Mechanical Engineering

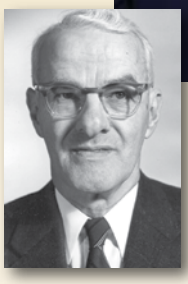
Spring 2007

the MEssenger

UNIVERSITY OF WASHINGTON
COLLEGE of ENGINEERING
A Community of Innovators

The late Professor Bryan McMinn would be proud of the line of mechanical engineers within his own family, which includes two sons-in-law and two grandchildren.

Celebrating the McMinn Professorship on March 7 are (from left): Dean Matthew O'Donnell; Jackie Etsell (UW '73); Rick Etsell (BSME '80), a grandson of McMinn; Assistant Professor Jiangyu Li; Cindy Darling, McMinn's youngest daughter; Owen Darling (BSME '63); and Professor Mark Tuttle.



Bryan McMinn

McMinn Professorship Honors ME's Past and Fuels Research that Creates the Future

Professor Bryan T. McMinn, ME's second longest-serving chair, died in 1979 but his impact on the department is growing rather than fading into the musty corners of history.

Members of Prof. McMinn's family and ME faculty, students, and staff on March 7 celebrated the installation of Assistant Professor Jiangyu Li as the first holder of the Bryan T. McMinn Endowed Research Professorship in Mechanical Engineering. Li is developing novel nanocomposite processing techniques for multifunctional materials (see pg 3).

"Professorships like this enable ME to retain faculty members like Jiangyu Li," said Dean Matthew O'Donnell. "It's vitally important to recognize and support junior faculty who show great promise as research leaders."

Years ago an estate gift from Richard and Janice Odell established a research fund in memory of McMinn. Richard Odell was the brother of McMinn's wife Louise. The ME department recently contributed $50,000 in discretionary money to elevate the research fund to an endowed professorship.

"We are thrilled to give more power to the Odells' gift," said Mark Tuttle, ME chair.

McMinn joined ME as a lecturer in 1920, earned his MS here in 1926, and rose steadily through the ranks to become a full professor in 1940. He chaired the department from 1947–1963 and retired in 1964. His legacy now will extend far into the future. ■

Three Endowments Established Through Students First Initiative

ME students for generations to come will benefit from three endowments established under the Students First Matching Initiative, a Campaign UW component launched last fall (see pg 6). Alumni benefactors are: Ron Crockett (BSME '62), who created a fellowship endowment; John Purvis (BSME '59, BSIE '61), who also set up a fellowship endowment (pg 6); and Sally and Warren Jewell (both BSME '78), who have created a scholarship endowment. Thank you for these gifts that will help attract top students to ME.

In this issue

Chair's Corner

ME Chair

Mark Tuttle

The 2006–07 academic year has been exciting. We began with the ME Centennial Celebration, described in the autumn '06 issue of *The MEssenger*. We also established new undergraduate scholarships and are now able to offer about 45 scholarships that provide financial assistance to students who would otherwise have difficulty pursuing their BS degrees. Two ME alumni established graduate fellowships, including the Purvis Family Fellowship and the Crockett Fellowship. They provide the funds needed to attract students from across the U.S. to our masters and doctoral programs.

During winter quarter the department held a very successful Leadership Seminar Series that generated interesting and thought-provoking discussions on current and future developments in engineering. The alumni and others listed in the sidebar gave students the insider's perspective on diverse career paths.

A March 7 ceremony honored Prof. Jiangyu Li, first recipient of the McMinn Endowed Professorship (see pgs 1 and 3). It was an honor to meet several descendents of Prof. McMinn, including his daughter Cindy Darling and her husband Olin Darling (BSME'63), and several of Prof. McMinn's grandchildren.

At the commencement ceremony on June 9, about 100 undergraduate and 50 graduate students will receive their ME degrees. My thanks to all of you who have helped make 2006–07 such a memorable and successful year for Mechanical Engineering and for our graduating students.

I am often asked to describe the department's current research focus areas. Our research activities defy easy categorization, reflecting the diverse nature of the discipline of mechanical engineering. Nevertheless, our research programs can be loosely grouped as follows:

- Health systems and biotechnologies
- Advanced materials/manufacturing
- Environmentally sensitive energy conversion
- Mechatronics

A brief summary of our current studies related to Health Systems and Biotechnologies can be found on pages 4–5. The next several issues of *The MEssenger* will provide similar summaries devoted to the other areas.

As I'm sure you will remember, the UW campus explodes with color every spring. As I write this column, thousands of azaleas and rhododendrons are in flower. Come visit and enjoy springtime on campus if you're in the area! ■

ME Leadership Seminar Series 2007

ME thanks the following alumni, friends, and faculty for participating in our leadership seminar series.

John Kramlich, Mark Tuttle
Professors, Department of Mechanical Engineering, UW

Doug Graesser
(BSME '86, MSME '88, PhD '93)
Co-Owner, NSE Composites

Teodora Rutar-Schuman
(MSME '94, PhD 2000)
Assistant Professor
College of Science & Engineering
Seattle University

Alex Kunzler
Co-Founder
Spinal Dynamics Corporation

Steve Pratt (BSME '70)
Chairman, President, and CEO
ESCO Corporation

Kelly McGee (BSME '68)
Director, Test Engineering
Lockheed Martin

Larry Anderson
(MSME '61, PhD '66)
Group Vice President
Exponent Incorporated

Peter Janicki (MSME '90),
Brian Holmes, Tom Doughty,
John Weller (BSME '90, PhD '96)
Janicki Industries

ME Alumni Honored with 2007 Diamond Awards

Congratulations to ME alumni honored at the College of Engineering's annual Diamond Awards Dinner on May 18. Our alums won three of the four individual awards: Don Peterson ('46), Distinguished Achievement; Frank Robinson ('57), Entrepreneurial Excellence; and Sally Jewell ('78), Distinguished Service. John Roundhill ('67, '73) shared the award for Distinguished Group Achievement with seven other engineering alumni who pioneered the Boeing family of passenger jets. To learn more, visit www.engr.washington.edu/awards/diamond.html.

Don Petersen

Frank Robinson

Sally Jewell

John Roundhill

Multifunctional Materials

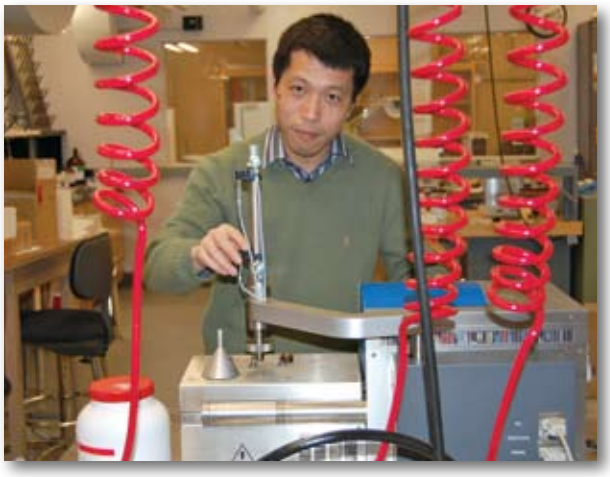
Two or More Birds with One Stone

"Scientists study the world as it is. Engineers create the world that never has been." This observation by Theodore von Karman aptly describes the research of Assistant Professor Jiangyu Li, who was recently named the first holder of the Bryan T. McMinn Endowed Research Professorship in Mechanical Engineering.

Professor Li has established a strong research program centered on developing and understanding multifunctional materials and structures. As its name implies, a multifunctional material is capable of performing several tasks and functions. For example, an aircraft frame made from multifunctional composites would not only carry the load, but may also act as a conductor providing protection from lightning strikes and provide electromagnetic shielding of vital electronic components. Compared to a conventional aluminum frame, a composite frame has the additional advantage of being lighter than aluminum, improving fuel efficiency.

Such multifunctional materials may also find extensive use in future all-electric ships in the U.S. Navy. Materials with high electric energy density could be used as capacitors for electric energy storage and power conditioning, saving a great deal of space and weight.

Li's research aims to develop novel nanocomposite processing techniques that would allow engineers to control the size, distribution, and morphology of nanofiller in a polymer matrix so as to enable multiple functionality. "This is difficult to do by conventional techniques," says Li. "New processing techniques, if successful, would find many uses in multifunctional composites for the better control of microstructures and enhanced functional properties."



Jiangyu Li

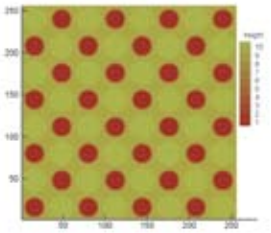
Li's research work also involves modeling and computation aimed at understanding the microstructure and microscopic properties of materials so that engineers will eventually be able to design materials with specific properties and microstructures for various applications.

The McMinn Endowed Professorship opens new doors for Li's research. "Funds from the McMinn Professorship will allow me to pursue some novel ideas and concepts that would be very difficult to pursue otherwise," he emphasizes. This kind of research is "high risk" in nature, meaning it has low probability of immediate success, and therefore is not likely to attract grant support. "The McMinn funding will allow me to develop preliminary data for the proof of concept," Li says. "Then I can use that data to compete for external funding."

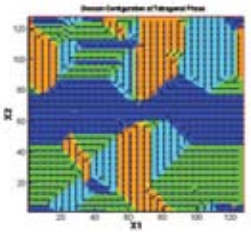
He adds that "It is a real honor to be named McMinn Endowed Professor. I want to thank the Odell Family for supporting research in mechanical engineering. Over the coming years this professorship will provide funding for the research of many junior faculty in the Department of Mechanical Engineering. It is a great honor to be the first."

Li earned his doctorate in mechanical engineering from the University of Colorado in 1998. He also earned masters degrees in electrical engineering (1998) and mechanical engineering (1996) from the University of Colorado, and a bachelors degree in materials science and engineering from Tsinghua University, Beijing, China, in 1994. He joined the UW faculty in 2006 following four years as an assistant professor at the University of Nebraska–Lincoln.

Additional information on Li's research may be found at: http://mfml.me.washington.edu. ■



Predicted surface pattern on a PVDF polymer created by an external electric field.



Simulated ferroelectric domain pattern in a PZT crystal.

Applied Biomechanics Laboratory
Randal Ching

Professor Ching's research team studies the biomechanics of the spine and neck in adults and children. A major goal is to prevent devastating injuries, particularly by improving automobile safety. These studies have led to better clinical treatment for the child cervical spine. Other projects investigating the biomechanics of the hip, foot, and ankle seek to optimize surgical placement of hip implants and the design of total ankle joint replacement systems.

- www.depts.washington.edu/uwabl/

Randy Ching with a Hybrid III crash test dummy used in defining injury reference values.

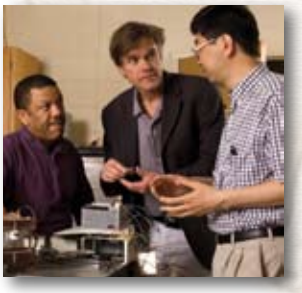
Biotechnology research is a hot f
nature crossdisciplinary. Mechanic
that helped give birth to bioengi
the late 1960s, former ME faculty s
and Lee Huntsman conducte
Alumnus Wayne Quinton (BSME '58
Today more than one-third of o
contributions to development
hard-tissue research, and to bi
Health Systems/Biotechnology is o
This section prov
of the vital wor

Center for Computational Biomechanics David Nuckley

David Nuckley instructing a seminar in muscle modeling.

This interdisciplinary research effort aims to facilitate multi-scale modeling of biological systems. Projects include pediatric head and neck injury assessment, modeling soft tissues as a continuum, modeling of foot deformities and pathologies, and heart valve and blood dynamics. A major thrust of Professor Nuckley's research is characterization of cervical spine tissues to understand the response of maturing tissues to the mechanical environment.

- www.depts.washington.edu/uwccb/



Per Reinhall (C) with colleagues Brian Fabien (L), Steve Shen (R).

Biomedical Sensors and Actuators Per Reinhall

Professor Reinhall is developing biomedical sensors and actuators for prosthetic, diagnostic, and imaging applications. He also studies the dynamics of the human heart, including computational modeling of heart valves and methods to screen for high risk of ventricular fibrillation or sudden death in patients with heart disease.

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

Computational Design and Manufacturing Laboratory
Mark Ganter, Duane Storti, Rhonda Anderson

Duane Storti holds a 3D printed metal part produced in the lab. Ceramic parts are also being produced.

L to R: Rhonda Anderson, Bryn Miyahara (MSME '06), and Mark Ganter produce polyurethane talus.

The research team is developing a new solid-modeling system compatible with 3D medical imaging such as MRI or CT scans and also a project to model and manufacture patient-specific structures for use as surgical aids. A new project will explore the rapid prototyping (or 3D printing) of dental systems.

Professor Ganter's research applies computational techniques to engineering and manufacturing problems. Professor Storti focuses on fundamental mathematical methods to support design and manufacturing, especially for rapid prototyping and manufacturing. Professor Anderson's research centers on chemical and systems modeling of components for manufacturing of composite and nano-materials for biomedical and environmental applications.

- www.me.washington.edu/people/faculty/ganter/
- www.me.washington.edu/people/faculty/storti/

Systems Biology
Ping Ao

A theoretical physicist by training, Professor Ao works across diverse disciplines. He applies computational mathematics to solve fundamental questions in biology, including the growth dynamics of bacteria and the efficiency of gene regulatory networks. A key goal is to relate core engineering theory to computational biology.

- eprintweb.org/S/authors/ao/Ao

iotechnology Research

ield in engineering, one that is by
cal engineering is a core discipline
neering at the UW. At least since
uch as Colin Daly, Albert Kobyashi,
ed research in biomechanics.
3) was a pioneer in medical devices.
ur faculty are making important
of medical devices, to soft and
omechanics and computation.
ne of ME's four major thrust areas.
vides an overview
k of our faculty.

Human Interface Laboratory
Eric Seibel

Eric Seibel (center) demonstrates the SFE prototype system to (L to R) doctoral students Chris Brown (Bioengineering) and W. Jong Yoon (Mechanical Engineering).

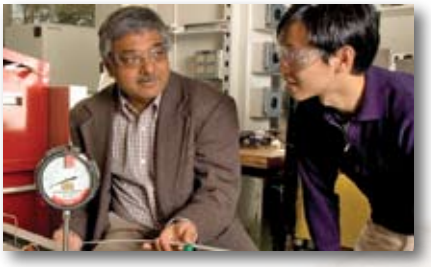
HIT Lab research includes biomedical applications of human interface science and development of novel image acquisition systems such as scanning optical microscopes and endoscopes, and visual display systems such as virtual retinal displays. Professor Seibel's multidisciplinary research team is working on a single-fiber endoscope (SFE) that will be thinner and more flexible than current instruments. SFE will allow viewing of previously inaccessible regions of the lung and pancreas for diagnosis, therapy, and monitoring of cancers. A major goal is earlier and less invasive treatment.

- www.hitl.washington.edu/people/eseibel/

Micro Technology Laboratory
Wei-Chih Wang

Professor Wang's research teams are working on flexible, polymer-based microsensors, actuators, and self-configurable robots for biomedical applications. Among their innovations are sensors placed in the lining of prostheses to allow more stable walking, and optical fiber sensors for fluid measurement.

- www.depts.washington.edu/mictech/home/research/index.html



Vipin Kumar (L) and doctoral student Xiaoxi Wang.

Microcelluar Plastics Laboratory
Vipin Kumar

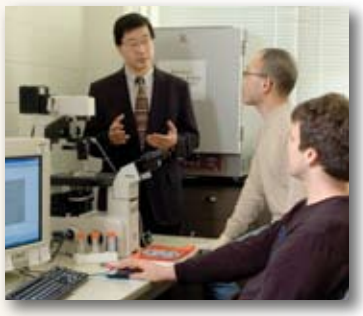
Professor Kumar's laboratory develops porous, biodegradable polymers to serve as scaffolds and promote cell growth for tissues such as bone. The polymer scaffold functions as a selective membrane that allows penetration of nutrients and other substances. After the scaffold has served its purpose, it should dissolve over time into harmless components. Kumar's team is also exploring the use of ultrasound to create interconnectivity in solid-state PLA foams.

- faculty.washington.edu/vkumar/microcel/

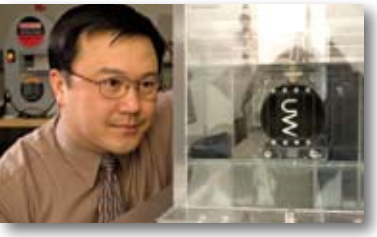
Thermal/Fluid Science and Biomedical Engineering
Dayong Gao

Professor Gao's research focuses on thermal/fluid science and problems in bioengineering. Projects include a new generation of artificial kidney and liver devices, cryogenic preservation of living biological cells and organs, tissue engineering and bio-instruments/sensors, and stem cell research.

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



L to R: Dayong Gao, PhD student Simon Chen, and Jester Purtteman (MSME '06).



Wei Li observing the selective foaming process.

Advanced Materials Processing and Manufacturing Laboratory Wei Li

Professor Wei Li is developing an innovative technique to fabricate porous polymer for biomedical applications. Such porous structures have great potential in tissue engineering, 3D micro cell culturing, and lab-on-a-chip and animal-on-a-chip devices for drug discovery.

- faculty.washington.edu/weiwli/

© Boeing

John Purvis Helped Make Flying Safer; Now He's Helping ME Students Take Off

More than three million people fly on Boeing jetliners every day, all over the world. They would have a long list of people to thank for safe arrival at their destinations, from pilots and air traffic controllers to Boeing engineers and factory workers. One person who deserves special mention is John Purvis (BSME '59, BSIE '61), who led Boeing's commercial airplane investigation unit from 1982 to 1999.

A report of an accident or incident on any continent required assembling a team to work on the investigation with the airline and national aviation authority. Purvis visited some 80 countries and coordinated Boeing's participation in more than 2500 events, including 250 accidents involving major damage or fatalities.

"Determining the cause of an accident produces knowledge vital to improving the safety of air travel," Purvis said. Within Boeing, he worked with design, maintenance, and operations engineers to ensure implementation of safety recommendations.

Purvis joined Boeing in a part-time drafting job as an ME undergraduate. The work helped pay his way through school and led to a full-time job after graduation. With "inside out" knowledge of Boeing's drafting system, he worked in units providing customer service and support. He gained expertise in flight control, hydraulic, and landing gear systems, and helped plan the 737 and 747 models. In the 1970s Boeing sent him to Europe to work with airline customers and manage field service operations. After returning to Seattle, he was a manager in customer field service.

"Every job at Boeing taught me the technical and relationship building skills that prepared me to lead the investigation team, a spectacular position for me. I learned something new every day," Purvis said.

This core commitment to the value of education plus good memories from his own student days inspired Purvis to help support future generations of mechanical engineers. His gift of $100,000 creates the Purvis Family Endowed Fellowship in Mechanical Engineering. The addition of $50,000 in UW funds through the Students First matching initiative (see box) gives the endowment extra thrust.

Purvis is pleased he can fund his endowment through the Pension Protection Act of 2006. "I did my research. A gift of up to $100,000 can be withdrawn from an IRA tax free and satifies your annual minimum distribution. It's slick," Purvis said.

After retiring from Boeing in 1999, Purvis stayed professionally active through consulting work, lecturing, and teaching.

He enjoys participating in alumni activities and also volunteering as a docent at the Museum of Flight. An avowed "aviation nut," sharing his love for flying is as rewarding as ensuring that passengers arrive safely.

Create the Future Through Students First Endowments

Engineering alumni and friends have established 17 endowments since the Students First matching challenge initiative launched late last year — 36% of the endowments established campuswide as of April 30. We're in the lead!

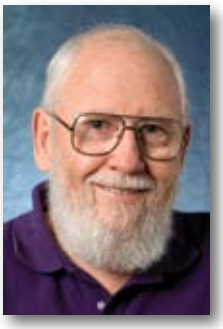
The new initiative addresses a critical university goal to increase access by removing financial barriers for deserving students. Students First affirms the Husky Promise, which will bridge gaps in financial aid for qualified undergraduate and graduate students. Students First helps build private support to make this possible. Here's how it works:

- New endowments with a minimum contribution of $100,000 are eligible for matching funds of 50 percent on the principal.
- Pledges can be paid over five years.
- The challenge continues through the end of Campaign UW in June 2008.

ME needs more undergrad and graduate support to draw exceptional students who otherwise could not afford to attend the UW.

▶To learn how you can establish an endowment for ME, and for more information on gift options under the 2006 Pension Protection Act, contact: Anne Fitzmaurice Adams, anne@engr.washington.edu or 206-685-3041.

Former Chair Bill Wilson Sails into Retirement



William Wilson

Professor William R. D. Wilson retired on March 15, 2007, after eight years of service to the University of Washington and four years service as chair of the Department of Mechanical Engineering. His distinguished career in academe spanned 36 years, including professorial appointments at the University of Massachusetts (1971–1981), Northwestern University (1981–1999), and the UW (1999–2007).

In 1967, Wilson was granted the PhD in applied science and technology from The Queen's University of Belfast, Northern Ireland. His academic career has been marked by distinguished achievement in every area. He has taught graduate and undergraduate courses in many subjects, and has chaired 23 doctoral dissertation committees and 56 masters thesis committees.

Wilson's main research interests are metalforming tribology and surface generation, design for manufacture, and flexible automation. He has authored or co-authored over 130 publications in his areas of expertise. He was the recipient of the American Society of Mechanical Engineers Blackall Award (1996) and the Society of Automotive Engineers Arch T. Colwell Merit Award (1993).

Wilson's plans include gardening, model railroading, sailing Puget Sound, touring Washington vinyards, and visiting his daughters and grandson. ■

Kosály Retires but Avoids Major Changes

George Kosály

After a distinguished career of almost 50 years, Professor George Kosály retired on December 15, 2005. He is still adjusting to retirement. "I am a new retiree, so I don't have much experience with retirement yet," he says. Since he dislikes radical changes, he has arranged his schedule so that the lifestyle changes "would not be too radical." He will continue to teach in the department for one quarter a year, and will also continue research related to the modeling of the metabolism of certain bacteria, which he started some years ago. Despite these activities, Kosály still has a lot of free time. "Originally, I thought I would spend time with my two grandchildren, Holden (16) and Isabel (6), he says. Sixteen year-old teenagers are, however, pretty busy. Luckily, Isabel can still find free time for me."

Upon earning his diploma in physics in 1957 from R. Eötvös University in his native Hungary, Kosály joined the Central Research Institute for Physics (CRIP) in Budapest, where he remained through 1979. In 1980 Kosály, his wife Marta, and daughter Anna moved to the United States and he accepted a position as research professor in nuclear engineering at the UW. "Changing my country of residence was quite out-of-character for someone who hates radical changes," he says. From 1983 to 1988 he held a joint appointment as professor of nuclear engineering and mechanical engineering. When the Nuclear Engineering department disbanded, his appointment became professor of mechanical engineering. ■

Fred Forster (right) celebrates retirement with some colleagues from his early years at the UW. From left are Ed Gow (MS '85), John Greenlaw (MS '84), and Paul Detmer (PhD '90).

Travel Tops Forster's Retirement Plans

Traveling for pleasure topped Fred Forster's to do list after he retired on June 15, 2006. Last summer, he and his wife, Professor Laura Koutsky (Epidemiology), visited New Zealand, followed by Kauai in September and Australia in October. Since then, he has been devoting time to reading, exercise, and cooking. He also remains active professionally, and will present papers at Nanotech '07 in May, ASME InterPACK '07 in July, and ASME IMECE '07 in November.

"I am happy with my new roles, and I have also come to the realization that making room for bright new talent is an important contribution all faculty will eventually make," Forster says. That gives me as much satisfaction as contributing to the development of energetic and dedicated students at all phases of their education. That is what I call a win-win situation."

After earning his PhD at Stanford, Forster came to the UW in 1974 to work in ultrasonics with Dr. Rushmer's group, then joined the ME faculty in 1979. He is an authority on micro-fluidics and micro-pumps. A dedicated teacher, his students won prestigious awards under his direction, including the 2005 National College Design Engineering Award for a microfluidics pump with fixed-geometry valves. ■

***Scholarship Recipients Honored**: A February 22 luncheon honored 38 students who received scholarships for the 2006–07 academic year. Scholarship donors or representatives attending were Ron Crockett (BSME '62), Joanne Jeppesen and Blair Petersen (Roy C. and Irene Grossman Memorial Scholarship), Henry Schatz (BSME '64), and Jan Stephen (BSME '75) (John Salathe Scholarship).*

Capstone Design Project Will Aid Bolivian Village

For their senior design capstone project, four undergraduates are using their engineering knowledge to design wood-fired adobe cooking stoves that will help improve the quality of life in a poor village in the Andes Mountains of Bolivia. Aaron Liss, Bryce Kuhn, Rick Rosenkilde, and Matt Simon, with faculty advisor Dr. Dayong Gao, are working on the project in cooperation with the UW Chapter of Engineers Without Borders (EWB). The inefficient stoves in the village of Yanayo lack outside vents, so many of the women and children develop chronic lung and eye diseases. Two of the students hope to travel with EWB to Bolivia this July to work with the community to build a model communal stove, answer questions about the design, and plan for additional installations in 2008. To learn more about this project and EWB, visit http://students.washington.edu/ewbuw.

Honors & Awards

Associate Professor **Martin Berg** is a 2007 Boeing Welliver Faculty Fellow and this summer will work with engineers at Boeing facilities.

Associate Professor **Ann Mescher** has been honored as 2007 Academic Engineer of the Year by the Puget Sound Engineering Council for her outstanding efforts to advance undergraduate design education.

Professor **Mamidala Ramulu** has been elected a Fellow of the Society of Manufacturing Engineers, one of only nine this year, and will be installed in Chicago in November.

The **ME Centennial Program** won the 2007 Grand Gold Award for Alumni Relations Events from the Council for the Advancement and Support of Education, Region VIII.

The Washington Technology Center has awarded research development grants to Professor **John Kramlich** and Greenwood Technologies, and Professor **Eric Seibel** and VisionGate.

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

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Editor: Curt Fritsch
Layout: Nancy Moses
Sandy Marvinney
Faculty Advisor: Brian Fabien

Contributors:
Sandy Marvinney
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