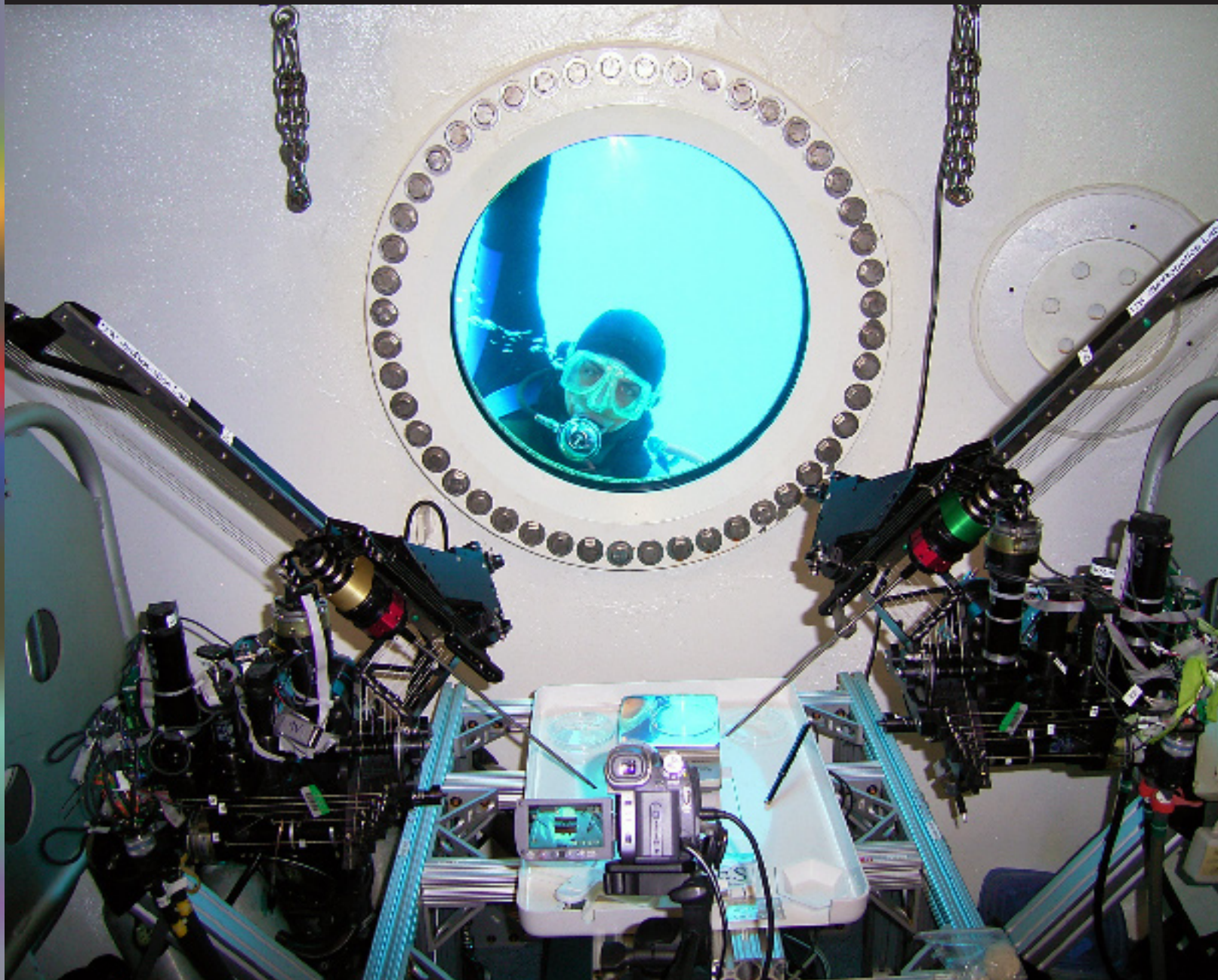


the Trend

Autumn 2007: Volume 57, Issue 2

in engineering



Into the deep ... NASA tests UW surgical robot *page 6*



It's been clear for the last several years that UW Engineering is a rising star. Sometimes we overuse this metaphor, but the feeling is almost palpable. Recently, the rest of the technology world has been starting to notice some of the light beaming from Seattle.

As reported on the facing page, *Technology Review*, published by MIT, recognized faculty members Yoshi Kohno and Babak Parviz and graduate student Tapan Parikh in its annual TR35 list of outstanding young innovators. Tapan won special recognition as Humanitarian of the Year and a three-page spread in the magazine for his technological work with the poor in India. It's unprecedented for a university to have three members on this list in one year.

And there's more. Alumna Karen Liu (now at Georgia Tech) and affiliate faculty member Desney Tan (Microsoft Research) also earned TR35 honors. All five now belong to an elite group that includes past winners such as the founders of Google and Yahoo! and the developer of Linux.

We had barely settled from this news when UW faculty member Yoky Matsuoka and alumnus Marc Edwards, a professor at Virginia Tech, won prestigious MacArthur fellowships ("genius awards") for their exceptional creativity and contributions to society. We are thrilled for them and for the notice they bring to UW Engineering.

These awards confirm that we are attracting top-quality faculty and students. The impact will magnify as these researchers continue to mature, becoming stand-out leaders in their fields, and drawing more outstanding faculty and students to the UW.

Clearly, the best attract the best, which is why we need many more endowed scholarships, fellowships, and professorships to help draw the best to Seattle.

We're moving on other fronts, too. I'm excited about the CoE leadership team and our latest appointments noted below. We have recently recruited a dynamic new chair for Civil & Environmental Engineering who will lead an expansion of that program. We have also appointed new chairs in Electrical Engineering and Materials Science & Engineering. Searches are under way for new chairs of Bioengineering and Technical Communications. Bioengineering is a core department, along with Materials Science and Chemical Engineering, for a new, interdisciplinary focus in the emerging field of molecular engineering.

During the just-concluded fiscal year, the UW exceeded \$1 billion in research funding. A year ago, the College of Engineering brought in a record \$95 million in research awards, and we are near that mark for FY07.

What a terrific way to kick off a new academic year.

MATTHEW O'DONNELL
Frank and Julie Jungers Dean
of Engineering

Outstanding Leaders Take On Key Positions

The academic year opens with new appointments, congratulations for confirmations to permanent chair positions plus one reappointment, and appreciation to faculty members who recently assumed interim chair roles.

Greg Miller, professor of civil and environmental engineering, has taken on the new position of associate dean for infrastructure. He will oversee all facilities projects, including components of two proposed new buildings, and will head the college's computing services functions.

Civil & Environmental Engineering welcomes **Craig Benson** as chair on July 1, 2008. He is an expert in geotechnical engineering now at the University of Wisconsin, Madison. As chair designate he will visit monthly to confer with college and department leaders and faculty. Professor **Tim Larson** is interim chair during the transition.

Two acting chairs confirmed to permanent positions are **Leung Tsang** in Electrical Engineering and **Alex Jen**, holder of the Boeing-Johnson Endowed Chair in Materials Science & Engineering. **Eric Stuve** has signed on for a second five-year term as chair of Chemical Engineering. **Paul Yager** became acting chair of Bioengineering after **Yongmin Kim** completed his chair term in June. Read more about these appointments at <http://uwnews.washington.edu/ni/uweek/uweekarticle.asp?articleID=36831>.



Greg Miller
Associate Dean



Craig Benson
CEE Chair Designate



Leung Tsang
EE Chair



Alex Jen
MSE Chair



L to R: Tapan Parikh, Yoshi Ohno, and Babak Parviz

Our Five of the TR35 Brilliant, Creative, Driven, and the Future of Technology

That is how *Technology Review* describes an elite group of 35 innovators aged 35 or younger saluted in the magazine's October issue. A panel of expert judges selected the 2007 TR35 winners from more than 300 nominees in academia and industry. Any institution would be thrilled to have one winner. UW Engineering is tremendously excited that two faculty members and a graduate student are honored this year. Add to that a recent alumna and an affiliate faculty member, and our level of representation is truly remarkable.

"I'm extremely proud of our TR35 winners," said Dean Matt O'Donnell. "This speaks to the exceptional talent we've been able to attract to the college."

Yoshi Kohno, 29, an assistant professor of computer science and engineering, is recognized for his work in computer security. Kohno invented the concept of systems-oriented provable security, which promises to beef up the safety and privacy of online transactions. His other research has looked at the privacy implications of electronic voting machines, consumer electronics, and Web browsers.

Babak Parviz, 34, an assistant professor of electrical engineering, is recognized for his research at the interface of biology and nanotechnology. Parviz works on biologically inspired self-assembly. He has used the method to build flexible plastic circuits, nano-scale electronics, and low-cost biological sensors for detecting diseases such as HIV.

Tapan Parikh, 33, a doctoral student in computer science and engineering, uses mobile phones and open-source software to create novel tools for the developing world. He started a company in India to develop a product for microfinance co-ops and is now creating tools for healthcare diagnoses and agricultural certification. He was also named Humanitarian of the Year.

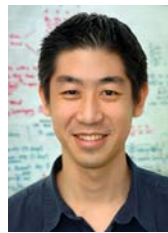
Karen Liu, 30, an assistant professor at George Institute of Technology, was recognized in part for her computer science doctoral research at the UW. She develops realistic body language for characters in computer animation.

Desney Tan, 31, of Microsoft Research in Redmond, was recognized for using electroencephalography (EEG) signals to operate computers. He is an affiliate professor of computer science and engineering.

The winners accepted their awards at the Emerging Technologies Conference held at MIT in September. More information about the TR35 award and the winners is available at www.technologyreview.com/tr35/.



Karen Liu



Desney Tan

Hail to Engineering's First MacArthur Fellows!

The calls came out of the blue to Yoky Matsuoka, associate professor of computer science and engineering, and Marc Edwards, a 1991 UW engineering doctoral graduate and professor of civil and environmental engineering at Virginia Tech.

The caller from the John D. and Catherine T. MacArthur Foundation instructed Matsuoka to sit down and put down her week-old baby. Only then did he reveal that she is a 2007 MacArthur Fellow, one of 24 honored this year with a \$500,000 no-strings-attached prize often referred to as the "genius" award.

"It's unbelievable," Matsuoka said. Recipients cannot apply for the award and didn't even know they were nominated until receiving the call that places them among a select group of highly creative and accomplished scientists, artists, and innovators from diverse fields.

Matsuoka directs the UW's Neurobotics Laboratory. She studies how our central nervous system produces signals that control movements of the limbs and then uses that information to create advanced robotic prosthetics. The goal is to give people with reduced mobility a prosthetic that integrates seamlessly

Continued on page 4



Yoky Matsuoka



UW Earns High Fives as Terrific Host for Concrete Canoe Races

The UW Concrete Canoe Team and the Department of Civil & Environmental Engineering hosted the Northwest regional competition in April and, for the first time, the American Society of Civil Engineers national competition in mid-June. Red Square proved a great venue for the team displays of canoes and Lake Sammamish a scenic setting for the races. Students and faculty with 22 teams from across the country proclaimed the national competition one of the best organized ever. The Dawgs placed second overall at Northwest regionals and 11th at nationals.



Photos by Peter Mackenzie (top and right) and Kevin P. Casey

MacArthur Fellows (from page 3)

with the affected limb and offers an unprecedented degree of control.

“What I build is not even the next step, but many steps ahead of what is available today,” Matsuoka said. An example is a lifelike robotic hand. Seven motors, representing muscles, power the tendons’ movements of the index finger. The idea is that the signals a person once used to move a biological hand would work to control the electronic replica.

Matsuoka earned a BS degree from UC–Berkeley and a PhD from MIT, both in electrical engineering and computer science. From 2001 to 2006 she was an assistant professor at Carnegie Mellon. Previous honors include the Presidential Early Career Award for Scientists and Engineers and the IEEE Early Career Award in Robotics and Automation.

Visit Matsuoka’s Web page at: <http://www.cs.washington.edu/homes/yokyl>. You can listen to one of her lectures at <http://www.researchchannel.org/prog/displayevent.aspx?rID=4314>.

Crusader for Safe Drinking Water

The MacArthur Foundation honored Professor Marc Edwards of Virginia Tech for “playing a vital role in ensuring the safety of drinking water ... and making critical contributions to the health of individuals and communities throughout the U.S.” *Time* magazine in 2004 cited his research revealing shockingly high levels of lead in Washington, D.C.’s water system. An expert in the chemistry and toxicity of urban water supplies, Edwards did his UW doctoral research in environmental engineering under the guidance of Professor Mark Benjamin. “Marc is a real hero of the water treatment world,” Benjamin said.



Marc Edwards

Visit <http://www.macfound.org> for more information on both new fellows.

◆ Winners ◆

◆ Faculty Honors

BIOENGINEERING The Controlled Release Society honored Professor **Alan Hoffman** with the 2007 Founders’ Award for his 50 years of research contributions.

COMPUTER SCIENCE & ENGINEERING Professor **David Notkin** received the 2007 Distinguished Service Award from the Association for Computing Machinery’s Special Interest Group on Software Engineering.

ELECTRICAL ENGINEERING Professor **Sumit Roy** was elected a Fellow of the Institute for Electrical and Electronic Engineers. Assistant Professor **Maya Gupta** has won a 2007 Office of Naval Research Young Investigator Award. Assistant Professor **Babak Parviz** has won a 2007 CAREER Award from the National Science Foundation. *Genome Technology* magazine also recognized him as a “Rising Young Investigator,” as did *Technology Review* (page 3).

MATERIALS SCIENCE & ENGINEERING Professor and Chair **Alex Jen** has been awarded the Chang Jiang Scholar Endowed Chair by the Ministry of Education, People’s Republic of China. As a visiting professor, he will establish an advanced organic optoelectronic materials and devices program at Wuhan University.

MECHANICAL ENGINEERING Professor **Mamidala Ramulu** was elected a Fellow of the American Society of Manufacturing Engineers, one of only nine named in 2007.



MESA Day photos by John Merrill.



MESA at 25

Sparking excitement for math, engineering, and science

It's hard to imagine more gleeful smiles. At annual MESA Day competitions K-12 students build model bridges and airplanes and put robots through their paces. Excitement goes off the scale at the end of the day when students receive achievement medals and plaques for their classrooms.

Through MESA (Mathematics Engineering Science Achievement), students of color and girls excel in a challenging and fun learning community. MESA supports students, teachers, and parents with innovative, hands-on programs in the classroom, after school, and during the summer. Beginning in 1982 with 88 students at four high schools in Seattle, MESA now serves over 5,000 students in 106 schools and 28 districts statewide.

MESA provides a pathway to college for students who are under represented in math, science, and engineering careers. An impressive 96 percent of MESA high school students go on to college, and they earn university degrees in science and engineering at rates well above the national average.

Two who did so are engineers Dana Norwood (Boeing) and Elizabeth Stephens (Pacific Northwest Laboratory). They were honored with Alumni Hall of Fame awards at MESA's twenty-fifth anniversary celebration on August 25. Stephens, the daughter of farm laborers, first experienced MESA during eighth grade at Toppenish Middle School. "I didn't know what an engineer was, and didn't know anyone in science," Stephens recalls. By high school she was hooked. MESA scholarships and others enabled her to attend the UW to earn a BS ('98) in materials science and engineering. She is now a research scientist in the energy materials group at PNL. "MESA opened so many doors for me and has had tremendous impact on my life," she says.

Washington MESA is administered through the College of Engineering and serves six MESA centers based at colleges around the state.

Thank you to MESA 25th anniversary sponsors! Boeing, UW College of Engineering, Battelle, The Bill and Melinda Gates Foundation, Weyerhaeuser, Microsoft.

Students are eager to talk to Dr. Calvin Mackie of Tulane University after his inspiring keynote talk at the celebration.



MESA Alumni Hall of Fame Honorees

Above: Dana Norwood, a Boeing engineer, presents medals at Seattle MESA Day.

Right: Receiving their awards on August 25 are Anthony Rose (UW '06) and Elizabeth Stephens (UW MSE '98). All three volunteer with MESA programs to mentor the next generation.



MESA's 25th Anniversary

The August 25 celebration brought together several Washington MESA founders including Patricia MacGowan (left) and Mona Bailey (right). With them is John Pope, a member of the MESA board of directors. Bailey was the first board president. Celebration attendees honored MacGowan for her 25 years of leadership as executive director. She retires with accolades!

Raven, a mobile surgical robot that may one day fly into space on NASA missions, has passed a critical test in a challenging environment. Like its resilient namesake bird, the lightweight robot with two black, wing-like arms recently proved its mettle in an undersea laboratory that mimics some of the conditions of working in space.

Flip the calendar back to May 8, 2007. Three and a half miles offshore from Key Largo, Fla., Raven perches before a porthole in the Aquarius Undersea Laboratory, ready for the remotely generated signals that will put it through its paces.

A six-person NASA team, including two astronauts and two medical specialists, is in the second day of a 12-day mission in the cramped habitat. They are on a space simulation and training project, NASA Extreme Environment Mission Operations (NEEMO 12), with a focus on advanced medical technology experiments.

Some 2700 miles away in Seattle, in a meeting room in the UW Electrical Engineering building, two surgeons from the UW Medical Center, Drs. Mika Sinanan and Andrew Wright, and Dr. Thomas Lendvay of Children's Hospital and Regional Medical Center, take turns sitting before a computer monitor and manipulating control arms. Their commands travel over the Internet to Key Largo, then via a wireless connection to a buoy, and finally via cable down to Aquarius. While watching the video images of Raven beamed back over the Internet, they direct the robotic arms to pick up small plastic triangles and drop them over metal pegs, a standardized test of surgical skills (see photos, far right).

Raven's undersea sojourn capped five years of development work by Blake Hannaford, professor of electri-

cal engineering, Jacob Rosen, research associate professor, their team of graduate students, and partners in the UW's department of surgery.

In the BioRobotics Lab the team hatched a design for a lightweight, mobile surgical robotic system that vehicles could carry into combat zones or into areas devastated by natural disasters. Onsite technicians would monitor the systems while surgeons anywhere in the world could direct the robots to perform emergency procedures to quickly stabilize the injured for safer transport to treatment centers.

Robotically assisted surgery may seem like space-age science fiction, but it's already a tool in some medical centers. Only one remotely controlled surgical robot, named da Vinci, is FDA-approved and commercially available in the United States. A surgeon in the same room as the patient sits at a console to control da Vinci and perform minimally invasive procedures such as removal of the prostate gland through tiny incisions made in the lower abdomen. The \$1.5-million system weighs half a ton and is immobile.



During the NEEMO mission, Raven did double-duty as a lunar sample manipulator. Mary Sue Bell, a planetary geologist at the Johnson Space Center, controlled the robotic arms to test Raven's ability to manipulate simulated lunar rock samples (right foreground).

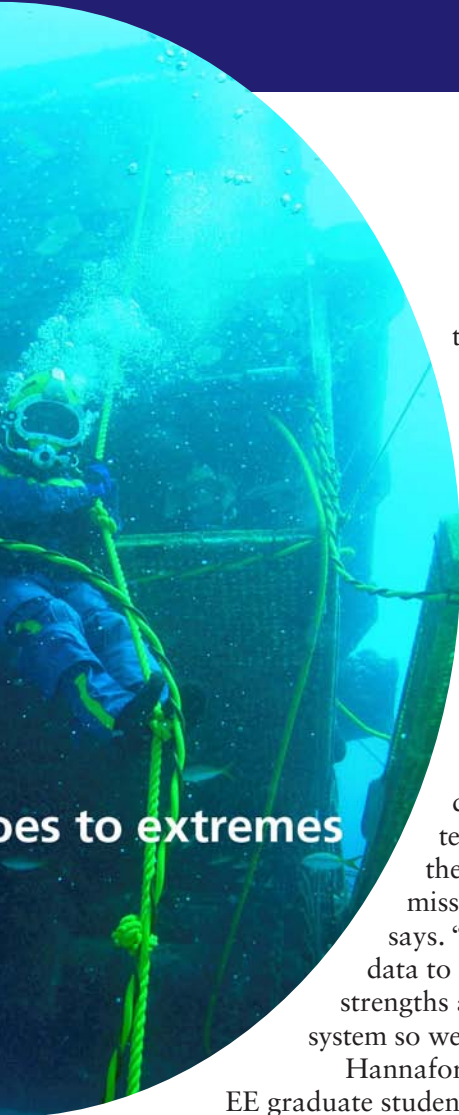


PHOTO CREDITS:
Cover photo, NASA staff, and Aquarius habitat and testing are courtesy of NASA.



In an EE conference room on May 8, UW surgeon Thomas Lendvay sent commands to Raven in the Aquarius lab off Key Largo, Florida.

UW Engineering



...es to extremes

Enter Raven, one of just two light-weight, mobile surgical robots in development. The other is the M-7 from the Stanford Research Institute, also tested during NASA's NEEMO 12 mission.

"We've met the challenge to design a portable, robust robot that functions outside a pristine operating room environment. That, and the cross-continent demonstration of the telerobotic controls, were the key goals of the NASA mission," Blake Hannaford says. "Next we want to gather data to understand the medical strengths and weaknesses of the system so we can perfect Raven."

Hannaford's research team includes EE graduate students Mitch Lum, Diana Friedman, Hawkeye King, Ganesh Sankaranarayanan, and undergrad Gina Donlin. Lum began working in the BioRobotics Lab as an undergraduate in 1999. His doctoral research compares how expert surgeons perform on a set of five skills tests when using the robot versus traditional manual instruments used in minimally invasive surgery. "These tests, such as dropping plastic triangles around pegs, were developed by the Society of

American Gastrointestinal Endoscopic Surgeons," Lum says. "They give us a measurable, objective way to evaluate Raven and determine how we need to refine it."

Friedman is completing a masters in mechanical engineering and embarking on a doctorate in EE. She joined the biorobotics team in spring 2005 to help run experiments and provide mechanical support, particularly focused on functioning of the robot's arms.

Lum and Friedman played key roles in subjecting Raven to the rigors of extreme environments. To test the system in field conditions last year, the research group drove it in a cargo van over bumpy roads to the blistering hot, windy rangelands near Simi Valley, Calif., and set up the robot and controls under separate canopies. Surgeon and research collaborator Timothy Broderick of the University of Cincinnati performed the surgical skills tests, including suturing exercises. Broderick, also a consultant to the U.S. Army (which funded Raven), joined NASA's team on the NEEMO 12 mission to observe the robot and assess its suitability for space travel.

For the NEEMO tests, Lum and Friedman flew to Florida while Raven shipped FedEx (another test of ruggedness). In Key Largo they packed the robot's parts in dive bags taken by scuba divers to Aquarius, where an astronaut reassembled Raven. Lum had taken dive training and put his skills to the test during an 80-minute visit to Aquarius to repair a cable damaged by water pressure on a dive bag. "We've had some amazing experiences that are rare for graduate students," Lum said.

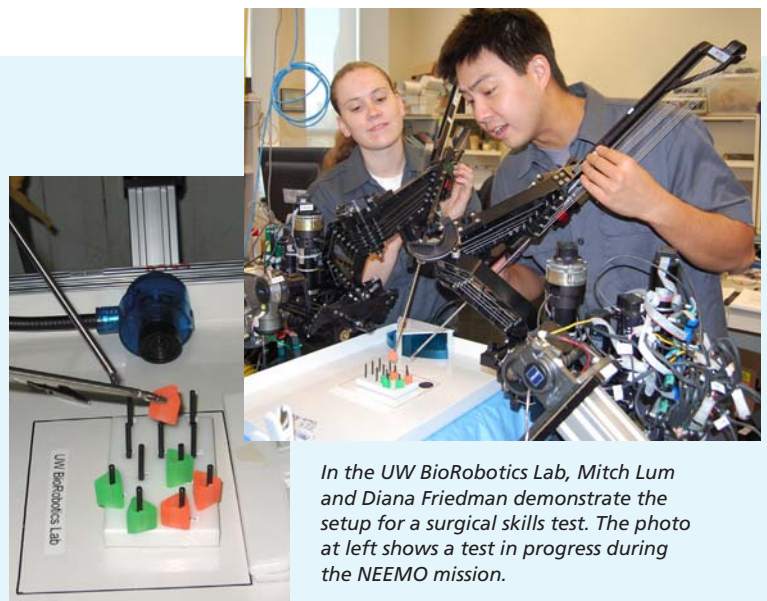
Raven is unlikely to soar into space for at least 10 or 15 years, but earthbound use by the military or disaster relief teams could be possible in about five years.

A five-year \$1.5-million grant from the U.S. Army's Telemedicine and Advanced Technology Research Center funded development of Raven.

Information on the UW Biorobotics Lab is at <http://brl.ee.washington.edu>.



The NASA crew works in the submarine-like Aquarius habitat, owned by the National Oceanic and Atmospheric Administration.



In the UW BioRobotics Lab, Mitch Lum and Diana Friedman demonstrate the setup for a surgical skills test. The photo at left shows a test in progress during the NEEMO mission.

UW Engineering



In the past, engineering brought to mind topics like mechanics, hydraulics, and electrical circuits. Such basics remain important, but today we're also exploring on a molecular and nanoscale level, across disciplines, and developing new technologies such as lab-on-a-chip, photonics, and smart polymers.

It's an exciting time to be part of engineering education at the UW. Our alumni and friends are integral, as private contributions catalyze innovation and enable students and faculty to make discoveries that will change our world. We couldn't do it without you! My thanks for your generosity and commitment to our students and faculty.

MATTHEW O'DONNELL
Frank and Julie Jungers Dean
of Engineering

Campaign UW Milestones

- Support for the University topped **\$2.2 billion** by June 30, 2007, well on the way to the new 8-year goal of \$2.5 billion by the close of Campaign UW on June 30, 2008.
- The **College of Engineering** has reached 95% of our goal to raise **\$250 million** for student scholarships, fellowships, professorships, capital projects, and programs.
- UW Engineering alumni and friends have established 22 **Students First** endowments — 25% of the campuswide total!

To make a gift to engineering online, please visit http://uwfoundation.org/giving_opps/school_opps/engineering.asp

Honor Roll of Donors 2006~2007

This honor roll and its giving categories reflect gifts and pledge payments made during the 2006–2007 fiscal year. New pledge commitments and planned gifts made during this timeframe are also included in this list of annual support.

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Time passes at a truly amazing pace. It seems not that long ago that we began the Creating Futures campaign by putting a vision and goals on paper and

setting out to develop support for students and faculty.

UW Engineering's alumni and friends have responded by expanding access to education with new scholarships and fellowships, ensuring top-quality faculty through professorships and chairs, and creating exciting learning environments in labs and facilities designed for twenty-first century science and engineering.

UW Engineering today defines cutting-edge. We'll be creating futures for years to come! Join us. You can make a difference.

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Continued on page 10

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Opportunity to Make Lifetime Gifts from IRAs Ends Soon

The Pension Protection Act of 2006 permits taxpayers who are at least 70½ to make charitable gifts from Individual Retirement Accounts (IRAs) without adverse tax consequences. Under previous provisions, any distribution of funds from an IRA was included in gross income, therefore taxable. The PPA, which expires soon, provides an exclusion from gross income of otherwise taxable distributions of up to \$100,000 per donor, per year, from traditional IRAs and Roth IRAs if this amount is transferred directly to a charity. Gifts must be made by December 31, 2007 by plan owners who are 70½ or older when the gift is made.

If you would like to find out if you qualify to make a nontaxable gift from your Individual Retirement Account, please contact Judy Mahoney at 206.685.2414 or jmahoney@engr.washington.edu.

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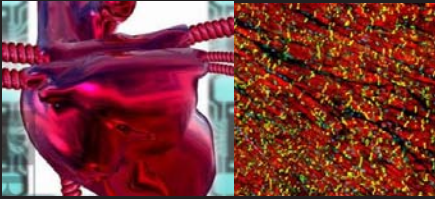
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October 23



Rebuilding the Baby Boomer: Replacement Parts for the 21st Century

Buddy D. Ratner, Professor of Bioengineering, UW Engineered Biomaterials

Bionic Man has bounded from science fiction to 21st century reality. Today's engineers are developing "smart" materials and frontier-blazing technology to grow new human tissue, build entire organs, target drug delivery, and even use the brain to control artificial limbs. These innovations will help save lives and improve our journey from cradle to grave. Learn about the amazing advances on the healthcare horizon that may someday earn "medical miracle" status.

November 1



Building the New Tacoma Narrows Bridge

Steven Hansen, '69, Senior Vice President, Kiewit Corp.; Joe P. Mahoney, Professor, UW Civil and Environmental Engineering

The Puget Sound region is famed for our floating bridges and now we can boast the nation's fifth-longest suspension bridge. What did it take to span a mile-wide, fjord-like channel and turn more than 47 million pounds of structural steel, enough cable wire to circle the world twice, and nearly 115,000 cubic yards of concrete into a striking and sturdy new landmark? Hear the engineering story, end to end, tower tops to Narrows' bottom.

November 13



Building the Future of Commercial Aviation: Boeing's 787 Dreamliner

Al Miller, '71, '77, Director, 787 Technology Integration, The Boeing Company; Mark Tuttle, Chair, UW Mechanical Engineering

Boeing is preparing for the first flight of the 787, a light-weight, super-efficient plane with a structure that incorporates an innovative shift from metals to composite materials. Before you take your first flight on the Dreamliner, get the inside story on the making of the plane and how it will change your flying experience. Also hear about next-generation advanced materials being developed in UW labs that will alter the future of planes, cars, energy, and more.

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