Green or Bust
A closer look at “carbon neutral” building

Up Close: Students
Solar Team Builds
Unique Ride

Up Close: Faculty
Fu Zhao: Boyhood Environmentalist

In My View
Sustainability in the Aviation Industry
This issue of Mechanical Engineering Impact focuses on sustainability. Regardless of whether we are addressing the grand challenge of economic, social, or environmental sustainability, Purdue mechanical engineers are integral to meeting that challenge. Purdue has graduated more than 24,000 mechanical engineers and the impact of their work is felt worldwide.

We are proud that the Roger B. Gatewood Wing of the Mechanical Engineering Building will be the first LEED-certified (Leadership in Energy and Environmental Design) building on Purdue’s campus; it sets a precedent for others to follow. Also leading the way will be the new Ray W. Herrick Laboratories building that will include the Gerald D. Hines Sustainable Buildings Technology Laboratory. This will provide a “living laboratory” to evaluate the efficiency and overall value of new building technologies (developed through our own research and that of others), including the impact of these technologies on human behavior. With approximately 40 percent of the country’s energy consumed in buildings (commercial and residential), Purdue mechanical engineering will be addressing a huge piece of the energy problem in this laboratory alone.

Transportation consumes approximately 28 percent of our energy and we are having an impact on this, too, with our work on engines, hybrid vehicles, hydrogen fuel cells, and propulsion systems. Jay Gore, the Vincent P. Reilly Professor of Mechanical Engineering, is director of the Energy Center at Discovery Park and is facilitating Purdue’s work on high-impact, multidisciplinary projects in energy alternatives and consumption. With nearly 40 percent of our energy consumed in the form of electricity, the energy center works on wind, solar and nuclear energy, bioenergy, clean coal, electromechanical systems, power electronics, and the Social, Economic, and Political Aspects of Energy Use and Policy (SEPAE). This work places Purdue at the forefront of solving the country’s energy challenges—and mechanical engineers are in the middle of all of it.

None of this would be happening without the outstanding help of our alumni and friends. Whether your circumstances have allowed you to give $10 or $1 million, or more, you are part of our successes. Thank you, and I hope that we are earning your continued support.

E. Dan Hirleman
William E. and Florence E. Perry Head
School of Mechanical Engineering

On the Cover
Growing in popularity are roofs that grow literally. "Green roofs" are partially or completely covered with vegetation and soil, or some other growing medium spread over a waterproof surface. Also called eco-roofs, vegetated roofs, and living roofs, these roofs also include those that feature some form of "green" technology, such as solar panels.
UP FRONT
From Dan's Desk

AROUND ME
New Faculty • Groll’s Talents Recognized

COVER
Green or Bust: The Quest for “Carbon Neutrality”

UP CLOSE: STUDENTS
Seeking Sustainable Lubricants • Solar Racing

UP CLOSE: FACULTY
Fu Zhao: Boyhood Environmentalist

IN MY VIEW
Sustainability in the Aviation Industry

UP CLOSE: ALUMNI
Kevin B. Smith: Hopes Amid Hindrances

ALUMNI NEWS
Class Notes • Outstanding Mechanical Engineers

IMPACT INTERACT
Oscillating Beans

ME Impact is published for alumni and friends of the School of Mechanical Engineering at Purdue University. To comment on the magazine or to ask to be removed from the mailing list, please contact:

Mechanical Engineering Impact
Attn: Cynthia Dalton
Purdue University
585 Purdue Mall
West Lafayette, IN 47907-2088
(765) 494-7320

We welcome your comments. Please send them to the following E-mail address: peimpact@purdue.edu

In submitting a letter, you grant us permission to publish all or part of the letter in an upcoming issue. We reserve the right to edit letters for length or clarity.

Produced by the Engineering Communications Office.
Purdue is an equal access/equal opportunity university.
ME Welcomes New Faculty

Purdue University’s new vice president for research, Richard Buckius, joined the ME faculty as a professor in 2008 after serving as director of the National Science Foundation’s Engineering Division since 2004. Before his position with NSF, he was chair of the Department of Mechanical & Industrial Engineering at the University of Illinois, Urbana-Champaign. He obtained his bachelor’s, master’s and PhD degrees in mechanical engineering at the University of California, Berkeley.

Kartik Ariyur has joined the ME faculty as an assistant professor. He received Honeywell’s Technical Achievement Award after five years in research and development with the company. With 25 inventions, one patent, 14 published patent applications and 10 additional applications, Ariyur studies nonlinear filtering, prediction and control (analysis and synthesis), adaptive control, dynamic optimization, and wireless network performance quantification, among many other areas of interest.

Also an assistant professor, Jong Hyun Choi comes to Purdue from Massachusetts Institute of Technology, where he led a research group after finishing a postdoctoral fellowship at the University of Illinois, Urbana-Champaign. He obtained his PhD at the University of California, Berkeley, where his doctoral thesis addressed nanoparticle synthesis and nanoparticle interactions with deep-UV laser light. His areas of research interest include optical spectroscopy of nanomaterials, diagnostics and therapeutics, nanoscale energy conversion, and bio-inspired nano-motors.

Research Professor Sanjay Mathur also is new to the ME faculty. He comes to Purdue from Fluent, Inc., where he directed research and development efforts for the last 14 years. Mathur received his bachelor’s degree from the Indian Institute of Technology in Bombay, and his master’s and PhD degrees in aerospace engineering from Iowa State University. His ME research will include computational fluid dynamics and transport simulation, the development of efficient numerical algorithms for multiphysics problems that occur in industrial applications, and developing a platform for the simulation of micro-electro-mechanical systems (MEMS) response.
Groll’s Talents Recognized

Students consistently name him a favorite

Purdue adds names to its Book of Great Teachers only once every five years. In August 2008, Eckhard Groll was among those singled out for the honor. Groll, who joined the mechanical engineering faculty in 1994 and became a full professor in 2005, teaches thermodynamics and energy use. He was first recognized for his outstanding teaching in 2002, when the School of Mechanical Engineering presented him the Solberg Outstanding Teaching Award.

Groll says he derives joy and great satisfaction from “seeing a student smile” during class. “Engineering is such a challenging topic to teach. To see students smile indicates that they truly enjoy learning the material,” Groll says. “Also, it’s wonderful to see if a student understands the material and can make a connection to real-life engineering challenges.”

In class surveys, students often use the word “favorite” to describe both Groll and the classes he teaches. As for what shaped his teaching style and philosophy, Groll credits his own positive and negative experiences as a student. “I have had wonderful research advisors and career mentors,” he says. “In particular, I would mention Ray Cohen (Herrick Professor Emeritus of Mechanical Engineering). However, I was not always satisfied with my course instructors during my studies. I often thought that there was a better way to present the material and to some extent, I am still trying to find that way.”

In addition to the recognition Groll received for teaching, his talents have been put to administrative use. Appointed director of the Office of Professional Practice in 2008, Groll has taken on added responsibilities that require him to help students integrate theory into practice, and to ambitiously investigate career choices and opportunities.

Groll says he hopes that his students will look back on their experience in his classes and remember him as “the instructor who made learning thermodynamics enjoyable, who raised their awareness of environmental and energy-related issues, who was fair, approachable, and available.” — Amy Raley

A Book for the Ages

The Book of Great Teachers, a permanent wall display in the west foyer of the Purdue Memorial Union, is an extension of Academy Park. It was dedicated on April 23, 1999.

The book currently bears the names of 316 faculty members, past and present, who have devoted their lives to excellence in teaching and scholarship. They were chosen by their students and their peers as Purdue’s finest educators. The nomination process for inclusion in this book is repeated every five years.
Green or Bust
The quest for “carbon neutrality”
by Emil Venere and Amy Raley
Because using less energy means saving money, creating new “green” jobs, and maintaining the environment, America appears poised to elevate going green from merely an important goal to an essential one. And energy use in U.S. buildings will be an important target in the effort.

In July 2008, the U.S. Department of Energy (DOE) reported that the nation’s 113 million households and more than 4.7 million commercial buildings use about 39.7 quadrillion BTUs of energy annually, about 40 percent of the U.S. total, making the building sector the largest energy consumer.

While running for office, President Barack Obama outlined his $150 billion “New Energy for America” plan, designed to make America “the most energy efficient country in the world.” The plan endeavors to reduce overall electricity demand by 15 percent from the DOE’s projected levels by 2020. With a 15 percent reduction, the plan anticipates that carbon dioxide emissions will drop by more than five billion tons through 2030, a significant number of jobs will be created, and consumers will save an estimated $130 billion on utility bills. The goal would be met by requiring utilities to meet annual demand-reduction targets and by requiring new, more stringent appliance and building standards. The Obama-proposed building-efficiency goal would require all new buildings to be “carbon neutral,” or produce zero emissions, by 2030. To achieve that goal, all future buildings would have to be designed and built to be 50 percent more efficient than buildings going up today, and existing buildings would need to be revamped so their energy efficiency would be at least 25 percent improved.
Purdue’s School of Mechanical Engineering, with help from its generous donors, has long been on the case, working toward a future in which green buildings are the norm.

Beginning in 2003, Roger B. Gatewood (BSME ’68, OME ’06) blazed Purdue’s green-building trail with his leading gift to the Mechanical Engineering Building wing that will bear his name. The Roger B. Gatewood Wing, due to open in 2010, will be the first building at Purdue to be constructed to environmental standards set by the U.S. Green Building Council.

Most recently, in September 2008, it was announced during the University’s “Green Week” that a $2 million gift from Gerald D. Hines (BSME ’48, HDR ’83) completed the $11 million fundraising effort to expand the University’s Ray W. Herrick Laboratories. Administered by mechanical engineering, the Herrick labs are a hub of industry-oriented research in areas ranging from advanced automotive technologies to “smart” and green buildings. The enlarged and updated lab facility will include the Gerald D. Hines Sustainable Buildings Technology Laboratory, a LEED-certified lab for Leadership in Energy and Environmental Design. LEED certification was developed by the U.S. Green Building Council, a non-profit organization dedicated to sustainable building design and construction.

“The Sustainable Buildings Technology Laboratory is a leading-edge concept,” Hines says. “It will have a great impact on helping our industry improve the energy efficiency of buildings and make them more environmentally friendly.”

As the lab focuses on new building technologies, it also will answer questions about how such technologies will affect human behavior and productivity, according to E. Daniel Hirleman, the William E. and Florence E. Perry Head of the School of Mechanical Engineering.

Since opening its doors in the 1950s, Herrick laboratories has established a long tradition of vanguard research. In keeping with that tradition, Purdue researchers working in the Herrick labs are at the leading edge in the quest to increase energy efficiency.

“Herrick was ahead of its time because it started as an interdisciplinary collaboration when it wasn’t fashionable,” says Patricia Davies, Herrick director and professor of mechanical engineering. “An animal sciences professor and a mechanical engineering professor got together to study the effects of climate on animals.

“All of our research connects with industry needs. For example, new concepts using theoretical modeling and advanced experimental techniques developed at the laboratories continue to have a great impact on the design of cars and trucks, the design of buildings, and equipment used in heating.
ventilating, air conditioning, refrigeration, and other systems.” Among many diverse research ventures, current Herrick studies include these “smart” and “green”-oriented projects to benefit building energy efficiency:

- Developing new types of heating and cooling systems that are more environmentally friendly, energy efficient, compact, and quiet than those in use today.
- Creating “smart” equipment for commercial buildings that reduce energy demand when electricity rates are highest, during times of peak demand in summer months.
- Developing a system to monitor and improve indoor air quality using mathematical models and sensors. Such a system could be used in buildings and commercial airliners to detect the release of hazardous materials or pathogens and trace their origin.
- Using room-size climate control chambers to study heating, ventilation, refrigeration, and air conditioning problems.

“The overall concept behind the new Herrick labs is to go beyond green,” Davies says. “We will learn through research how to further increase energy efficiency and lower environmental impact and also integrate occupant comfort and productivity into building design objectives so that you design spaces that people actually want to be in.”

All of our research connects with industry needs. For example, new concepts using theoretical modeling and advanced experimental techniques developed at the laboratories continue to have a great impact on the design of cars and trucks ...
Seeking Sustainable Lubricants

Graduate student John Bomidi pursues green solutions through tribology

Surpassing geographical boundaries while uniting the world’s citizens, the quest for a “green” society appears to be making substantial strides. This is particularly true within the School of Mechanical Engineering, which boasts talented scholars like John Bomidi from Visakhapatnam, located on South India’s east coast.

Bomidi explored several graduate schools with competitive graduate research programs and top facilities, but Purdue’s stellar reputation and offer of financial support ultimately led him to West Lafayette. Here he has applied his skills and knowledge to sustainability projects since 2007.

“I have an interest in tribology,” he says. A branch of mechanical engineering, tribology focuses on the design, friction, wear and lubrication of interacting surfaces.

Two tribology-related projects currently consume Bomidi’s time and attention. One seeks to understand the lubrication of joints in a molecular scale; the second aims to develop sustainable additives to lubricants. “The extreme pressure (EP) and anti-wear (AW) additives are usually not readily biodegradable,” Bomidi says. As part of his research, he seeks to discern a structure-function relationship between readily biodegradable elements that provide excellent EP and AW performance.

While Bomidi maintains a keen interest in the lubrication/friction-wear side of engineering, he says he realized that considering the green factor could reap rich rewards. “The need today calls for it,” he says, noting that much can be achieved within green parameters. This requires a multidisciplinary approach, which he also finds appealing.

Through his work, Bomidi hopes to validate processes for testing and quantifying biodegradability, especially that of lubricant oils and additives. This will eventually require the use of a four-ball machine, which is commonly used to test EP and AW performance of lubricants.

“The EP and AW additives being used are not green—not readily biodegradable,” Bomidi says. “This research will add to the value of the lubricant and will also be environmentally friendly—or rather sustainable.” Such a lubricant would offer added value as lubricants found in living organisms and nature are extremely efficient compared to traditional lubricants and do less long-term damage to the environment.

While Bomidi launched his research at Purdue just over a year ago, he has quickly found the experience rewarding. Bomidi says that Fu Zhao, assistant professor of mechanical engineering and Bomidi’s adviser, plays a key role in developing the plan for his work while providing Bomidi freedom to pursue his own ideas. Meanwhile he consumes countless books, research papers and online articles that whet his appetite for discovery and add to his determination to make an impact through his research.

Clearly, Bomidi will not be satisfied until he achieves his “green” tribology goals: “Research ought to produce results,” he says.
The next time you’re in the market for a new car, consider this sporty one-seater that’s guaranteed to draw attention. And don’t worry if you forget your wallet when you take a spin. The fuel is free; and on clear days, its supply is unlimited.

This is Pulsar, a solar-powered vehicle built by the Purdue Solar Racing team that took first place in the solar division of the Shell Eco-Marathon in California last April. Teams competed to design and build the most fuel-efficient vehicle. Purdue’s Pulsar traveled the farthest and got the highest miles-per-gallon.

Galen King, professor of mechanical engineering and the team’s advisor, says the car’s fuel efficiency was measured as being equivalent to traveling 2,862 on one gallon of gas.

“What Shell does in the Eco-Marathon is take the amount of energy that’s received from the sun and convert that into an equivalent amount of 87-octane gasoline,” King explains. “They then calculate the mileage that the car gets from that equivalent amount of energy to measure the efficiency of the car.”

Getting 2,862 miles “per gallon” is phenomenal, of course, but the $200,000 Pulsar has its drawbacks. Drivers must be no bigger than 5’2” and 120 pounds, and they must recline under a cockpit-like hood where it gets hot. And they can’t be in a hurry. Pulsar tops out at 20 mph. Its older sibling is the broader and more powerful S.P.O.T II (Solar Powered Overland Transportation vehicle), which can hit 61 mph.

Pulsar and S.P.O.T. II were built by the team’s devoted engineering and technology students using industry funding. Cole Skelton, a mechanical engineering junior from Bloomington, Ind., and the group’s vice president, oversees its engineering teams. He says his involvement has helped him learn how to work effectively in teams, plus the value of never being satisfied and considering all ideas. “In most cases it’s not good enough if it works—all of the team members have a tendency to want to take it one step further, make it lighter, stronger, more reliable,” he says. “If you think an idea is too costly or too complicated, put it out there anyway because maybe someone else will take that idea and run with it, and we’ll end up with an idea that will be both feasible in terms of cost, and it will make the car that much more competitive.”

Linda Thomas Terhune and Amy Raley
Fu Zhao: Boyhood Environmentalist

Saddened by pollution in his Chinese hometown, Fu Zhao became environmentally minded at a young age.

“It is upon all of us to solve the sustainability puzzle,” says Fu Zhao, assistant professor of mechanical engineering. Zhao, for one, is certainly doing his part. In addition to his work as an educator at Purdue, he is on the frontlines of research and technology development in the area of ecological and sustainable engineering.

From a young age, Zhao was already mindful of how technology affects the environment. Growing up in the 1980s in an area known as the “rust belt” of China, Zhao became aware of the “serious environmental issues” that confronted his hometown in the northeastern province of Liaoning. The thick black smoke that billowed from the many nearby industrial stacks and the unnatural foam that could often be seen coating local rivers made an indelible impression on the young Zhao.

After being selected to attend college at the prestigious Tsinghua University in Beijing, Zhao later decided to complement his BS and MS degrees in thermal engineering with another BS in environmental engineering. He then spent three years as a researcher in China’s State Key Lab of Clean Energy, immigrated to the U.S., and enrolled in the doctoral program in mechanical engineering at the University of Michigan.

His doctoral research involved highly interdisciplinary work on manufacturing process pollution prevention with a focus on cutting fluids.

Zhao says he was attracted to Purdue because of its reputation as “one of the best universities in the U.S. to conduct integrative, cross-disciplinary research.” His current focus has been on the development of a new, more “flexible” means of producing alternative fuels, hydrogen and electricity.

This new method—what Purdue researchers are calling a flexible carbon-to-liquid fuel process—could reduce greenhouse gas emissions by more than 50 percent compared with petroleum-derived gasoline. This process also has the potential to eventually supply up to 20 percent of the transportation fuels in the United States.

“This technique is more flexible than conventional methods because we can process a wider range of very different feedstocks and, at the same time, we can generate a wider range of end products—not just gasoline and diesel but ethanol and hydrogen. Or we could generate electricity directly from the gas produced,” Zhao says.

Globally minded, Zhao is attempting to “set up some formal collaboration” with several of his former classmates who now work at Tsinghua University and the Institute of Engineering Thermophysics Research of the Chinese Academy of Sciences. The potential for fruitful cross-cultural collaboration, in Zhao’s estimation, is high because engineers in China “are really good at pilot-scale experiments” while many of his U.S. colleagues excel in their “focus more on the fundamental stuff.”

Zhao is committed to making sure experts from all over the world are working together to solve a sustainability puzzle that affects us all.
as I put pen to paper (yes—I still use paper occasionally!),
the next United States president has just been selected. The
decision is one that brings hope and “change”—the one true
constant in life. As engineers with problem-solving skills, our
challenge is to help make change a force for a better world,
to make “sustainable” changes. That means approaching
opportunities with not only the mechanical arts, but also with
full consideration of the social, economic and environmental
elements. It is all about excellence and balance across the
four dimensions.

I’ve thrown my career energy into improving commercial
airplanes—marvelously complex machines full of challenge.
Aviation is responsible for 32 million jobs and about 8
percent of global GDP, gross domestic product. Air travel
enables commerce, tourism, and global connections like
never before. But, like most industries, benefits come with
environmental challenges.

Aviation is accustomed to addressing challenges.
Every day we overcome barriers to bring innovation to
our customers, while managing our business in dynamic
and challenging market conditions. One such challenge is
continually reducing carbon dioxide (CO₂) emissions—one
of the longest-lasting greenhouse gases, and the only Kyoto
gas produced by aviation. To address it directly, aviation is
taking aggressive steps to keep its emissions low, without
losing sight of other issues such as local air quality or noise.

Everyone's doing their part, from washing planes between
flights to flying optimized routes and acquiring newer, more
efficient aircraft. The focus on efficiency is greater than ever
before, despite a track record that’s far better than most
other transport modes.

In addition to emphasizing using less fuel, the industry is
adding a new option—finding and commercializing a new
generation of sustainable, plant-based fuels that offer a smaller
carbon footprint and don’t compete with food and land
resources. These new biofuels—or biojet—offer significant benefits
when considered using a lifecycle approach. Plant-based fuel
sources absorb CO₂ while growing, which means that fuels
produced through sustainable growing practices have the
ability to reduce the industry’s dependence on fossil fuels, while
offering a 50 to 80 percent CO₂ reduction over their lifetimes.
That’s a tremendous progression for the industry and its ability to
support destinations that rely on aviation for their economic
livelihood.

By the time you read this, we will have conducted two sustainable
biofuel flights with two more planned. But
solutions take time, and we’re still three to five years from
seeing biojet available for commercial use.

This is an emotional and personal issue for me and many
others. People want to move freely throughout the world,
without misguided guilt being placed upon them. Not until
we effectively replace misinformation with facts, data
and innovative technological solutions, will we
be able to say that we’ve effectively solved the
sustainability puzzle. Making a difference means
demonstrating commitment with action. Purdue
mechanical engineering grads have extraordinary
opportunities to make a difference, in new and
emerging fields or whatever field we choose to
apply ourselves! Go Boilers! Bill M. Glover Jr. (BS
’76, MSME ’78), managing director, Environmental Strategy for
Boeing Commercial Airplanes, The Boeing Company
Hopes Amid Hindrances

Opportunities for solar power impeded by economy

Just as the world’s consensus on the need to pursue affordable, sustainable, “green” technologies to protect the Earth appears to be at a historic peak, the global economy is facing some of its most trying times.

Those converging factors give alumnus Kevin B. Smith (BSME ’79), chief operating officer and head of development for SolarReserve, a solar power development company, a mix of hope and concern. He hopes for increasing progress in promoting solar-generated electricity worldwide, but he has real concern about the economic hindrances, such as the decline in available investment dollars, that stand in the way.

SolarReserve of Santa Monica, Calif., aspires to develop utility-scale renewable-energy solar power plants worldwide, using technology that can deliver power 24 hours per day, or as needed during peak periods of demand.

“One of the challenges,” Smith says, “is finding opportunities that work from an economic standpoint, because solar is considered more expensive.”

He points out, however, that his company is able to compete because the solar technology it offers provides cost predictability superior to any of the less Earth-friendly fossil fuel production methods. That predictability means lower long-term risk.

“You can build a solar project today and you can predict what your costs will be for the next 30 years. It really comes down to who’s going to do the forecasting and what’s going to happen to natural gas prices or other fuels over the next 30 years,” he says. “We’re also looking at a number of other ways to make the technology more competitive. And although we’ve seen a recent dip, most agree that oil and natural gas are continuing to rise.”

Beyond that, Smith says that the United States could add millions of jobs to the economy by fostering sustainable power technologies, such as solar and wind.

“When you look at all the energy issues, job creation is a big factor. People are recognizing that there’s more to energy supply than just raw cost; there is job creation.”

EPA Decision a Boon for Solar

A recent decision by an appeals board of the Environmental Protection Agency (EPA) added some balance to the economic playing field between fossil fuel-generated power and power from solar and wind technologies. On Nov. 13, 2008, the EPA panel blocked a permit for a proposed coal plant near Vernal, Utah, reversing an earlier EPA decision. The panel’s ruling, which stated that the EPA needs to develop a single nationwide standard for limiting carbon dioxide emissions, has effectively stalled more than 100 other coal plant projects, which could drive away already limited investment dollars.

One of the 2008 Outstanding Mechanical Engineers, Smith obtained an MBA at the University of Chicago after earning his bachelor’s degree at Purdue. He tackles the challenges of his work, confident that his Purdue education remains critical to his success.

“The mechanical engineering degree I received at Purdue gave me a great foundation. I studied power plant economics and design, and started out in a power plant design firm (Sargent and Lundy Engineers, Chicago). As I was getting my MBA, my career went more into the commercial side, but fundamentally, you have to have a good understanding of the engineering, so you can understand fuel consumption.”

— Amy Raley
Class Notes

1940-49

Jerry Shore, BSME '46: retired as founder and chairman of Park Electrochemical Corp. and is a metal sculptor of public art.

William G. Agnew, BSME '48; MSME '50; PhD '52 (OME '91; DEA '72): was awarded “AUVSI Man of the Year” in 2008 by the Association for Unmanned Vehicle Systems Competition (IFVS) for engineering students. (Designed the GPS navigation, follow-the-leader and design-report challenges for the competition.)

Leo W. Gross, BSME '48: retired after working for 36 years at Eveready Battery.

August Zoll, BSME '48: retired from Curtiss-Wright Corp. and is working as a curator in the library of the Aviation Hall of Fame and Museum in Teterboro, N.J.

Edward A. Zywiec, BSME '49: is retired. He held a professional engineer’s license in six states and received his master’s degree from Northwestern University in 1981.

1950-59

Ray Barney, BSME '52: recently was named Outstanding Older Worker in the State of Washington and was provided an all-expense-paid trip for two to Washington, D.C., to attend the award ceremony.

Irving W. Grander Jr., BSME '59: retired as a lieutenant colonel in the United States Air Force after 24½ years of service, is a veteran of WWII and the Korean War.

1960-69

Wayne E. Kennedy, BSME '68; MSME '72; MSIA '72: retired from Whirlpool Corp.

Raymond A. Rust Jr., BSME '69: retired from Carrier Corp.

1970-79

Charles A. McPherron, BSME '70: retired from National Steel and Shipbuilding Co.

1990-99


Joseph W. Kresovsky, BSME '97: recently accepted a position in marketing and sales with Cummins, Inc., relocating to Denver, Colo.

2000-present

Brian S. Longardner, BSME '02: is a resident engineer for Dana Corp. in the United Kingdom, working to increase the efficiency of all vehicles using Dana Corp. product.

William E. Healy III, BSME '05: is marketing projects specialist in the Product Marketing Division for Balluff, Inc., Florence, Ky.

Eric R. Brace, BSME '07: is an industrial lubricants sales engineer at ExxonMobil in Fairfax, Va.

It’s Your Turn

Please help us keep up with your achievements and career successes. E-mail us at mealumni@purdue.edu. Include your contact information, degree year, and the news—civic achievement, board memberships, professional honors, career activities—that you’d like to report. Alumni news will be published in future issues of ME Impact.
Highly accomplished ME alumni were named OME’s in 2008

**Campbell D. Carter** (PhD ’90) taught and worked as a researcher at Purdue while finishing his doctoral degree. As a postdoctoral fellow in the Combustion Research Facility of Sandia National Laboratories, he characterized turbulent jet flames and the nitric oxide they produce. Later he developed and applied laser diagnostic techniques for the advanced propulsion group at the U.S. Air Force Research Laboratory, where he now serves as a principal aerospace engineer. He currently develops and applies advanced laser diagnostic techniques for high-speed, air-breathing propulsion technologies (supersonic combustion ramjets or scramjets). Carter is a fellow of the American Society of Mechanical Engineering and an associate fellow of the American Institute of Aeronautics and Astronautics.

**Billy M. Glover Jr.** (BSME ’76, MSME ’78) has served in many roles at Boeing Commercial Airplanes. He now leads Boeing’s efforts to develop and implement a worldwide environmental strategy. His team addresses aircraft noise reduction, greenhouse gas emissions, alternative fuels research, public policy and opinion. It also provides input on product design to optimize aircraft environmental performance. He has worked with eight Boeing airplanes, from the 707 to the 787, and has developed Boeing products, research programs and contracts. Glover is an associate fellow of the American Institute of Aeronautics and Astronautics, co-chair of the Algal Biomass Organization, and is on the board of the Air Transport Action Group. He also serves Purdue engineering on the Industrial Advisory Committee for the Ray W. Herrick Laboratories.

**Jill M. Hruby** (BSME ’81) has been with Sandia National Laboratories in Livermore, Calif., for over 25 years. As Sandia’s director of homeland security programs, she now oversees a $70 million budget that helps anticipate, prevent, respond, and recover from terrorist attacks or natural disasters. Hruby, who obtained a master’s degree in mechanical engineering from the University of California, Berkeley, also has overseen work in materials research and development, microsystem fabrication and performance, and large-scale computation. She also has worked with LIGA-based microsystems, nanoscience research, hydrogen storage, solar energy, mechanical component design, thermal analysis, microfluids, and materials aging programs. Named an Outstanding Role Model by Sandia’s Women’s Committee, Hruby has three patents and the R&D 100 Award for solid state radiation detectors CZT with spectrum plusTM.

**Sung Jin Kim** (PhD ’92), vice president for Samsung Electronics’ Digital Appliance Business Research And Development team, received the 2007 Innovation Award from the International Consumer Electronics Association for his horizontal-axis washing machine—the quietest machine of its kind in America. The Korean model of this machine was awarded the coveted Industrial Research 52 Award, known as the Jang Young-Shil Award, named for one of Korea’s greatest inventors. Previously, Kim served as an adjunct professor of mechanical engineering at Korea’s Pusan National University, as the chief research engineer in LG Electronics’ Living System Research Laboratory, and as an engineer for General Electric’s Global Research Center. He served on the editorial board for the Journal of Korean Society of Noise and Vibration Engineering from 1997-99, and in the past 10 years, Kim has been awarded seven Korean patents, many of which further quiet home appliances.

**Kevin B. Smith** (BSME ’79) has managed the successful development, acquisition, financing, and construction of more than 40 power facilities in the United States and internationally, with total capital costs of more than $4.5 billion and long-term electricity sales contracts approaching $50 billion. Smith now is CEO for SolarReserve LLC, Wilmette, Ill., which develops utility-scale solar energy projects using novel solar energy generation and storage technology. Previously, he was senior vice president of development at Invenergy LLC, where, in three years, he led the development of Invenergy Wind from a startup to one of the world’s largest privately owned renewable energy businesses with more than $2 billion in projects and operation and construction. Smith also was president of Insight Energy, Inc., chief operating officer of London-based Rolls-Royce Power Ventures, and general manager and vice president of Indeck Energy. He also earned an MBA in finance from the University of Chicago.
Oscillating Beans

The bottom of a vertical, massless spring is 88.0 cm above the floor. When a 660 gram can of beans is hung on the end of the spring and moved to equilibrium, the end of the spring is stretched until it is 76.0 cm above the floor. The beans are then lifted up from their equilibrium position until the top of the can is 80.0 cm above the floor and released.

(A) What is the spring constant of the spring?
(B) Determine the equation of motion for the velocity of the can of beans as a function of time.
(C) At what height above the floor will the acceleration of the beans be equal to acceleration of gravity?
(D) How fast are the beans moving exactly 3.80 seconds after they are released? Are the beans above or below the equilibrium position?
(E) How much work did it take to set the beans in motion?
(F) How long does it take the beans to move from lowest position above the floor to their highest position above the floor?
(G) What is the speed of the beans when they are 73.0 cm above the floor?

Puzzle supplied by Purdue Mechanical Engineering Ambassadors.

Solution to “Will James Bond Escape?”

Due to the length of the solution, please see an abbreviated version below. If you would like the complete calculation, please contact Cynthia Dalton via e-mail at cdalton@purdue.edu or call us at (765) 494-7320.

- The total weight of the raft (empty raft + James Bond + anchor) = 1,040 pounds.
- The weight of the anchor is 489.8 pounds.
- The depth of the water displaced by the total weight of the raft is 1.852 feet.
- The total volume of water surrounding the raft is 44.963 ft$^3$ and the volume of water initially surrounding the raft is 12.963 ft$^3$.

- When the anchor is thrown overboard, the volume of water surrounding the raft is 6.858 ft$^3$ and the raft and James rise 0.44 ft to a height of 7.94 ft.
- Bottom line, James Bond does not make it out of the pit!

(David W. Hanna solved the puzzle correctly, but he also gets extra credit for pointing out that we had the wrong title [Torque Troubles] on the puzzle.)
Seemingly the stuff of futuristic gaming, this illustration uses rocket experimentation data from Purdue researchers. The two figures shown in repetition are Delayed Detached Eddy Simulations of combustion instability in an experimental rocket combustor. Guoping Xia, a senior research scientist, and Randy Smith, a graduate student, created the simulations working with Charles Merkle, the Reilly Professor of Engineering with appointments in aeronautics and astronautics and mechanical engineering. The experiments are conducted by a research group led by William Anderson, an associate professor of aeronautics and astronautics.