including group work and assembly areas, a robotics lab, computer modeling and systems labs and supporting shop areas. The Mechanical Engineering Department also held two Senior Design Showcases in the building.

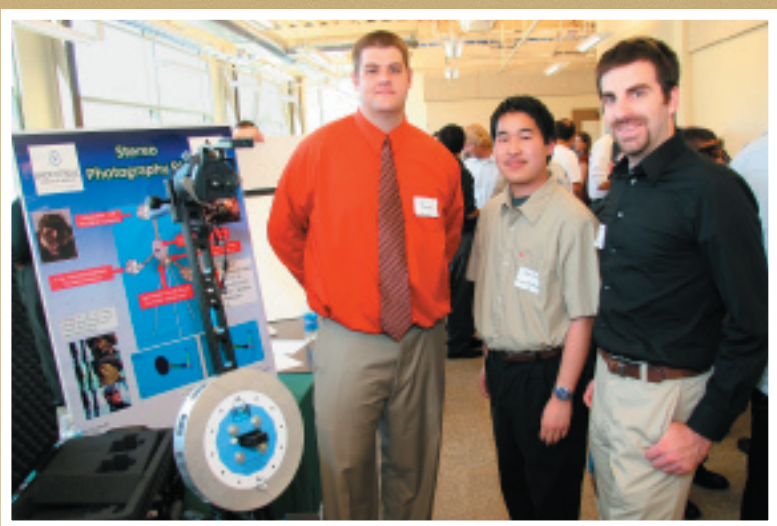
The Adapted Paddling Solid Quad Conversion team displayed their finished project in the Bonderson Student Projects Center during the Mechanical Engineering Department's Spring Project Showcase.

Cal Poly's Pre-Crash Sensing Demonstration System team was one of three North American winners of the Enhanced Safety of Vehicles International Collegiate Student Safety Technology Design Competition. *See Page 6.*



A detailed study of carbon fiber frames helped the Human Powered Vehicle Team finish second in the nation. *See article on Page 3.*

ME students Greg Baker and Victoria Drake display their "Dual Axis Rotating Chair" designed for vestibular stimulation therapy patients.



Mechanical Engineering students Zach Barton, Jason Onoda and Dan Reeves worked on a Stereo-3D Photography Tripod with the sponsorship of Industrial Light & Magic.

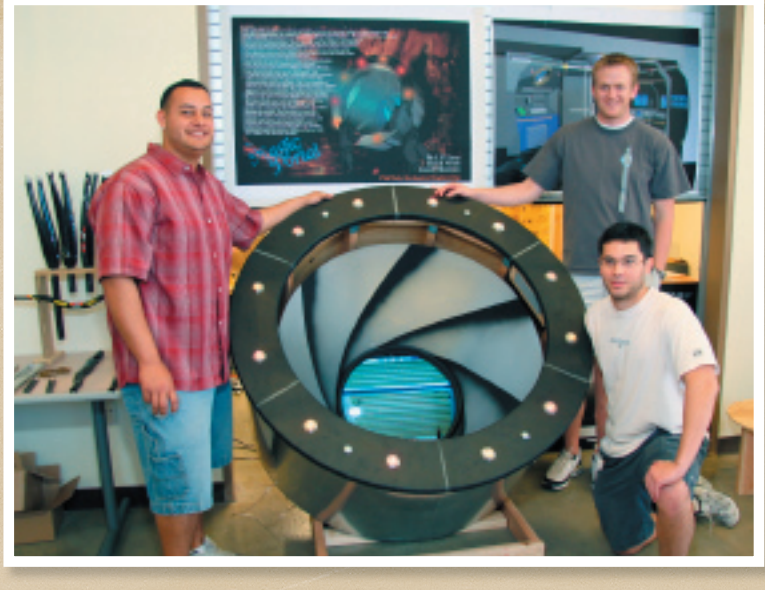
Erik Brockman (CPE) and Suzanne Yuen (ME), second and third from left, discuss their Capstone Service Learning project with members of CPE's Industry Advisory Board.

Workmen put the final touches on the Bonderson Student Projects Center during Spring Quarter.

ME professor James Widmann takes a spin on the Cal Poly Chainless Challenge bike at a demonstration outside the Bonderson Student Projects Center.

Kirk Torossian (CE/ENVE) of the Cal Poly Steel Bridge team does some grinding on a bridge strut in one of the Bonderson Student Projects Center shops.

CE/ENVE student Skye Orvis paints tiles for the deck of the Cal Poly concrete canoe. The M.C. Escher-inspired design won first place in a national competition. See Page 7.



A "Magic Portal" video teleconferencing display that will connect the San Luis Obispo Children's Museum with the Port San Luis Marine Institute was the project of ME students John Paul Lara, Jason Shannon and Derek Webb.

2005-06 Sponsored Projects

mance, emissions, and air quality impacts of variability in liquefied natural gas.

■ **Efficient Deployment of Advanced Public Transportation Systems (EDAPTS):** Traffic researcher Jeff Gerfen continues his work in Smart Transit System design and development.

Computer Science

■ **Redesigning Introductory Computing:** Dr. **John Clements** will help develop a radically new approach to teaching object-oriented programming in this NSF-funded project. The new approach proposes the use of problems to drive the teaching of programming constructs.

■ **Acquisition of Computing Resources:** A $53,000 NSF equipment grant supports a joint UC Santa Barbara-Cal Poly research project on Embedded systems. According to Dr. **Diana Franklin**, the grant will greatly enhance Cal Poly's ability to form collaborations with research-oriented universities.

■ **Horseshoes and Hand Grenades:** Exploiting Error Tolerance in Applications: Dr. **Diana Franklin** received a prestigious NSF CAREER Program grant for a project that proposes a shift in the design of embedded systems and microarchitectures.

Electrical Engineering

■ **Radio Frequency Identification (RFID) Tag Development and Testing:** Under the direction of Dr. **Dean Arakaki**, the Cal Poly Antenna Anechoic Chamber Laboratory provides testing services for the development of RFID tag antennas.

■ **Modeling of Semiconductor Lasers and Photodiodes, and Characterization of Cables:** Agilent Technologies funded research by Dr. **Xiaomin Jin** on modeling of semiconductor lasers, photodiodes, and cables for interferometer measurement system applications.

■ **70MHz Channel Emulator Specification:** Jet Propulsion Laboratory is sponsoring a project by Dr. **Albert Liddicoat** to develop a Digital Link Channel Emulator (DLCE) for use in evaluating space communications systems.

■ **Synthetic Aperture Radar Automatic Target Recognition for Ground Targets:** Dr. **John Saghri** has received year-to-year grants from Raytheon to develop an Automatic Target Recognition (ATR) system for Synthetic Aperture Radar (SAR) imagery.

Industrial & Manufacturing Engineering

■ **Workforce Innovation:** The California Space Authority has awarded Cal Poly $350,000 for the Workforce Innovation in Regional Economic Development Project, under which Cal Poly would team with other subcontractors on Systems Engineering Outreach and development of a STEM (science, technology, engineering and math) Strategic Action Plan.

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Cal Poly design team represents North America at international vehicle safety competition

A CAL POLY MULTIDISCIPLINARY DESIGN team was selected as one of three North American winners of the Enhanced Safety of Vehicles International Collegiate Student Safety Technology Design Competition for its Pre-Crash Sensing Demonstration System.

The CENG students developed a vehicle pre-crash sensing and automated braking system using a custom-made test cart, a laser range finder, and an ultrasound sensor. After an on-campus review in March, U.S. Department of Transportation representatives chose the Cal Poly team based on their work, presentation, and demonstration of the test vehicle that anticipates and reacts to collisions. Three teams from North America, two from Asia-Pacific and three from Europe competed at the finals in June.

The Cal Poly team achievement represents three years of work by 16 students from mechanical, electrical, and computer engineering programs. "This competition provided an exciting opportunity for students from multiple disciplines to combine on-going research activities in vehicle sensing," says faculty advisor **Peter Schuster**.

In 2004-05, three students worked to identify, collect, and perform baseline tests on a variety of exterior sensors. During 2005-06, eight students performed testing with LIDAR and RADAR sensors, developed sensor-filtering algorithms, and designed and built a mobile test vehicle for evaluating sensor performance. Over summer 2006, two students refined the sensor processing algorithms, and during the current academic year, the team of four students completed the integration of the sensor algorithms with the mobile test vehicle. The result of this ongoing research and development is a vehicle that demonstrates autonomous warning, braking, and simulated airbag deployment.

Mechanical Engineering student D.J. Parsons sets up a test of a Vehicle Pre-Crash Sensiing Demonstration System in Cal Poly's Engineering plaza.

The mechanical engineering students and faculty advisors who represented Cal Poly at the ESV Conference included Drs. **Peter Schuster** and **Charles Birdsong**, seniors **Danny Murphy**, **D.J. Parsons**, **Justin Carpenter** and **Duane Howard**. See: http://me.calpoly.edu/projects/3/ ■

IME class completes fourth PolyHouse home rennovation

A CAL POLY INDUSTRIAL ENGINEERING CLASS COMPLETED its fourth home renovation service project, this time for an elderly, disabled Santa Margarita woman.

Industrial engineering professor **Dr. Roya Javadpour** has led "PolyHouse" projects for the last three years. This year, her students raised more than $50,000 in donations of cash, building materials and other assistance for repairs and improvements for the home of the woman, who is suffering from severe diabetes and partial paralysis.

In the fourth annual "Poly House" project, the students worked on the Santa Margarita home on Friday, Saturday and Sunday, May 10, 11 and 12, and Friday, Saturday and Sunday, May 18, 19 and 20.

The project goals were to improve the accessibility, safety and comfort of the women's home and to complete household repairs that would otherwise go undone. "The project opens students' eyes to social need and community service," Javadpour said.

Each year Javadpour and her students work with social service agencies to find potential Poly House project clients. "There are a lot of families who have a need for help, but we also have to find someone with a home that offers a suitably complex set of issues for the students to tackle in a renovation," she said.

Demolition of a Santa Margarita home was the first part of the 2007 PolyHouse project.

The educational purpose of the class is to give students hands-on experience planning and managing a technical project involving fundraising, scheduling, supply management, team recruitment, resource allocation, time and cost budgeting, risk assessment, task coordination, project monitoring, and post-project assessment, Javadpour explained.

Javadpour's project management students come from a variety of backgrounds, including business, engineering management, and industrial and manufacturing engineering.

Central Coast businesses and construction companies gave the Poly House project tremendous support this year, the professor said. A complete list of supporters will be available on the class Web site at: www.polyhouse.org. ■

2006-2007 C3RP Faculty Applied Research Projects

funded by the California Central Coast Research Partnership (C3RP), which facilitates collaboration between Cal Poly and business/industry and provides grants sponsored by the Office of Naval Research.

DEPARTMENT(S)	PROJECT INVESTIGATOR(S)	PROJECT TITLE
AERO	David Marshall	Circulation control wing optimization study for ESTOL applications
AERO	Eric Mehiel	A four-axis reaction wheel platform for spacecraft attitude simulation
BME/GENE	Robert Szlavik	Establishment of an electrophysiology lab for experimental validation of a combined model of the neuromuscular junction under the influence of Acetylcholineterase inhibiting neural toxins
CE/ENVE	Garrett Hall, Eric Kasper	Numerical simulation of an active protection system
CE/ENVE	Daniel Jansen	Toughening mechanisms of hybrid fiber reinforced concrete composites
CE/ENVE	Tryg Lundquist	Development of a simple low-cost wastewater treatment process for warm-climate communities and military bases
CE/ENVE	Ashraf Rahim	Recycled waste materials as additives to improve the performance of cement-treated bases
EE	Dean Arakaki	Wireless system development of reduced-size aperture radiators, wireless interfaces for biomedical systems, and radiated emissions
EE	Dennis Derickson	LIDAR applications enabled by fast wavelength-tuning single-chip wavelength tunable lasers
EE	Fei Wang	Research on low power non-volatile information storage device based on novel chalcogenide material
EE	Xiao-Hua (Helen)Yu	An integrated neuro-fuzzy model for on-line adaptive control
EE	Jane Zhang	Tracking lips in unconstrained imagery for automatic speechreading
IME	Daniel Waldorf	PVD/CVD coatings for improved life of nano-grain cutting tool for machining aerospace alloys
IE; Animal Science; Dairy Science	Robert Crockett, Dan Peterson, Rafael Jimenez-Flores	Three-dimensional scaffolds for mammary epithelial cell growth
ME	Joseph Mello	Development of composite material solution for advanced nozzle research
ME	Peter Schuster	Enhancing human physical performance through detailed human modeling
ME	Xi Wu, James Meagher	Crack diagnosis of a rotor from torsional/lateral coupling mechanisms
ME	Bill Murray, Tom Carpenter	Development of a hybrid rocket motor facility for advanced nozzle research
ME; Center for Coastal Marine Sciences	Lou Rosenberg, Mark Moline	Enhanced operator control of remotely operated vehicles
ME; EE	Brian Self, Charles Birdsong, Lynne Slivovsky	Utilization of tactor displays as a collision avoidance system for the visually impaired

Cal Poly concrete canoe team places 5th in nation

EACH YEAR, STUDENTS FROM CAL POLY'S SOCIETY OF Civil Engineers (SCE) pit themselves against teams from approximately 220 colleges across the U.S. in a year-long contest involving design know-how, project management, engineering expertise, oral and written presentations, endurance, imagination and sheer muscle.

It's the Concrete Canoe Competition—and this year, Cal Poly paddled to fifth in the nation, with a first in the coed sprint race and a second in "final product." Cal Poly also brought home the ACI Innovative Design Award, which recognized the canoe's unique, M.C. Escher-inspired tile mosaic design detail.

The 20th Annual ASCE National Concrete Canoe Competition was held at the University of Washington in mid-June. Cal Poly's team was led by civil engineering seniors **Jason Kump**, **John Layous**, **Jason Marshall**, and **Skye Orvis**.

"One of the highlights was winning the design award," said Marshall. "It really represented the time, effort, and teamwork that went into the project. We also won a race for the first time. Our coed sprint team placed first by a tenth of a second—it literally came down to a photo finish." This was the second year in a row that Cal Poly scored well at the national level: in 2006, the team came in second. Cal Poly's winning formula, according to Marshall, includes faculty support, student interest, and the spirit of innovation.

"Two huge reasons for our success are professors **Garrett Hall** and **Eric Kasper** and from the Civil Engineering Department," notes Marshall. "They've always been supportive of whatever we need."

See: http://ceenve3.civeng.calpoly.edu/sce ■

AERO professor Robert McDonald, right, led a Cal Poly design team to the 2007 Raytheon Strike Weapons Design Competition. The team included AERO students Bryan Morrisey, Chaz Morantz and Jennifer Chan.

AERO students compete in Raytheon competition

FOR JUNIOR AEROSPACE ENGINEERING STUDENT **Chaz Morantz**, taking part in the Raytheon Strike Weapons Design Competition was nothing less than inspirational. "Our experience in Tucson was amazing," Morantz said. "Raytheon gave us a tour of their facility and the production line for several products including the one we worked on. The competition made me very eager to start working in industry."

The goal of the student teams was to reduce 18 pounds off the structural weight of the strongback of the Raytheon Joint Stand-Off Weapon while keeping stresses within limits. Morantz and fellow AERO students **Bryan Morrisey** and **Jennifer Chan** were given ProEngineer models for the components and also a list of restricted zones that could not be modified. All design work was done using ProEngineer and finite element analysis was performed using Algor DesignCheck.

"Most of the other teams that competed were mechanical engineers and we were the only team of purely Aerospace engineers," said Morantz. "The other teams were also doing this as their senior design projects. We did this in our spare time and really surprised ourselves with the quality of our results and presentation to Raytheon.

"The experience was a reminder of the quality of our professors and the education we are receiving here. The feedback we received from the judges at the competition was also very helpful and we learned a lot about what we did right and what we did wrong." ■

2005-06 Sponsored Projects

Materials Engineering

■ **A Holistic Assessment of the Ethical Development of Engineering Undergraduates:** The National Science Foundation is funding a four-year investigation by Dr. **Trevor Harding** and colleagues at the University of Michigan and Lawrence Technological University on the ethical development of engineering undergraduates.

Mechanical Engineering

■ **Optimal Thrust Vectoring for an Annular Aerospike Nozzle:** Cal Poly, which has a thrust vector research facility, has teamed with Rolling Hills Research Corporation to determine the optimal approach to thrust vectoring and throttling an annular aerospike nozzle. This is a NASA Small Business Technology Transfer (STTR) proposal.

■ **On-Road Measurement of Light-Duty Gasoline and Heavy-Duty Diesel Vehicle Emission Trends:** Dr. **Andrew Kean** will assist in quantifying motor vehicle emissions of ammonia and nitrous acid pollutants.

■ **Articular Carilage Growth in Vitro:** To better understand the processes of cartilage growth, degeneration, and repair, Drs. **Andrew Davol** and **Stephen Klisch** are developing an analytical cartilage growth model to serve as a paradigm for the in vitro growth of tissue engineered constructs.

■ **Global Adaptable Car Front Bumper Reinforcing Beam System:** The American Iron and Steel Institute's Bumper Team provided funding for a master's thesis project on the development of a front bumper reinforcing beam system adaptable to the performance requirements of mid-size cars in major global markets. The student will proceed through the design process from conceptualization, through analysis, into prototyping.

■ **Effect of Upstream Blockage on the Airflow and Fuel Spray in an Air/Fuel Swirler:** Solar Turbines is funding in-depth Computational Fluid Dynamics (CFD) by Dr. **Kim Shollenberger** on the effect of upstream blockage on the flow physics in the T60 UDF Lean Pre-Mix Fuel Injector.

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Cal Poly Robotics club places first at International RoboGames

Cal Poly ME student Tyson Messori holds the "Spybot," the winning robot in the Robo-Magellan competition at the 2007 RoboGames. The Spybot autonomously navigates an outdoor course.

A ROBOT DESIGNED AND BUILT BY Cal Poly students won the Robo-Magellan Competition at the International RoboGames held in San Francisco in mid-June. Dubbed "Spybot," the robot won the event by autonomously navigating an outdoor course with use of GPS, camera, compass, encoder, and ultrasonic range finder.

"Spybot completed a nearly perfect last run in a record 1:31, substantially lower than the next runner-up time of 2:12," reports team co-leader **Tyson Messori**. "Spybot navigated the course using only wheel encoders, a digital compass, and nine sonar sensors, and then homed in on the cone with its camera—it turns out that solar flares may have taken out the on-board ETek GPS system."

The multidisciplinary Robotics Club included mechanical engineering seniors **Scott Barlow**, **Tyson Messori** and **Chi-Yeh (William) Hsu**; mechanical engineering graduate student **Terry Cooke**; and computer engineering senior **Patrick McCarty**. Dr. **Chris Clark**, assistant professor in Computer Science, served as faculty advisor to the team.

"I am especially proud of this team because they started the club and the contest on a shoestring just over a year ago," comments **Tom Mackin**, chair of the Mechanical Engineering Department.

Held twice each year, Robo-Magellan reflects the growing importance of autonomous navigation for both military and commercial applications.The contest requires entrants to design and build a robot capable of GPS waypoint navigation, obstacle detection, and color tracking.

See: http://robotics.ee.calpoly.edu/dokuwiki/doku.php ■

Eco-Challenge from Page 1

competition was 1902.7 miles per gallon.

Cal Poly student **Kevin Fang** drove the winning car to victory in the marathon.

"It's important to be involved in programs like the Shell Eco-marathon to make people aware of what we can achieve in future transportation," said Mechanical Engineering major **Tom Heckel**, team manager for Cal Poly's Super Mileage team. "I hope teams like ours will help shape the vehicles people drive years from now, making them more environmentally friendly."

Teams were comprised of about eight students working together to build prototype vehicles with three or four wheels using conventional fuels or alternative fuels or energy sources such as liquid petroleum gas, biofuels, compressed natural gas, hydrogen or solar power.

This year's challenge brought 18 conventional fuel-powered entries, one hydrogen-powered entry and one solar-powered entry. See: www.calpolysae.org ■

BME/MATE student partners with Olympus

THREE JAPANESE ENGINEERS FROM Olympus Corporation headquarters in Tokyo visited Cal Poly in late spring to inspect a project developed by biomedical and materials engineering graduate student **Brent Huigens** and to discuss the future of the collaborative relationship he helped cultivate.

During the summer of 2006, Huigens completed a summer internship with a new division of Olympus—Olympus Microsystems (OMI). He worked on the design of a test-stand to evaluate the accuracy of the company's Wavelength Switching Array product. The WSA is a mechanical system of human-hair-width mirrors designed to make a selective transfer of data possible in an all optical network.

After submitting a proposal for Olympus to fund the completion of his test-stand, Huigens brought the project back to Cal Poly. Olympus is currently providing $15,000 per quarter, which funds Huigens along with two other materials engineering students, **Steven Meredith** and **Ryan Rivers**.

"This is where Cal Poly has the edge," Huigens said, "We have a lot to offer in terms of a real value based partnership." He believes Cal Poly students can deliver practical results to corporate partners, unlike more research oriented universities, "because we raise a different breed of engineer."

Huigens, who graduated in spring, added "There is a lot of potential for this to become a much bigger partnership in the future." Meredith and Rivers will continue development of the second phase test-stand after Huigens leaves Cal Poly.

Because its mirrors are so small, the WSA functions through Micro Electro Mechanical Systems (MEMS). Huigens said MEMS "naturally brings together multiple disciplines" because the tiny size of the machines allows possible application to any number of specialties, such as computer science, materials, electrical and mechanical engineering. Huigens belongs to Micro Systems Technology, a multi-disciplinary group of students on campus that is involved with various MEMS projects. ■

Engineers from Olympus received a tour of CENG's MATE labs from grad student Brent Huigens, right.

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