Mechanical Engineering

Spring 2008

the MEssenger

UNIVERSITY OF WASHINGTON
COLLEGE of ENGINEERING
A Community of Innovators

Photo by David Barenberg

The stateline wind farm near Columbia Gorge. Construction equipment at lower left gives sense of scale. www.rnp.org/projects/stateline.html

Energy in Washington State and the Pacific Northwest

In our water-rich environment, we might think that Washingtonians consume more hydroelectricity than any other form of energy. Hydro does provide about 80% of our electricity, but we are much like the rest of the U.S. and the world in oil dependency. Oil is our number one energy source, followed by hydropower and natural gas. Coal, nuclear, and biomass (mainly wood wastes) each contribute about 5%.

So what is new? Quite a lot. The Northwest energy scene includes wind, biofuels, in-stream tidal turbines, wave energy machines, distributed solar, and fuel cell development. Wind and biofuels are farthest along in contributing to Washington's energy production and use.

Wind Energy

Washington, Oregon, and Idaho had 1400 MW of installed wind turbine capacity at the end of 2006, with a projected total of 3800 MW by the end of 2009 (www.nwcouncil.org/energy/wind/library/2007-1.htm). Much is concentrated in the area east of the Columbia Gorge and from the Wallulu Gap to Walla Walla. Development in these areas is driven by the acceptable-to-very-good winds and transmission access to the major load centers of the Pacific Northwest.

To put these capacities in perspective, 1400 MW is similar to the capacity of the Rocky Reach hydroelectric facility on the Columbia just north of Wenatchee. The Northwest Wind Integration Action Plan estimates development could reach 6000 MW of wind turbine capacity, bringing it within 15% of Grand Coulee Dam's capacity, though the plan cautions that present transmission capacity limits development past 3800 MW.

Continued on page 3.

ME in the News

Joyce Cooper

Brian Polagye

Eric Seibel

Chunye Xu

Mechanical Engineering faculty and students have recently been featured in both the national and local news. On January 30, Associate Professor Joyce S. Cooper was on NBC Nightly News, commenting on the environmental impact of the increasing use of bamboo in flooring and clothing. View this story by visiting the ME website at: http://www.me.washington.edu/about/news, and click on "here" under the headline "Joyce Cooper shares her expertise on NBC Nightly News."

Research Associate Professor Eric J. Seibel and collaborating researchers at the UW have developed a tethered-capsule endoscope that can be used in the early detection of cancer of the esophagus. The tethered-capsule endoscope is a vast improvement over an earlier pill model, which was swallowed and took images as it passed through the body. The pill endoscope could miss important features because the images it took depended on where it was pointing as it moved through the body. The tethered endoscope is maneuverable, allowing it to be stopped and manipulated for a complete image of the esophagus. "Our technology is completely different from what's available now," says Seibel. "This could be the foundation for the future of endoscopy." For the complete story on the tethered-capsule endoscope,

Continued on page 2.

In this issue

Chair's Corner

ME Chair

Mark Tuttle

This academic year has brought impressive recognition to ME faculty, students, and alumni. In November, graduate student Sooyeun Kim was named a Boeing "Engineering Student of the Year." NBC Nightly News featured Prof. Joyce Cooper in a segment that aired nationally on January 30. Prof. Alberto Aliseda recently received a prestigious CAREER Award from the National Science Foundation. A flexible capsule endoscope developed by Prof. Eric Seibel and his colleagues has received extensive local, national, and international press coverage. These and other accomplishments of the extended ME family are summarized on pgs 1 and 7.

I extend my personal congratulations to all and especially acknowledge the career achievements of alumnus Savio Woo (ME PhD '71) of the University of Pittsburgh. As was announced in the autumn issue of the *The MEssenger*, Prof. Woo will be inducted into the ME Hall of Fame in June. In late May the College of Engineering also will honor Dr. Woo with its Diamond Award for Distinguished Career Achievement. Faculty, students, and alumni of the ME Department are truly making a positive difference in the world, and we all have much to be proud of.

Recent issues of *The MEssenger* featured summaries of research conducted by faculty and student teams. The spring '07 issue covered studies related to health systems and biotechnologies, while the autumn '07 issue summarized research devoted to advanced materials and manufacturing. In this issue we highlight research devoted to environmentally sensitive energy conversion.

Roughly 80–85% of worldwide energy supplies derives from burning fossil fuels such as oil and coal. Our extensive reliance on fossil fuels has led to a host of global problems, including detrimental impact on the environment, international political instabilities, and soaring energy costs. Energy conversion is a core competency of the mechanical engineering discipline, so it should come as no surprise that our faculty and students are working on alternative sources of energy while simultaneously developing technologies to minimize the environmental impacts of continued use of fossil fuels. I hope you enjoy the brief summaries of our energy research presented in this issue and explore the websites listed for more detailed explanations of our work. Each of us should reflect on our daily activities and take appropriate steps to minimize our individual "carbon footprint."

ME in the News

Continued from page 1.

visit http://www.me.washington.edu/about/news/ and view the six articles listed under "Eric Seibel's scanning fiber endoscope research recognized." The technologies pioneered by Seibel and the UW team have been exclusively licensed for commercial development to PENTAX Corporation, which plans to have a commercial version on the market within a couple of years. For the UW press release, see: http://depts.washington.edu/techtran/aboutus/Docs/Pentax_Release_FINAL.pdf

ME PhD candidate Brian L. Polagye is part of a research effort investigating the possibilities of using tidal currents in Puget Sound to generate electricity. Polagye has been studying local tidal currents to ascertain the most promising locations for this enterprise. According to Polagye, it is important to determine the shape of the tidal exchange as well as where the current is highest. Read about this research at: http://seattlepi.nwsource.com/local/332607_tidalpower21.html, and http://seattlepi.nwsource.com/local/327746_water16.html.

Research Assistant Professor Chunye Xu has been profiled in the October 2007 issue of *Seattle Metropolitan Magazine* for her development of "smart" sunglasses, which are made of layered electroactive polymers that can change color at the touch of a switch. Dr. Xu is featured in "The Smartest City in the World: How Seattle Is Inventing the Future Technology." This article is not available online.

Leadership Seminar Series 2008

ME thanks the following alumni for participating in our leadership seminar series.

Vesna Savic
(MSME '95, PhD '00)
Senior Project Engineer
General Motors Corporation

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Benjamin Jones
(MSME '87, PhD ME '92)
Research & Development Director
Micro Encoder Incorporated

•

Loern Halverson
(BSME '93, MSME '99)
Engineering Manager
MagnaDrive Corporation

•

Ron Crockett (BSME '62)
CEO
Emerald Downs

•

Brian Horman (BSME '77)
Assoc. Director, Capital Projects
Amgen Incorporated

•

Frank Robinson (BSME '57)
CEO
Robinson Helicopters

•

David Melin (BSME '79)
President
West Coast Yachts

•

Jim Skaggs (BSME '59)
(retired) CEO
Systems Development Corporation & Tracor
(retired) COO
AMEX Systems

•

Dwayne Arola
(BSME '89, MSME '91, PhD '96)
Associate Professor
University of Maryland, Baltimore County

Alberto Aliseda Wins NSF CAREER Award

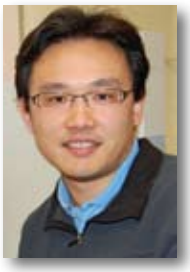
Alberto Aliseda, assistant professor of mechanical engineering, has won the CAREER Award, the National Science Foundation's highest honor for junior faculty. The award, $450,000 over five years, will support Dr. Aliseda's research in the area of microbubble dynamics in human blood circulation.

This work aims to improve the clinical use of microbubbles in the diagnosis and treatment of cardiovascular disease, the leading cause of death in the developed world. In particular, Aliseda's group is interested in the possibility of using ultrasound to exert a force on the bubbles, so that they can be non-invasively targeted to specific regions of the body where they are needed. For example, they could be loaded with blood thinners and directed at an intracranial thrombus, a blood clot in a difficult to reach artery inside the brain, or they could be loaded with chemotherapeutic agents and directed to a tumor while keeping chemotherapy's side effects to a minimum. But to achieve all this, the physical mechanisms that determine the fate of these microbubbles must be well understood.

This award will support two mechanical engineering PhD candidates studying under Professor Aliseda in the area of biomechanics. Additionally, it will support outreach activities to middle and high school students in an effort to attract them to engineering as a worthwhile career with the potential to make a significant impact in solving society's problems and even in saving lives.

"Winning the CAREER award during my first year at the UW is a great recognition of the potential of my research, and a fantastic push toward achieving that potential," says Aliseda. "Over the next five years I will have the necessary support and a high-visibility platform to establish a leading program in biomedical fluid mechanics here at the UW."

ME Welcomes Two New Research Faculty



Yuanchang (Robert) Liang

Research Assistant Professor Yuanchang (Robert) Liang joined the faculty last autumn. Dr. Liang, who was previously an ME research associate, earned his PhD in mechanical engineering from the UW in 2002. He is associated with Professor Taya's Center for Intelligent Materials and Systems, where his research focuses on active materials such as shape memory alloys (SMA) and ferromagnetic SMA. His current interests focus on active materials and their applications, including the development of novel compact actuators for use in various airborne systems. He is also interested in bio-inspired design of actuators and sensor systems.

• • • •

Alexander Varess

Research Assistant Professor Alexander I. Veress joins ME from a similar position with the Department of Bioengineering at the University of Utah. He earned his PhD (2000) and masters degrees (1995) in bioengineering from The Ohio State University, and his BSME in 1985 from the University of Washington. His recent research has involved the development of an image-driven mechanical model of the left ventricle of the heart employing a finite-element-based image registration technology known as hyperelastic warping. Varess plans two future projects. One project involves combining vascular tree data with an existing physiologically realistic, finite element (FE) model of the left ventricle in order to better define ischemic and infarcted regions in the model. A second project involves continued development and refinement of an FE-based breast model to depict the compressions associated with mammography.

Honors & Awards

Wei Li's paper "A Novel 3D Porous Micromixer Fabricated Using Selective Ultrasonic Foaming" was chosen for inclusion in Journal of Micromechanics and Microengineering 2007 highlights.

Steve Shen was elected a Fellow of the American Soc. of Mechanical Engineers.

An exclusive license has been granted to UW startup ImageSpace4D for rapid prototyping technology of 3D patient-specific anatomical models. This technology was developed by Randal Ching, Mark Ganter, Duane Storti and colleagues in Radiology.

Jiangyu Li was named the first recipient of the Young Investigator Award in Theory by the International Conference on Computational and Experimental Engineering and Science, presented at the ICCES Conference held in Hawaii.

Nate Sniadecki received a Royalty Research Award for Endothelium Mechanics: A microfluidic device and model for studying traction forces, remodeling, and permeability in vascular tissue.

Funding of the Center on Advanced Materials in Transport Aircraft Structure (AMTAS) has been extended to 2011 by the FAA. Directed by Mark Tuttle, AMTAS includes the U. of Washington (lead), Washington State U., Oregon State U., Edmonds C. C., Florida International U., and U. of Utah.

Savio Woo (PhD '71) will receive the 2008 UW College of Engineering Distinguished Achievement Award.

Colin Sandwith Retires

Colin Sandwith

Research Associate Professor Colin J. Sandwith retired on January 31, 2008, after 41 years of service to the University. He will be remembered by generations of students who took his ME 406 class, Corrosion and Surface Treatment of Materials. Over time this course has been one of the most popular ME elective courses,

Continued on page 8.

Henry Schatz talks with students at the annual ME Scholarship Luncheon.

Henry Schatz Urges Alumni to End Campaign UW with a Bang

Henry Schatz (BSME '64) believes in establishing clear goals, in business and in philanthropy, especially for giving back to his career-launching alma mater. "If you reflect on the benefits you gained from your engineering education at UW, you most likely will conclude it contributed to your success in your career and life," Schatz says.

His own experiences convinced him that the best way to express gratitude and have a positive impact on the world is to make meaningful gifts to UW Engineering for a variety of educational programs. His goals are to help students be successful and to encourage more alumni to give back in this way.

Schatz began his own "philanthropic journey" with the UW in 1981 with a gift of $100. That first step led to regular annual giving and increasing support to Mechanical Engineering. His philanthropic journey took him to a higher elevation in 1995 when Ray Bowen, then Engineering dean, and ME Professor Jim Morrison came to visit at General Plastics Manufacturing Company in Tacoma, which he then served as president.

"Dean Bowen asked me if I'd like to make a gift of $50,000 to set up an endowed scholarship fund for Mechanical Engineering, and I emphatically said yes," Schatz recalls. Underlying that enthusiastic response is the deep appreciation he feels for the lessons in critical and analytical thinking imparted during an undergraduate dynamics course taught by Professor Morrison. "His lessons inspired me to recognize that critical thinking needs to be applied not just to engineering but to everything in life," Schatz says. "Over the years this way of thinking and solving problems contributed greatly to my success."

Fast forward a decade into the midst of Campaign UW, when Schatz scaled a big philanthropic peak. In 2005 he established the James B. Morrison Endowed Chair in Mechanical Engineering and the James B. Morrison Endowed Scholarship Fund — thus doubly honoring his esteemed professor. This year, 13 undergraduates received Morrison scholarships and four received support from the endowed fund Schatz established in his own name in 1995.

And that's not the end of his journey. Schatz recognizes that the 50 ME scholarships awarded this year are not enough to meet needs and that the UW Students First 50 percent matching initiative is a gift-magnifying opportunity too good to pass up. So, in late 2007 he made another generous gift to expand the Morrison scholarship fund.

"I hope that significantly increasing scholarships will enable the UW to offer support to capable and hard-working ME students who struggle to cover tuition or who might not be able to attend this fine institution without support," Schatz says.

"Henry's gift will have a huge impact for us," says ME chair Mark Tuttle. "His commitment to students and his generosity inspire all of us."

And Schatz is aiming for just that — to inspire other alumni to demonstrate appreciation for their UW education by supporting incoming generations of engineering students. He points out that constrained financial resources in higher education limit training capacity at a time when America and the world need many more quality engineers.

"It is crucial that alumni contribute substantially and wholeheartedly to educating engineers who will take on the problems threatening the sustainability of our environment, infrastructure, and economic systems," Schatz says.

He encourages those with extra financial resources to consider a gift of five to fifteen percent of estimated net worth. "It will be the best investment you ever made. Let's conclude our UW Creating Futures Campaign with a bang!"

Campaign UW: Creating Futures Ends June 30, 2008!

ME Campaign Update

Gifts from ME alumni and friends total close to $8 million since Campaign UW launched in 2000. They have created:

- 9 undergraduate scholarships
- 1 chair
- 6 graduate fellowships
- 3 funds

Students First Matching Program

This UW scholarship/fellowship initiative offers 50% matching funds for new endowments created by June 30, 2008. Pledges may be paid over five years.

For information on opportunities to support ME and the diverse ways to give, please contact Anne Fitzmaurice Adams, 206-685-3041 or afa9@u.washington.edu.

Instrument maker Kevin Soderlund instructs students in waterjet usage.

Experience Is Key Product In Instructional Shops

A decade ago the instructional machine shop was in disrepair. More than 30 of 72 machines were broken and most tooling was damaged. Some of the lathes in use were manufactured in 1941. A milling machine dated to the late 1930s. These facilities simply could not meet educational needs of today's mechanical engineering students.

Instructional machine shops are expensive to maintain, and equipment must be continually updated or replaced to remain current with industry practice. Given these realities, why would the department want to keep the shop?

Russ Noé, shop manager and instructor, answers this question with another. "Would you hire a builder for your home who had only read about construction techniques? Our graduates are known for their practical as well as their theoretical knowledge, a very attractive combination to employers."

Both the faculty and the department's Visiting Committee believe the value our students gain from practical experience far outweighs expense of maintaining the shop.

In 1997 the department launched a dedicated effort to renovate the shop and modernize the installed equipment. Over $250,000 has since been spent in this effort. Much of the money came from industry, with The Boeing Company providing $150,000 for new equipment. Other funds came from private donors, student technology fees, and the Chair's Discretionary Fund, which made up any shortfalls in equipment cost and paid for shop modernization and equipment installation.

The updated Instructional Machine Shop encompasses four units—machine, welding, and wood shops, and a casting foundry. Over 75% of the machinery has been replaced, and our shops now boast multi-axis CNC mills and lathes, a CNC plasma cutter, a CNC abrasive waterjet cutter, and all new hand tooling.

All mechanical engineering students are required to take ME 355, Introduction to Manufacturing Processes. This course introduces students, both in theory and practice, to a wide range of manufacturing processes used in industry today. Theory meets practice in the instructional shops. Students study drawings to figure out how to fabricate a mini-lathe, a Stirling engine fan, or other projects, gaining hands-on experience in the manufacturing processes they will encounter in their professional career. Students who want more experience with computer-numeric controlled machines can take an elective course, ME 409, CNC Machining. Additionally, several projects including the SAE car and human-powered submarine are primarily constructed in the instructional shops. "Without support from the Chair's Discretionary Fund, this modernization would not have been possible," said Noé. Recent graduates have no doubts about the wisdom of maintaining these shops. Many tell us they were hired for their first job because they had practical experience, gained in the instructional shops, to complement theoretical knowledge. Shop renewal is money well spent!

To take a virtual tour of the Mechanical Engineering Instructional Shops, visit: http://www.me.washington.edu/resources/ilf/walkthrough.php#instructional_shop.

Instructional shop manager Russ Noé (R) instructs Alex Brandt in mill use.

Pacific Northwest Energy Sources

Continued from page 1.

As wind energy capacity grows, costs of integrating it into the electric infrastructure increase. Flexibility must be built into the system to handle uncertainties and variations of the wind. One solution is to include backup gas turbines that operate under low wind conditions, but they would increase costs and greenhouse gas emissions. Alternatives are pumped hydro storage or compressed air storage, which carry significant capital costs. Other storage possibilities are advanced-flow batteries or creating hydrogen fuel through electrolysis. Clearly, wind energy opens up opportunities for ingenuity in several engineering fields.

Bio-energy

Bio-energy is important to Washington for at least two reasons: our biomass resource and the bio-fuels industry that has taken hold in the state. The 2005 WSU inventory of the biomass resource (www.pacificbiomass.org) indicates a wood waste resource of 9 million dry tons per year from mill wastes, municipal solid waste (MSW) wood residues, land-clearing debris, logging residues, and forestry thinnings. If burned in conventional wood combustion boilers, these wastes could produce about 1100 MW of electrical power on average. Mill wastes produce heat and steam at lumber and pulp mills, with some going to electrical generation. MSW and land clearing wood wastes are sold for energy. Transportation costs limit the use of the logging residues and forestry thinnings. A solution might be mobile and transportable systems taken into the forests to convert the wood residues into high-density liquid fuel.

The opening of a large biodiesel refinery at Grays Harbor last summer has given Washington a significant role in biofuels manufacturing. The industry faces both opportunities and challenges. It has opportunities to decrease the energy required to produce the biofuel and to convert wood wastes into fuel ethanol. Estimates indicate this "cellulosic" ethanol should require significantly less energy to produce than corn ethanol, which has a particularly poor energy ratio. A challenge is life-cycle carbon. If the biofuel feedstock is grown on land cleared from tropical forest or grassland that is able to absorb large amounts of carbon dioxide, the manufacture and use of the biofuel may not lead to the desired environmental goals. Some studies show that oil from algae has the potential to be a significantly larger source of biofuel than the sources now being used and developed.

Environmentally Sensit

The May 2007
federal Energy Informati
predicted that worldwide energ
57 percent over just 26 years, from
BTUs to 702 quadrillion BTUs in 20
world.pdf). An eclectic mix of energy c
necessary to meet the projected demand
wind, solar, wave, tidal, nuclear, and bi
must be accomplished with minimal i
This section provides an overview
Please visit the websites in
explanation of
research

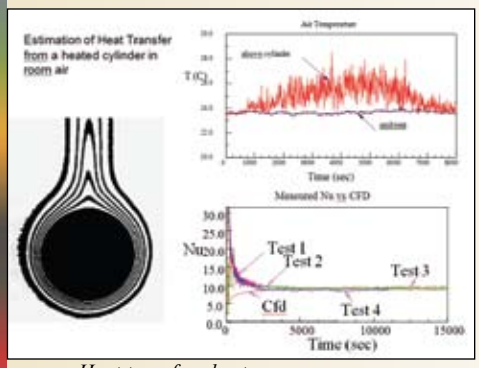
L to R: Steve Clark, Saensuk Wetchagarun, James Riley.

James Riley

Several of Prof. Riley's areas of interest relate to environmentally sensitive energy conversion. With the goals of decreasing pollutants and increasing combustion efficiency, he is working on modeling and computer simulation of turbulent combustion processes, including the behavior of fuel sprays and the effects of turbulent motion on combustion. The photograph shows Prof. Riley with two graduate students evaluating a computer simulation of a turbulent fuel jet carried out by former graduate student Dr. Joe Nichols. Prof. Riley also works on problems in environmental fluid mechanics and is applying this knowledge in a joint program with the School of Oceanography; the program is addressing the feasibility and environmental impact of developing tidal energy in Puget Sound.

- faculty.washington.edu/rileyj/

Ashley Emery



Heat transfer charts.

Prof. Emery's many technical interests include advanced heat transfer predictions and measurements. He has recently used the Bayesian statistical approach to develop methods of accounting for non-deterministic (i.e., stochastic) properties and driving forces that are present in any heat transfer phenomenon. A typical example is the effect of random local air currents on the heat transfer from a horizontal cylinder (see figure). The air currents cause temperatures measured above the cylinder to vary at high frequency, although the average temperature varies slowly with time. The stochastic nature of the heat transfer phenomenon can cause discrepancies between measurement and predictions based on deterministic models, such as the measured Nusselt number compared to that predicted by a deterministic computational fluid dynamics (CFD) code.

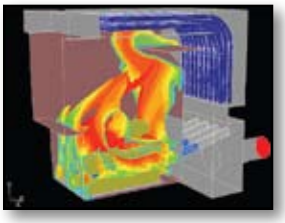
- www.me.washington.edu/people/faculty/emery/

Brian Fabien

Brian Fabien

Flywheel energy storage (FES) systems are being considered as an alternative to electrochemical batteries. Composite materials, along with modern bearing technology, have made FES systems a viable option for energy storage. The heart of the FES system is the flywheel itself. It is critical that the design of these disks maximize energy density of the system to efficiently use the strength of composite materials. Prof. Fabien's current research activity includes development of a 300-Wh/kg FES system. The energy density of this FES device is approximately five times that of a typical lead-acid battery.

- http://abs-5.me.washington.edu/



Wood combuster

John Kramlich

Prof. Kramlich focuses on improving the efficiency and sustainability of energy sources, while reducing environmental impacts. His main research thrusts have included the problem of controlling mercury emissions in coal-fired power generation, the use of advanced materials in solid-oxide fuel cells, and the reduction of emissions from wood waste combustion in the wood products industry. A recent project has used computational fluid dynamics modeling to develop an improved design for a residential wood combustor in a project funded by a Washington manufacturer (Greenwood LLC) and the Washington Technology Center. The results of the modeling, shown here, are used to reduce smoke emissions and improve the efficient capture of heat. This has allowed the furnace to become one of the few in the country to meet the new EPA "Green Label" criteria.

- www.me.washington.edu/people/faculty/kramlich/

Ann Mescher

Algae samples under preparation

In a research effort recently initiated with support from Boeing, ME Professors Ann Mescher and John Kramlich are teaming up with UW Professor Rose Ann Cattalico, Biology, to study energy-efficient extraction of oils from algae for biofuel production. Algae have the potential to produce more biofuel per unit of sunlight than any other agricultural source. A major barrier to the commercialization of algae as a biostock is the difficulty of efficiently extracting the oil from these organisms. The study will use highly oligenous algal strains that are easily disrupted and thus readily yield their oil during processing.

- www.me.washington.edu/people/faculty/mescher/

tive Energy Conversion

forecast of the
ion Administration
gy consumption will increase
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30 (www.eia.doe.gov/oiaf/ieo/pdf/
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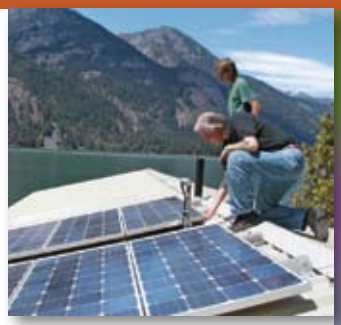
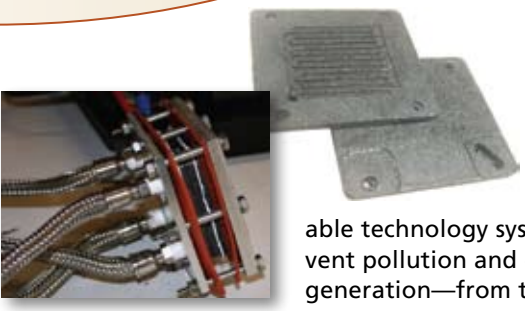


Phil Malte (kneeling) and Tom Langley (National Park Service) inspecting solar panel installation at North Cascades National Park, Stehekin.

Philip Malte

Prof. Malte and his students work on renewable energy systems and to reduce the environmental impact of traditional fossil fuels. For example, using laboratory-scaled combustion reactors, computational fluid dynamics (CFD), and chemical reactor network (CRN) analyses, they have developed methods to predict the behavior of large gas turbines used to generate electricity, with an emphasis on controlling pollutant emissions. They have also studied the use of fuel-air and fuel-steam injectors to achieve lower emissions from liquid-fueled gas turbines and in fuel cell reformers. Their studies on renewable energy have included the design and installation of solar energy systems for the National Park system, and the feasibility of solar, wind, tidal, wave, and biomass energy systems at locations throughout the Puget Sound region.

- http://faculty.washington.edu/malte/



Student design projects.

Joyce Cooper

Prof. Cooper's research focuses on the development of sustainable technology systems. Such systems prevent pollution and optimize energy use and generation—from technology and infrastructure construction, use, and ideally through reuse, remanufacturing, and recycling. She and her students are working on a wide range of research topics: from the development of product life cycle design tools for fuel cell manufacturers and Boeing, to ensuring electronics recycling needs will be met, to development of optimal systems for using wood wastes and other biomass to produce energy. In the classroom, Prof. Cooper's students develop environmental product design guidelines and rating systems; design, build, and test fuel cells (like those shown above, from the 2007 ME Undergraduate Fuel Cell Capstone Design Team); and assess the life cycle of technologies being developed in UW labs and beyond.

- http://faculty.washington.edu/cooperjs/

Minoru Taya, Chunye Xu, Y. Robert Liang

Center for Intelligent Materials and Systems

Most CIMS projects involve developing lightweight materials or structures, but a new initiative is devoted to energy harvesting and storage systems for use in aircraft or other transportation vehicles. The objective is to develop new types of organic solar cells, rechargeable batteries, and other thermoelectric devices that can be mounted on or embedded within load-bearing structures. These systems will then "harvest" solar and/or vibratory energy during operation of the aircraft, and the energy collected will be used to power sensors, motors, or actuators during vehicle operation. This concept has been successfully demonstrated using the model airplane shown above. Organic solar cells attached to wings collected enough energy (on a sunny day) to power an electric motor and propeller, allowing sustained flight. A larger unmanned air vehicle is under development.

- http://depts.washington.edu/cims/

Alberto Aliseda

Alberto Aliseda

Prof. Aliseda's research focused on fluid mechanics and its application to energy and biomedical engineering. His approach is to improve fundamental understanding of fluid flow phenomena to enable new and enhanced technologies that benefit society. In the area of environmentally sensitive energy conversion, he focuses is on the rheology of biofuels and its impact on the atomization characteristics of these new fuels. A better understanding of their flow behavior during fuel injection will lead to improved efficiency and decreased pollutant formation. Under a recent NSF grant, his lab is also trying to better understand and predict the formation of rain droplets in clouds. This is of great interest because cloud cover plays a dominant role in Earth's thermal balance, and therefore is a key element in understanding global warming.

- www.me.washington.edu/people/faculty/aaliseda/

Bruce Adee

© Marine Current Turbines, Ltd

Artist's conception of tidal energy station.

Prof. Bruce Adee has studied wave energy systems for several years. Most recently he has participated in a state-funded study of potential tidal energy resources within the Puget Sound region. A student team is being formed to design and build small-scale models of several devices that can be used to extract energy from a free stream. Several simple numerical methods will be used to perform preliminary design studies of energy extraction devices. Promising devices will then be studied in detail using CFD techniques.

- www.me.washington.edu/people/faculty/adee

Scholars and Donors Honored

Forty-three ME undergraduate students received a total of fifty scholarships during the 2007-08 academic year. A luncheon on February 21 honored these students and the donors whose generous endowments provide much-needed support.

Curkendall scholarship (L to R): Tom Curkendall, Rebecca Craswell

Morrison scholarship (L to R): Daniel Libby, Matthew Kim, Geoffrey DuBuque, James Morrison, Risa McGill, Virginia Morrison

Mills scholarship (L to R): Dorothy Mills, Diane Mills, Dave Mills, Kristina Olson

Sandwith Retires

Continued from page 7.

offered both in the classroom and off campus through EDGE, the UW distance education program. Students have consistently rated Prof. Sandwith as one of the top ME instructors.

Professor Sandwith earned his BSME from the UW in 1961 and his PhD from Oregon State University in 1966. He joined the ME faculty as an assistant professor in 1966. In 1974 he joined the UW Applied Physics Laboratory as a mechanical engineer, accepting a concurrent appointment as research associate professor in the Department of Mechanical Engineering. At APL he specialized in marine corrosion, failure analysis, corrosion mechanisms, O-rings, and fiber-optic electromechanical cables. He is widely known within the U.S. Navy for his expertise in corrosion. As program director for the U.S. Navy Submarine and Surface Ship Corrosion and Materials Design Inspection Program, Sandwith inspected over 30 submarines and surface ships, often venturing into remote reaches of these ships where man previously had not dared to go.

Upon retirement, Professor Sandwith was elected by his peers to the rank of research associate professor emeritus.

Professor Sandwith's retirement agenda includes: playing handball twice a week; developing and offering a self-defense course based on knowledgeable behavior; spending time with children, grandchildren, family, and friends; volunteering at service centers; improving his farm at Friday Harbor; maintaining health; keeping active at APL and ME; and playing tennis.

ME Website: www.me.washington.edu / ME Main Office: 206.543.5090

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Chair: Mark Tuttle
Editor: Curt Fritsch
Layout: Nancy Moses
Sandy Marvinney

Contributors:
David Barenberg
Philip Malte
Sandy Marvinney
Brian Polagye
Mark Tuttle
University Photography

Send address corrections, questions, and comments to:

Editor, ME Newsletter
at the return address above.

Mechanical Engineering Building 143, Box 352600
Seattle, Washington 98195-2600