Cal Poly Engineering: Bridge to the future

Cal Poly's Steel Bridge team, shown praticing speed construction of their bridge, helped Cal Poly's Society of Civil Engineers (SCE) pull off a "three-peat" at the American Society of Civil Engineers (ASCE) Pacific Southwest Regional Conference last April. The group was named the overall conference champion for the third year in a row, bringing Cal Poly's winning record to 14 out of the last 16 years. Cal Poly steel bridge engineers placed 2nd in Stiffness, 2nd in Structural Efficiency, 1st in Construction Speed, 1st in Construction Economy and 1st overall.

Pipeline

CAL POLY ENGINEERING

September 2010
Volume 5, No. 1
http://ceng.calpoly.edu/

CAL POLY COLLEGE OF ENGINEERING

QL+ Lab open for projects

Multidisciplinary teams work to help the disabled improve their quality of life

THE NEW QL+ LABS ARE OPEN AT CAL Poly and dozens of engineering students are making news by undertaking projects that aid the disabled and, in particular, public servants and veterans who have been injured in the line of service.

Founded by alumnus **Jon Monett** (IE '64), the QL+ Lab has already generated multiple multidisciplinary projects including:

■ **ERB PROSTHETIC HAND —** ME students **Max Maloney**, **Matt Griebel** and **Nickolas Butler** are collaborating to update and redesign the Erb Conformable-Grasp prosthetic hand, originally developed in the early 1990's. The updated hand will be inexpensive, lightweight, and fit a wide range of amputee arm sizes and remaining limb sizes. It will be intuitively functional, meaning control of the hand will require little conscious thought. Its outer covering will maintain anatomic fidelity and as closely as possible mimic the appearance and functionality of a natural hand.

■ **ADAPTIVE WHEELCHAIR —** A student team comprised of **Mark Azzarello**, **Brian Robinson**, **Jason Della Rosa** and **Dean Swenson** are working on a wheelchair design that will make it possible for wheelchair riders to re-experience nature independently, without the need to purchase

Please see QL+ on Back Page (8)

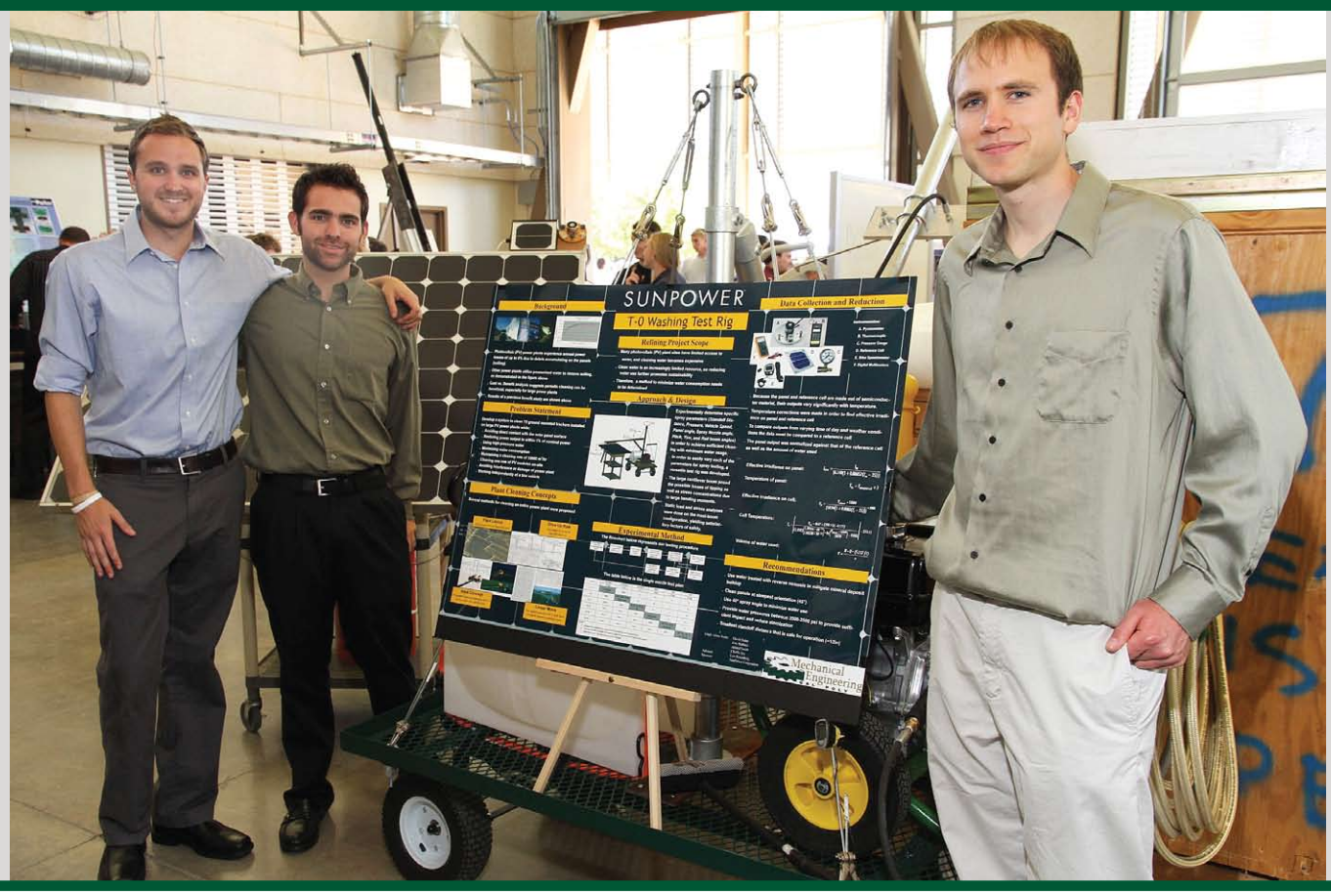
Opening doors

The QL+ Lab near Cal Poly's Engineering Plaza is now open and sponsoring student projects that mitigate physical limitations or restrictions caused by injury or disability. QL+ serves military veterans and other public servants who have sustained life-changing injuries in the line of duty. For more information, see www.qlplus.org.

THE CHAIR-MAN — QL+ Lab founder Jon Monett (IE '64) tries out the AdapTech adaptive indoor/outdoor powered wheelchair while talking with the student team working on the project. The goal of this QL+ project is to make it easier for wheelchair riders to re-experience nature by being able to handle a wide variety of terrain. The student team includes Mark Azzarello, Brian Robinson, Jason Della Rosa and Dean Swenson.

Let the sunshine in:

Project aims to increase efficiency of solar panels by keeping them clean



AFTER DEVOTING THREE QUARTERS TO DESIGNING and building a washing rig for solar farms, the primary "take-away" for the four mechanical engineering students working on the project was: "You can't predict everything."

David Hohn, **Eric Wallace**, **Atlund Smith**, and **Charlie Joy** had to work with significant constraints in designing a mobile rig to wash the dust from solar panels. They had to consider the water pressure and distance to the face of the panels; and they needed to facilitate run-off of the water.

"We had to scale down our original design considerably," said Eric, "but our biggest concern was water consumption."

In the end, all the team members were excited to work with a real client, Sun Power Corp., and they all found themselves highly motivated to work in the renewable energy field. ■

Electrical Engineering professor John Saghri, center, is working with students Ashley Wagner (CPE), Matt Woolbridge (EE) and Hushnak Singh (EE) on the Unmanned Aerial Vehicle (UAV) Pirates/SilenTrack integration project. Not pictured: Travis Dean (CPE).

"The project has also served as a good introduction to working on engineering projects in teams and the weekly progress reports and conference calls with Raytheon tie in that corporate feeling."

— Electrical Engineering student Hushnak Singh

CENG "Pirates" project tracks, captures and diverts dangerous UAV's

IMAGINE SMALL, UNMANNED ARIEL vehicles (UAVs) that are cheap, easy to build and fly, and are capable of a variety of applications ranging from reconnaissance to carrying a deadly payload. Now imagine these UAVs in the hands of terrorists.

Enemy UAVs have, in fact, been seen and captured in the Middle East conflict, which is why Raytheon is funding a project at Cal Poly to develop a UAV pirating system that would make it possible to track a UAV and capture or divert it out of harms way.

Directed by EE Professor **John Saghri**, the Unmanned Aerial Vehicle (UAV) Pirates/SilenTrack integration project ties together Raytheon's computer vision system (SilenTrack) and the mini radio controlled UAV Pirating system developed at Cal Poly.

"The system's purpose is to track the UAV's speed and position and watch how it changes as signals are sent out on different servo channels," explains Saghri. "This information is then used to remap the controls of the UAV to a standard controller so that a UAV pilot can fly the plane out of the area."

Saghri notes that "this method of UAV takeover eliminates the need for human visual confirmation and speeds up the process of taking over the UAV. This also allows the system to be used without extensive knowledge of UAVs or the communication signals between the transmitters and receivers used for radio controlled UAVs."

In addition to Saghri, the Pirates project is co-supervised by Software Engineer Micheal Scott of Raytheon, who provides a corporate perspective for the student team members, including **Travis Dean** (CPE), **Hushnak Singh** (EE), **Ashley Wager** (CPE), and **Matt Woolridge** (EE).

Singh notes not only has he learned a lot about UAVs and "the hassles of working with large software and hardware projects," but the "project has also served as a good introduction to working on engineering projects in teams and the weekly progress reports and conference calls with Raytheon tie in that corporate feeling."

Travis Dean also comes away from his Pirates experience with enhanced "teamwork and project scheduling skills" in addition to learning "about the creativity of problem-solving when given limited resources." All invaluable lessons when he and his fellow "pirates" enter the professional workplace. ■

RMAX unmanned helicopter

Cal Poly team seeks to incorporate UAVs into SLO County search and rescue efforts

A TEAM OF RESEARCHERS FROM CAL POLY ENGINEERING ARE LEADING AN effort to bring the advanced technology of Unmanned Aerial Vehicles (UAVs) to local search and rescue teams.

In a recent proposal submitted to the California State Park Off-Highway Motor Vehicle Recreation (OHMVR) Division's Grants and Cooperative Agreements Program, electrical and computer engineering professor **Lynne Slivovsky** and aeronautical engineering professor **Rob McDonald** have outlined a project to develop two UAVs — including the Yamaha RMAX helicopter donated to Cal Poly Engineering by Northrop Grumman — to assist the San Luis Obispo County Sheriff's Search and Rescue team to located lost hikers and OHMVR users. ■

A team of engineering students led by EE professor Lynne Slivovsky, second from right, are working on a project that would employ the RMAX unmanned helicopter for search and rescue efforts.

Cal Poly students unveil new hoist to aid disabled kayakers

CAL POLY ENGINEERING and Kinesiology students unveiled their Adapted Paddle Launch Vehicle in mid-May. The device is the result of a collaborative project aimed at helping people with disabilities enjoy kayaking. Funded by a National Science Foundation grant, the APLV was designed to make the process of loading clients into boats less invasive while simultaneously increasing safety within Cal Poly's Adapted Paddling Program.

The Adapted Paddling Program also offered a free kayaking clinic to local residents with disabilities and includes a paddling experience in the Morro Bay estuary. Kinesiology students participate as assistant instructors.

Cal Poly's Adapted Paddle Launch Vehicle was launched into Morro Bay Harbor in mid-May.

Previously, participants in the program who used wheelchairs had to be physically lifted and placed into the kayaks by students. Four to six students were then needed to lift the kayak and walk it down the boat ramp in order to launch the kayak.

A team of mechanical engineers and Kinesiology students was created and challenged with devising a less invasive way of loading program participants into their kayaks and then safely transporting the kayak to the water.

The vehicle consists of multiple parts that can be broken down for easy transportation as well as assembled quickly for use at the launch site. A hoist is used to transfer the paddler from their wheelchair to the kayak, which is securely mounted on the launch vehicle. The APLV is then deployed to safely transport the kayak down the boat ramp to be launched. ■

A happy group of Cal Poly Engineering and Kinesiology students collaborated on the Adapted Paddle Launch Vehicle.

SuPER project addresses global energy crisis

THERE IS SOMETHING SuPER GOING on at Cal Poly. Dr. **James Harris** (CPE/EE), Dr. **Ali Shaban** (EE) and Dr. **Dale Dolan** (EE) are working to bring energy sustainability to families in underdeveloped nations.

The Sustainable Power for Electrical Resources (SuPER) project is an example of Cal Poly's special brand of applied research: students, even at the undergraduate level, working hand-in-hand with faculty researchers on cutting-edge projects that address engineering global challenges. In this case, seniors in the Electrical Engineering Department are working on SuPER, as both a senior project and long-term development project.

Matt Camack (EE) is one of the engineering students working on the Sustainable Power for Electrical Resources (SuPER) power station project.

The project involves the development of a low-cost, sustainable source of electrical power with a 20 year life cycle that can be owned by a family unit. Harris initiated SuPER out of a belief that sustainable energy is key to raising the standard of living for the world's poor.

The system relies on solar power and battery power storage.

"This technology will provide access to electrical power through free market mechanisms, as opposed to governmental aid," explains Harris. "The technology is based on solar photovoltaic source, battery storage, and a standard DC output."

The project involves system engineering, embedded system design, controls, power electronics, digital design, and power protection, making it ideal as a focus for master's theses and senior projects.

The SuPER technology is based upon existing technology, but extrapolates capabilities into the future using a Moore's Law model. The system development plans are to use an FPGA, soft-core processor architecture for flexible hardware implementation of the acquisition, storage, control, and distribution of DC power.

According to Harris, the project is slated for a five-year development period, with the first three years devoted to technical development. "The last two years will focus on the economic sustainability of the system," he says. ■

2009-10 Sponsored Research

A sampling of sponsored faculty projects:

Multidisciplinary

■ **Organic Twittering: A Service-Learning Approach to Green Jobs:** This project encompasses a diverse group of faculty led by Dr. **Lynne Slivovsky** to address economic community needs through a mixture of sustainability, organic farming, computing, and civic engagement. Students in an introductory honors class will focus on sustainable, green economic development. A history class in comparative social movements will examine the use of media, past and present, in environmental and organic movements. A biological controls class will look at sustainable approaches to pest control. A freshman materials engineering design class will develop projects that aid native plant production. A computer engineering senior design class will develop social media tools to link both knowledge and practice of green jobs.

■ **Support for the Cal Poly E-Plane Project:** Under a grant from the California Space Grant Consortium, six Cal Poly students will design and develop an aircraft that can achieve very high mileage in terms of range achieved for specific energy consumption. The multidisciplinary senior project will include students drawn from aerospace engineering, mechanical engineering, electrical engineering, and computer science. The project will be guided by faculty members from these disciplines with the support of a graduate assistant who will utilize the project as the master's thesis project.

Aerospace Engineering

■ **Physical Properties of Orbiting Objects:** Jacobs Technology has been working with Dr. **Kira Abercromby** to determine physical characteristics of orbiting objects to be used within models to predict the future environment of objects at specific orbits.

■ **Cal Poly Flight Test Platform and Instrumentation Development:** A Cal Poly team led by Dr. **Robert McDonald** will develop a flexible, modular, low-cost approach to flight test appropriate for testing of aerodynamic models and components, and including development of flight test instrumentation using autonomous modules.

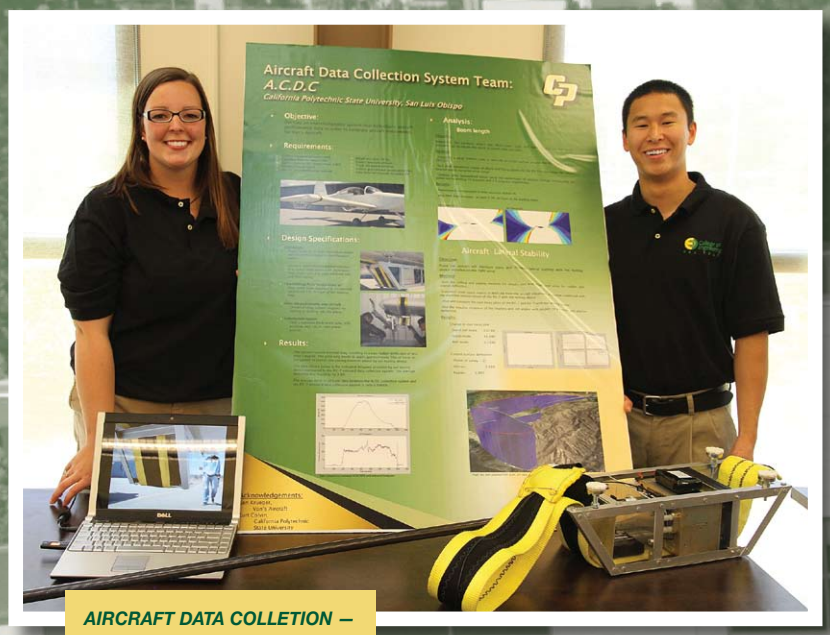
■ **Light Sail 1 mission:** Stellar Explorations and Dr. **Jordi Puig-Suari** are supporting the Plantary Society's Light Sail 1 Satellite Mission. This work is funded by the Planetary Society, which will be responsible for procuring the launch vehicle contract for this satellite.

■ **P-POD Integration and Launch Support:** Cal Poly will support qualification testing, fitchecks, integration, and launch services at various test and launch sites. Project statement of work also includes refurbishing a P-POD harness and actuator after a test firing.

Biomedical and General Engineering

■ **Master's of Science Specialization in Stem Cell Technology:** Under a $500,000 grant from the California Institute for Regener-

Continued on Page 6



AIRCRAFT DATA COLLETION — ***Comprised of AERO, EE and CE students, the "A.C.D.C." project commissioned by Van's Aircraft was tasked with designing a lightweight, unobtrusive, independent machine which would help revolutionize the way aircraft performance data is collected.***

Prosthetic Hand — ***ME student Max Maloney, center, demonstrates the prosthetic hand project he's working on in the QL+ Lab. (See Page 1)***

Project-Based Learning

Taking "Learn by Doing" to the next level

The Bonderson Projects Center was once again filled with an impressive array of senior projects at the 2010 Senior Design Expo in June. Generally supported or sponsored by companies or organizations looking for innovation, and happy to team with Cal Poly to allow bright, innovative young students the opportunity to gain hands-on, often private sector experience, the projects showed the power of multidisciplinary colloboration. And the range of projects was wide: From aircraft data collection projects to guidable motorcycle lights to robotic limbs and machines sensitive enough to sort out various types of recyclables, ingenuity was on full display.

Amy Kronsteiner and **Danny Marx** were two members of the seven-member "A.C.D.C" — Aircraft Data Collection Team — comprised of Aero, EE and Computer Engineering students. The project was commissioned by Van's Aircraft, which asked the students to "develop a system to collect accurate aircraft performance data to calibrate data," Kronsteiner explained. The team's objective was to "develop an interchangeable system that collects aircraft performance data in order to calibrate aircraft instruments for Van's Aircraft." The students sought to develop a lightweight, unobtrusive, independent machine which would help revolutionize the way aircraft data is collected.

Marx said working on the project was "a fantastic experience because I got to work on a real-world engineering project that our sponsor company will actually use. It was a great learning experience to go through the whole design process from conception to design to construction to testing to delivering the final project." Marx, a third-year AERO student, added: "This course was by far the most useful class I have taken at Cal Poly and what I learned during this project I will keep with me forever regardless of what field of engineering I'm working in… It's classes like this one that makes great engineers."

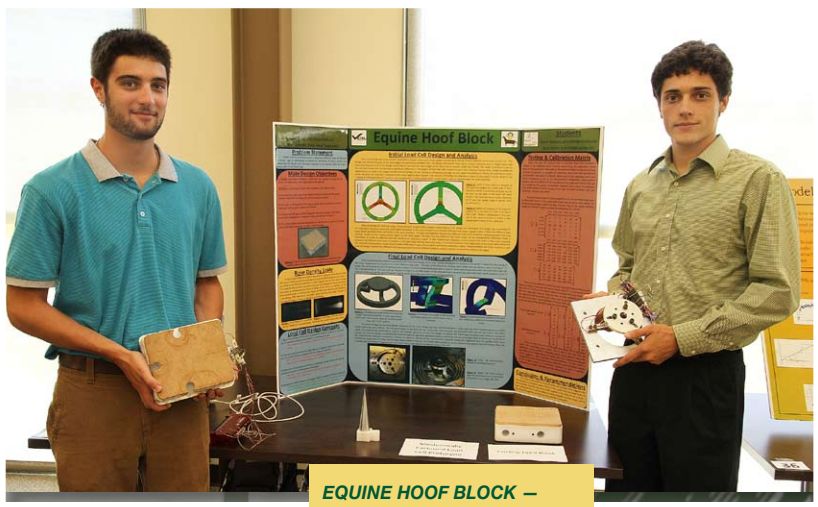
Two other senior projects that attracted atten-

HUMAN-POWERED HELICOPTER — ***Following the lead of Leonardo da Vinci and a successful Cal Poly project in 1989, members of the Cal Poly Aircraft Construction Club are competing in a $250,000 contest by engineering a new human-powered helicopter. Club members include Eli Knight, Danial Hudson and Brenton Haven.***

SUPER LIGHT, SUPER STRONG — *The goal of "Central Coast Composites" was to build lightweight wheels for the Cal Poly Supermileage vehicle. Team members included: Verent Chan, James Alvernaz, Brian Hamstrom, David Lewis and James Sciaini.*

HYDROGEN-POWERED GOLF CART — *A team including Greg Sanders, Barlos Basulto, Mike Brickner, Jeff Herde and Mike Brickner are working with IME professor Kurt Colvin on a golf cart that runs on hydrogen.*

Abradable Seal Test Rig — *Sponsored by Solar Turbines, this team, which includes Jason Fong, Andrew Pease and Trevor Plaine, designed a rig that tests abradable seals, which allow relative movement of rotar parts with respect to stationary parts in a turbine motor.*



EQUINE HOOF BLOCK — *Team members Jason Smith and Aaron Murano display their Equine Hoof Block, which helps measure forces on a horse's leg.*

Expo photographs by Larry Coolidge

tion were the Equine Hoof Block and the Guidable Motorcycle Headlight. Equine Hoof Block team members **Jason Smith** and **Aaron Murano** hope that their project — a stand that measures different forces on a horse's legs — will be a breakthrough in equine health. When project sponsors came to Cal Poly, one particular idea caught Smith's eye: "It feels good to work on a project that can can be useful in the future."

The Guidable Motorcycle Headlight addresses the problem of "inadequate lighting while riding [a motorcycle] at night," by using gyroscopic leveling and lighting cues from sensors around the helmet. This project has already won accolades, and has the distinction of winning the Cal Poly Venture Challenge. ■

— Susie Kopecky

ENERGY OF MOTION — *Designing an interactive exhibit for the San Luis Obispo Children's Museum that enhances concepts of energy was the task for this Cal Poly team that included Steven Azeka, Patrick Ligot, Brian Mich, Jaime Salazar and Eric Sanchez.*

2008-09 Sponsored Projects

ative Medicine, Cal Poly is developing an MS degree specialization in Stem Cell Technology that will provide 10 trainees with a foundation for successful careers in stem cell research. Graduates of the program will be well-prepared to matriculate into stem cell-focused doctoral programs or to begin employment as research specialists in stem cell labs at for-profit or non-profit institutions.

Civil & Environmental Engineering

■ **Collaborative Research: Innovative Learning Styles and Universal Access for Geotechnical Engineering:** In a collaborative effort with Auburn University, this NSF-sponsored project by **James Hanson** proposes to improve student learning of engineering curricula by providing broad-based teaching techniques and learning exercises which may correlate with independent and unconventional learning styles. The methods will employ challenging uses of both experimental design and student-friendly technology. The final physical products of the research will be student-developed learning modules that are particularly designed for universal accessibility.

■ **VOC emissions from flooring systems and the impact of floor leveling screeds:** Dr. **Daniel Jansen** is studying Volatile Organic Compound (VOC) emissions from flooring, in particular whether alkalis from concrete slabs can react with flooring materials resulting in emissions of additional VOCs and whether calcium aluminate floor leveling screeds reduce the transport of alkalis from the concrete slab to the flooring material thereby reducing the emissions of VOCs from flooring systems.

■ **Durability Studies of Modified Plastering Mixes, Surface Deteriorations of Plastered Swimming Pools:** This is the seventh phase of a study led by Dr. **Damian Kachlakev** to investigate the long-term effect of various parameters on the mechanism of etching deterioration, cracking and discoloration of plastered swimming pools.

■ **Polytech Waterbag, Water Treatment for Disaster Relief:** The Polytech Waterbag provides clean drinking water in the critical time following natural disasters. The waterbag project, led by Dr. **Trygve Lundquist**, enables an individual to collect, transport, treat, and hygienically store water in a single unit.

■ **Study on the Risk of Levee Failures in the Western U.S.:** Dr. **Robb Moss** will lead a time-critical comprehensive risk analysis will be performed on the California Bay Delta utilizing existing failure data, available loading data, newly acquired subsurface data, advanced reliability methods, and spatial statistics/tools to provide a rational means for directing levee failure mitigation efforts.

■ **Microalgae Production and Harvesting in Wastewater:** Cal Poly students led by Dr. **Yarrow Nelson** is assisting MicroBio Engineering, Inc. with the demonstration of a low-cost municipal wastewater treatment process based on algal growth that also produces biofuel. The work is performed at four ponds located at the San Luis Obispo Wastewater Reclamation Facility.

Continued on Page 7

Bently Center funds research for engineering projects

THE DONALD E. BENTLY CENTER For Engineering Innovation is used to fund research in rotor dynamics, sponsor graduate and undergraduate research, publish conference and journal papers, develop graduate courses, provide service to professional societies and improve research in engineering education, according to the newest director, Dr. **Chris Pascual**.

The Bently Center welcomed Pascual during the 2009 Fall Quarter. It was founded in 2003 by industrialist Donald E. Bently and led by Dr. Jim Meagher until last year. Currently, the Center's endowment is valued at $6.5 million, and continues to grow.

"I am excited about this professional development opportunity," Pascual said in a recent newsletter. "The Bently Center promotes the teacher-scholar model, a central Cal Poly attribute, by providing release time from teaching, so that faculty members can pursue professional growth, which, in turn enriches classroom teaching.

Activities and projects undertaken via the Bently Center include: Rotor Dynamics Research, Course Pack and Textbook Development, Cal Poly Cartilage Biomechanics Group, Monkey Robot Project, Rocket Nozzle Research, Vehicle Dynamics Model, Improving Engineering Education, and Automotive Air Cycle Machine and Wind Power Research.

"All of the projects in the Center are equally important and unique," says Pascual.

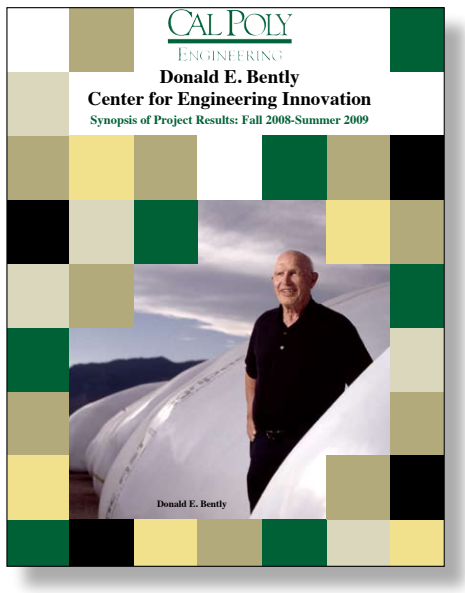
"What is amazing is the diversity of projects that the Center has helped fund," he notes. "The key to this diversity and success is that the Center encourages faculty to pursue their interests and research inclinations."

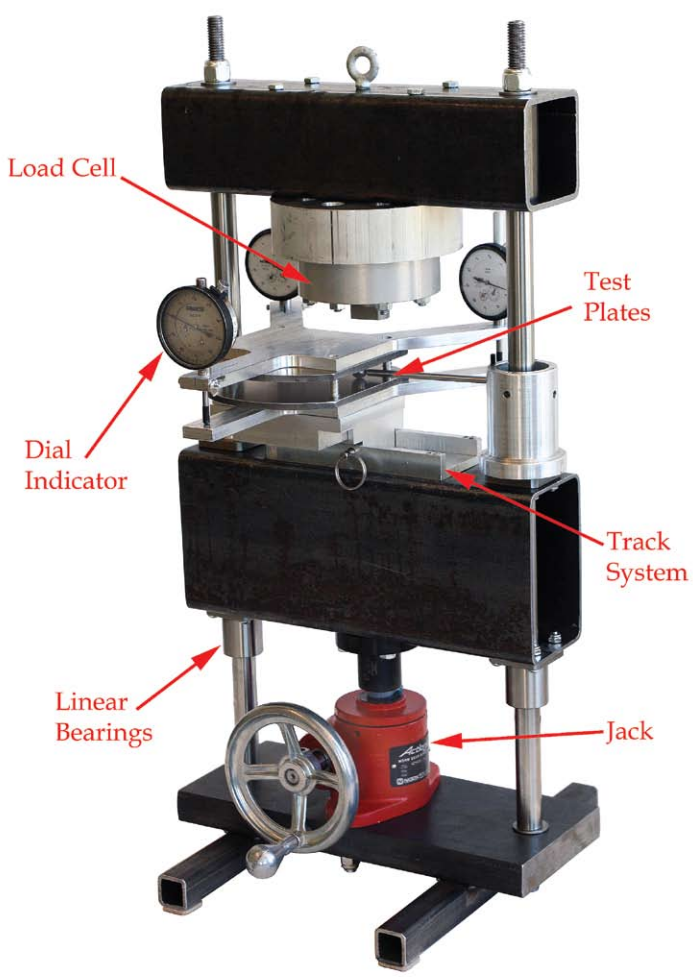
"What is amazing is the diversity of projects that the Center has helped fund. The Center works best because it helps the faculty pursue their interests." ***— Chris Pascual***

For instance, prior to joining Cal Poly, Bentley Center researcher **Patrick Lemieux** had worked on a model for Automotive Cycle Machines. At Cal Poly, he worked closely with master's student **Christopher Forster** on a machine powered solely by shop air and a turbo-diesel engine.

"The work performed on these prototypes may be the subject of an ASME presentation in 2010, and may be considered for patent protection by the university," Pascual said.

As the Bently Center endowment's spending reserve continues to build, the Center will fund more innovation and research by Cal Poly's mechanical engineering faculty and students. Since its inception, however, the Bently Center has been a model of "Learn by Doing" in action. ■





Student's Brinell Testing Machine comes in under budget — and it works

MAYBE THE STATE OF CALIFORNIA SHOULD LET CAL POLY engineering students **Joe Cloutier**, **Mike Jaskulsky** and **Joshua Kessler** run the budget hearings. Sponsored by a $10,000 grant from Parker Aerospace Group to build a Brinell Limit Testing Machine, the students designed, constructed and validated through testing a machine that came in at a thrifty $5,292, including travel.

"Parker was really involved in the process and really pleased with the result," Jaskulsky said. "It was great combining everything we've learned and getting to design with a mathmatical foundation a model that works — and it does indeed work."

The fixture was designed to determine the load limits of new material samples at "the onset of brinelling," which refers to a material surface failure caused by contact stress that exceeds the material limit. (Dents or "brinell" marks are the result of too great a load).

The student's Brinell machine was tested by loading 1/2-inch metal balls and 1/4-inch rollers between 52100 steel plates and comparing the loads at which visual deformation was detected to the loads calculated. The students concluded: "Once a quantitative definition of brinelling is accepted by Parker and more advanced equipment is available for measurement of permanent deformation, this machine will be able to determine the brinelling values of new materials." ■

A whole lotta shaking going on

Cal Poly undergrads contribute to NSF seismic research: teamwork is the key to this complex project

FIVE PRESTIGIOUS UNIVERSITIES ARE COLLABORATING ON the National Science Foundation-sponsored project titled, "Seismic Performance Assessment in Dense Urban Environments: Soil Structure Interaction on the Scale of a City Block." Participants include UC Berkeley (lead institution), Cal Poly, SUNY Buffalo, UC Davis and UC San Diego – plus the Consortium of Universities for Research in Earthquake Engineering.

The project addresses the need to better understand ground motion interactions between densely spaced buildings by undertaking centrifuge experiments in which the input motion, ground conditions, ground response, and structural response are carefully tracked. This database will enhance the profession's understanding of soil-structure interaction (SSI) effects of buildings in a dense urban environment.

Dr. **Gregg Fiegel**, Cal Poly faculty advisor to the project, notes, "During the past year, no less than 20 technicians, engineers, and students assisted in the completion of three intense centrifuge experiments. The construction of a centrifuge model typically includes over 150 measurement transducers and instruments and will be subject to over a dozen simulated earthquakes. How much data is collected? Tons!"

Cal Poly Civil Engineering student Roshani Patel worked at UC Davis on an NSF-sponsored study of soil structure during earthquakes.

Key "City Block" team members have included three undergraduate students from Cal Poly. During the past year, civil engineering majors **Jack Montgomery**, **Roshani Patel**, and **Clayton Proto** each spent approximately two months living in Davis, where the centrifuge facility is located at the Center for Geotechnical Modeling.

Needless to say, completion of the experiments requires effective teamwork and communication. "One of the most rewarding aspects of the assignment was working closely with other students toward a common goal," said Patel.

Patel's assignment actually began at UC San Diego, where she teamed with graduate students to apply nearly 200 strain gauges to two small-scale structural models. "I remember learning about strain gauges in my Mechanics of Materials class at Cal Poly," she said. "At the time, I didn't understand them completely, but working with them at San Diego allowed me to better understand their application."

For the initial centrifuge research, Jack Montgomery applied his structural dynamics and earthquake engineering knowledge while teaming with a UC Davis graduate student to design and test a miniature voice coil mass vibrator. This device was eventually used to study the dynamic response of model buildings tested on the centrifuge.

Says Montgomery, "I found the combination of structural and geotechnical engineering to be the most interesting aspect of the project. The structures, the foundations, and the soil must all be analyzed when evaluating how neighboring buildings interact. This required research experts with different backgrounds to work together toward a common goal." ■

— contributed by Gregg Fiegel

Cal Poly student Jack Montgomery, left, works with graduate researchers from UC Davis, UC San Diego and UC Berkeley on a seismic study sponsored by the NSF.

"Strider" project aims to improve mobility for young SMA patient

SPINAL MUSCULAR ATROPHY IS A RARE DISEASE THAT CAUSES a critical loss of muscle motor function for young patients. The overall goal of the Strider project is to provide Nathan, an energetic 4-year-old with SMA, with a device that will allow him to exercise, sustain impact to promote bone density growth and to move around in a vertical position.

Designed for Nathan for ages 4-6 and to supplement his current means of exercise that include water therapy, stretching, swinging and vibration therapy, the 4-wheel, lightweight prototype passed tests for stability, handling, ability to traverse multiple terrains, functionality and comfort.

"The best part was when Nathan got in it and started moving — it made all the work worthwhile to see him smile," said **Alex Trask**, who along with **Eric Johnson** and **Ricardo Garcia** form the Strider team. "We learned the whole process of design and this project makes me consider going into adaptive technologies." ■

Four-year-old Nathan, an SMA patient, moves in his "Strider," a project by Cal Poly students Alex Trask, Ricardo Garcia and Eric Johnson.

2008-09 Sponsored Projects

■ **New Methods for Measuring, Evaluating and Predicting the Safety Impact of Road Infrastructure Systems on Driver Behavior:** As part of this Collaborative proposal to NSF, Dr. **Anurag Pande** is involved with the collection and analysis of the data used to calibrate and validate the macroscopic and microscopic models of driver behavior.

■ **Soil Stabilization Guide:** Working with the University of California, Davis, Dr. **Ashraf Rahim** is developing a Soil Stabilization Guide for the Caltrans Division of Pavement Management.

Computer Science

■ **Ice-edge AUV mapping and Navigation Experiments in the Arctic:** Dr. **Christopher Clark** took a planning visit to the Ny-Alesund Arctic Research Station in Svalbard, Norway, to prepare for autonomous underwater vehicle (AUV) navigation experiments,

■ **Redesigning Introductory Computing: The Design Discipline:** Continuing a project with Adelphia University, the Cal Poly team led by Dr. **John Clements** will sponsor a workshop on a radically new approach to teaching object-oriented programming in introductory courses.

■ **Test-Driven Learning with WebIDE:** This project led by Dr. **David Janzen** endeavors to ease and speed adoption of Test-driven development (TDD) in academia by developing and assessing lab materials and a supporting web-based integrated development environment (WebIDE) for first year programming courses.

Electrical Engineering

■ **70MHz Channel Emulator Project Phase II:** The student project led by Dr. **Al Liddicoat** will work on the digital design, computer interface, and system level verification for a Digital Link Channel Emulator (DLCE) used to evaluate the end-to-end radio frequency communications systems in use for space exploration.

Smart Dial-a-Ride for Demand-Responsive Transit Operations: Research and Development of a Prototype Dispatch Assistance Tool: This project led by Dr. **Jeffrey Gerfen** proposes to investigate and develop the conceptual basis for an efficient system to aid Dial-a-Ride operations in several areas including: (a) taking ride reservations, (b) assigning rides to vehicles, (c) optimizing vehicle routing, and (d) automatically generating reports which characterize system operation and ridership. This proposal covers the first part of the project envisioned to analyze dial-a-ride operations and develop a concept of operations for a Dispatch Assistance Tool (DAT).

Materials Engineering

■ **Testing Services for Agilent Technologies:** Dr. **Trevor Harding**'s team analyzes samples provided to Cal Poly by Agilent for the appearance, location, composition and integrity of intermetallic layers and compounds, and to analyze failures. The purpose

Continued on Page 8

2008-09 Sponsored Projects

of the project is to allow Agilent to determine the effect of gold (Au) content on SAC305 solder joint reliability of certain surface mount packages and through-hole connectors with various isothermal aging times and environmental stresses.

■ **Opening the Dialogue to Collaborate for Systemic Change at Cal Poly:** Sponsored by the National Science Foundation via the National Academy of Engineering, the project led by Dr. **Linda Vanasupa** will bring local stakeholders together in a one or two day workshop to initiate the dialogue on how the Cal Poly community can work together to grow a new model of multi-stakeholder collaboration. In the proposal, Vanasupa writes: "A polytechnic education in the 21st century can take place in the context of working on relevant societal challenges, rather than solely on hypothetical 'problems' within the walls of classrooms."

Mechanical Engineering

■ **Cal Poly Laminar Flow Technology Development:** The Cal Poly team led by Dr. **Russell Westphal** continues to conduct feasibility studies and component/system testing aimed at improving the Boundary Layer Data System (BLDS) devices.

■ **Reusable, Oxidizer-Cooled, Hybrid Aerospike Rocket Motor for Flight Test:** The Cal Poly team led by Dr. **William Murray** is studying the use of the refrigerant capabilities of nitrous oxide (N2O) to provide the cooling required for reusable operation of an aerospike nozzle in conjunction with an N2O-Plexiglas® hybrid rocket motor in use by the NASA STTR program. As a simple, practical nozzle, the proposed innovation fits well with hybrid rocket designs, which tend toward simpler, less expensive design alternatives.

Multicultural Engineering Program

■ **Support for MESA Schools Program:** The MESA Schools Program (MSP) at Cal Poly receives funding from MESA, the College of Engineering, and corporate donors. Students from rural and low-income populations are less likely to select educational paths that prepare them for college. This program works with middle and high school students who are interested in science and math. Through establishing a MESA period during the educational day, students will learn about applied scientific and mathematical principles, increase their knowledge of careers and technology, and expand their educational horizons to include college as a viable educational option.

CAL POLY ENGINEERING

Pipeline is published annually by the Cal Poly College of Engineering • Volume 5, No. 1 • October 2010 • (805) 756-6225

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Mechanical Engineering student Max Maloney, left, demonstrates his QL+ prosthetic hand project to Cameron Clapp.

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or switch between different wheelchairs. The new wheelchair will "easily adapt between indoor and outdoor environments, and on-road and off-road formats, including rough terrain and gradients."

■ **BREATHABLE FACIAL PROSTHETIC** — The objective of this QL+ student team project is to develop and demonstrate a practical system for the aeration of facial prostheses for patients with severe disfigurement.

■ **CAT D6R INGRESS/EGRESS** — The team of **Matt Rubin**, **Erick Serrano** and **Eric Ward** are developing a system to enable equipment operators with limited mobility, included leg amputees, to easily enter and exit the operating cab of a CATD6R earth moving machine, which is several feet above the ground.

■ **THE TABLETTE** — The goal for this QL+ project is to create a portable table to make dining out easier and more pleasurable for people in wheelchairs. The Tablette is engineered to fit any table, regardless of height or width. The design provides adequate lap covering, filling the space between the table edge and the wheelchair seat, effectively extending the table edge.

■ **RECUMBENT BICYCLE** — The development of a recumbent bicycle designed to accommodate a rider with a length differential between right and left legs is the goal of this QL+ project. Among the engineering tasks on the special bike are a new pedal, fixing a problem with the chain's tension, and developing a hydraulic seat for greater comfort.

See http://www.qlplus.org/ for more information on QL+ Lab projects. ■