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METRICS

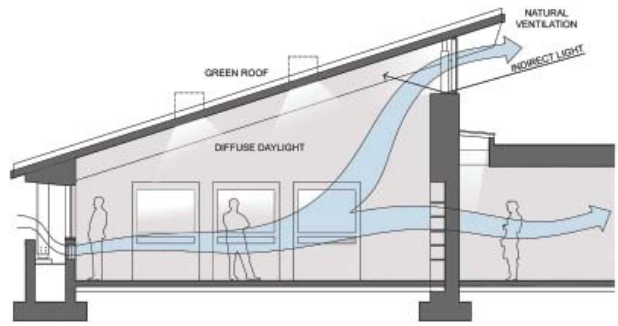
MECHANICAL ENGINEERING

A newsletter for alumni and friends of the Department of Mechanical Engineering

INSIDE

ME Design Teams Win Sustainable Technology Welcome Center Competition

Department of Mechanical Engineering graduate students and faculty, in conjunction with Ziger/Snead Architects, Henry Adams Consulting Engineers, Catholic University and Michael Furbish, won a design competition to create an environmentally friendly welcome center at an existing scenic overlook in Frederick County, Maryland.



The interior design of the proposed welcome center features natural lighting and ventilation, a scenic view of the nearby historic battlefield, and a green roof.

The Western Maryland Welcome Center Sustainable Technology Showcase competition was a way to stimulate a variety of innovative design concepts for the existing Goodloe Byron Scenic Overlook facility located along northbound I-270. The competition was sponsored by the Office of Congressman Roscoe G. Bartlett and the Maryland Department of Transportation State Highway Administration.

The final design of the welcome center is intended to be independent from the need to rely on traditional energy, water supply and wastewater treatment technologies. When constructed, the facility will be self-contained and self-sustaining.

The first place winners included ME research graduate assistants Ji Bian and Jonathan Winkler, who worked with the Center for Environmental Energy Engineering (CEEE) at the University of Maryland in cooperation with the Ziger/Snead architecture firm. They will be asked to become the prime contractor for the State Highway Administration with the final design of the project.

Professor Reinhard Radermacher, faculty advisor for the winning design team adds, "Participation in such a competition is an ideal teaching opportunity where students get first hand experience in interdisciplinary team work, engineering design decisions and compromises to see the results of their hard work come to fruition."


Radermacher

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Message From the Chair

I AM EXCITED TO INFORM YOU THAT AS THE 2004 FALL SEMESTER BEGAN, the Department of Mechanical Engineering was honored with recognition from the U.S. News and World Report, the President of the United States, and the State of Maryland. As you'll read in subsequent pages, in August for the first time in its history our undergraduate program joined the upper tier of Mechanical Engineering Departments, with a ranking of 23rd in the nation, 14th among public schools in U.S. News and World Report's America's Best Colleges 2005. This follows the announcement in April that the ME graduate program ranked 24th, and 15th amongst public institutions for 2004 by this same publication (USN&WR). At the end of August the White House announced that Professor Ali Mosleh, Director of the Reliability Engineering Program, was appointed by President Bush to be a Member of the Nuclear Waste Technical Review Board. And as we go to press we've learned that our colleague Professor Elisabeth Smela is the recipient of the highly prestigious Presidential Early Career (PECASE) Award for 2004. Earlier this summer, the Maryland State Highway Administration chose a visitor center design developed by our students and faculty for the creation of an environmentally friendly scenic overlook in Frederick County.

In the past few months the Department has initiated major collaborations that will expand the opportunities for learning and scholarly research in Mechanical Engineering. Professor Michael Pecht , Director of the CALCE – Electronic Products and Systems Center visited Jiao Tong University in Shanghai to sign a cooperative agreement between UMD and this leading Chinese University to establish a bio-electro-mechanical health monitoring program. An imminent Memorandum of Understanding with the U.S. Army Aberdeen Test Center nearby in Maryland, spearheaded by lecturer Dr. Greg Schultz, will provide students interested in vehicle dynamics with direct access to a world-class automotive roadway simulator, described in detail in this issue of METRICS, and dramatically expand the automotive research capability of ME and Clark School faculty.

Mechanical Engineering students have joined in organizing a campus chapter of the new country-wide Engineers Without Borders organization with ME student David Kerske joining with others this summer to build a wastewater treatment plant in Samli, Thailand.

This fall our department will be joined by Assistant Professor Adam Hsieh who hails from the University of California, San Francisco. Dr. Hsieh will be our first appointment within the department to work with the School of Engineering's Bioengineering Graduate Program. In the last few months, CALCE Electronic Products and Systems Center welcomed two new research scientists, Drs. Michael H. Azarian and Peter Rodgers. Dennis Moran joined the Center for Environmental Energy Engineering (CEEE) in April as a Research Associate to direct the new Mid-Atlantic CHP Application Center and the CHP Integration Test Center.

Our faculty continues to receive accolades and recognition in their fields of study. Professor Ashwani K.Gupta was recently awarded the prestigious James N. Landis Medal. Professor Shapour Azarm was appointed Associate Editor of ASME Transactions, Journal of Mechanical Design, and Professor Bongtae Han was appointed to Associate Editor of ASME Transactions, Journal of Electronic Packaging, both for three-year terms. Prof. Michael Pecht was granted honorary professor status by the Jiao Tong University in Shanghai.

Building on our initial success last year, we are again hosting a UMD-ME alumni event co-located with the ASME International Mechanical Engineering Congress and R&D Expo in Anaheim, California on November 17. Please see the back cover of this issue for further information and if you can't join us in person, then please join us virtually, via the Web, e-mail (*abc@umd.edu*), or by phone at (301) 405-3173. I would also very much welcome your ideas on other alumni events or on other ways you would like to keep in touch.

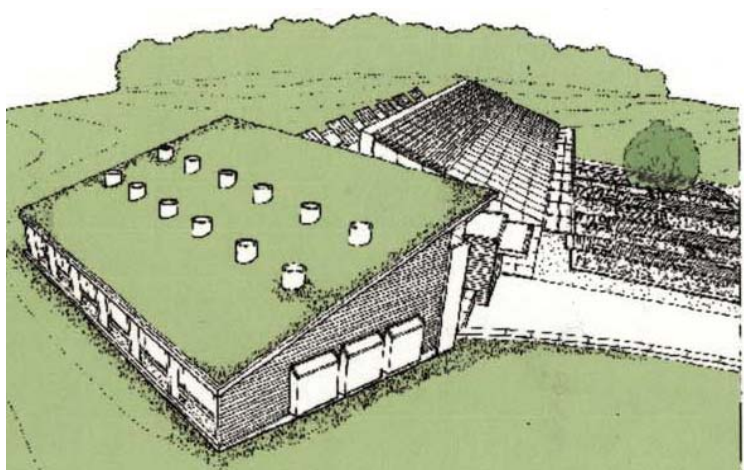
I sincerely hope you will enjoy this latest issue of METRICS and that you will find ways to become part of the Department's continuing rise towards the very top echelons of mechanical engineering in the nation.

Welcome Center Design Team Winners

continued from page 1

Jackson

Second place finalists included research graduate assistant Jason McGill, advised by Associate Professor **Greg Jackson** in conjunction with students from Catholic University and Cho, Benn and Holbeck Associates. Both the first and second place winners were awarded $25,000 for the effort, and plan on sharing ideas for the final design.



Left: Native plants and a green roof minimize water use and create a natural landscape

facultyNEWS

New Faculty

The Department of Mechanical Engineering is pleased to announce the following faculty additions:


Hsieh

Adam Hsieh will hold a joint appointment with the Bioengineering Graduate Program as an Assistant Professor. Hsieh begins his term in Mechanical Engineering on November 1, 2004, and is the first faculty hired by the ME department in conjunction with the Clark School's Bioengineering Graduate Program.

Dr. Hsieh has been conducting his postdoctoral research in the Orthopaedic Surgery Department at the University of California, San Francisco since July 2000, with support from the NIH as a postdoctoral fellow since August 2001. During this period, Hsieh also co-developed and co-instructed a course in Tissue Mechanobiology at the University of California, San Francisco/Berkeley in the Department of Bioengineering for the 2004 Winter quarter, and served as co-instructor for courses in Kinesiology at San Francisco State University during the 2002-2003 academic year. Hsieh received his Ph.D. in bioengineering at the University of California, San Diego.

New Research Center Scientists


Azarian

Dr. **Michael H. Azarian** joined CALCE Electronic Products and Systems Center (EPSC) in June as a Research Scientist. He holds a Ph.D. in Materials Science and Engineering from Carnegie Mellon University, a Masters degree in Metallurgical Engineering and Materials Science from Carnegie Mellon, and a Bachelors degree in Chemical Engineering from Princeton University.

He brings to CALCE thirteen years of professional experience in the data storage, advanced materials, and fiber optics industries, having worked for Philips Research Laboratories in Eindhoven, the Netherlands; W. L. Gore & Associates, Inc. in Elkton, MD; and Bookham Technology in San Jose, CA, as well as several start-up companies. He was most recently Manager of Quality and Reliability at Bookham Technology in San Jose, CA. His areas of expertise include reliability of photonic components, failure analysis, and tribology of the magnetic head-disk interface.

Dr. **Peter Rodgers** joined CALCE EPSC as a Research Assistant Professor, to support the Center's electronics thermal management activities. He has extensive research and product development experience in the thermal analysis of electronic equipment.

Dr. Rodgers was formerly with the Nokia Research Center in Finland, and Electronics Thermal Management Ltd., Ireland, where he consulted on a wide range of aspects in electronics cooling, spanning integrated circuit (IC) packaging to facility cooling. He holds a Ph.D. in mechanical engineering from the University of Limerick, Ireland.

Dennis Moran joined the Center for Environmental Energy Engineering (CEEE) in April as a Research Associate. He will direct the new Mid-Atlantic CHP Application Center and the CHP Integration Test Center, and he will support expansion of CEEE's industrial energy efficiency program.

Mr. Moran has over 30 years of diverse experience that has focused primarily on the development and commercialization of advanced energy conversion technologies and on utility industry restructuring. His recent responsibilities have included: directing the American Gas Association's power generation, cogeneration and gas cooling programs; developing and implementing energy management and energy procurement programs for Marriott International; and consulting on technology development and marketing issues for numerous government, utility, and industrial clients. Dennis has a BS in Mechanical Engineering from the University of Notre Dame and an MBA from the University of Pittsburgh.

Jan Sengers Elected to Fellow in IUPAC


Sengers

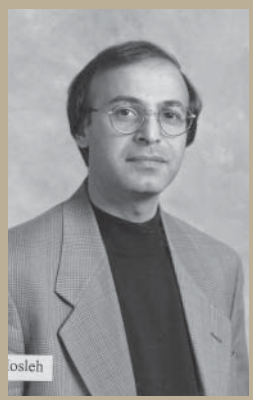
Affiliate Professor of Mechanical Engineering and Distinguished University Professor Emeritus **Jan Sengers** has been elected to Fellow status in the International Union of Pure and Applied Chemistry (IUPAC).

Sengers' elevation to Fellow is in recognition of his research achievements in fluid science, academic achievements and contributions to IUPAC. He was a subcommittee member IUPAC's Commission I.2 on Transport Properties of Fluids since 1985. He served as editor and co-editor for two IUPAC Volumes, and the co-author of five chapters in three IUPAC Volumes.

Sengers' research group developed equations for the transport properties of several fluids which have been adopted by IUPAC as recommended international standards.

In the field of fluid science, Sengers specializes in research on fluctuations in nonequilibrium fluids and the transport properties and thermodynamics of fluids and fluid mixtures.

Professor Ali Mosleh Appointed to Presidential Review Board



Professor of Mechanical Engineering **Ali Mosleh** was Appointed to the U.S. Nuclear Waste Technical Review Board (NWTRB) by the President of the United States of America George W. Bush.

The Board is an independent federal agency established by the U.S. Congress in 1987 to provide oversight of the scientific and technical activities related to the packaging, transportation, and disposal of high-level radioactive waste and spent nuclear fuel in the United States. The board consists of 11 members who are appointed by the President of the United States from a list of nominations submitted by the National Academy of Sciences. Board members serve a four-year term.

The main requirements for appointments to the NWTRB were established by Congress, which expect the appointee to be eminent in a field of science or engineering, including environmental sciences; and that the appointee is selected solely on the basis of established record of distinguished service.

The NWTRB performs an important service to the nation, ensuring that the management and disposal of high-level waste and spent nuclear fuel have a sound scientific and technical basis, and appointment to the board is considered to be a professional honor.

Professor Mosleh was appointed as the Director of the Reliability Engineering Program in the Mechanical Engineering Department this Summer. He is an internationally recognized leader in technology risk and reliability with numerous seminal contributions to diverse fields of theory and application, winner of several scientific achievement awards, Fellow and Chair of the Engineering Division of the Society for Risk Analysis (SRA), Engineering Editor of the SRA Journal, Chair and organizer of numerous international conferences on risk and reliability engineering, and technical advisor to many national and international organizations.

The Reliability Engineering Program at the University of Maryland began offering MS and Ph.D. degrees in Reliability Engineering in 1989. By 2003, the program boasted a total enrollment of 118 students; with 50 MS students and 68 Ph.D. candidates. It provides a broad range of courses and experiences for its students, designed to prepare them to assist the nation in its ability to produce complex technological systems with ultra-high reliability and availability.

For more information about the Reliability Program, please visit their website at: *www.enre.umd.edu/*

Professor Michael Pecht Bestowed Honorary Professorship at Jiao-Tong University

Pecht

Dr. **Michael Pecht**, the George Dieter Chair Professor of Mechanical Engineering, was granted honorary Professor status at the Jiao Tong University in Shanghai on June 8, 2004 as part of a cooperation between Jiao Tong and the University of Maryland Department of Mechanical Engineering. The professorship will enable him to establish a program in bio-electro-mechanical health monitoring at Jiao Tong.

The award followed a presentation by Dr. Pecht on bio-electro-mechanical health monitoring. Pecht plans to establish a program in this discipline at Jiao Tong which would incorporate electronics and mechanical engineering concepts with both Chinese and Western medical philosophies. Professor Pecht also signed an agreement of cooperation between Jiao Tong and the CALCE Electronic Products and Systems Center (EPSC), which is part of the mechanical engineering department.

Michael Pecht has a BS in Acoustics, an MS in Electrical Engineering and an MS and Ph.D. in Engineering Mechanics from the University of Wisconsin. He is a Professional Engineer, an IEEE Fellow, an ASME Fellow, and a Westinghouse Fellow. He has written thirteen books on electronic products development. He served as chief editor of the IEEE Transactions on Reliability for eight years and on the advisory board of IEEE Spectrum. He is the founder and the Director of the CALCE Electronic Products and Systems Center at the University of Maryland and is a Chair Professor. He has consulted for over 80 major international electronics companies, providing expertise in strategic planning, design, test, IP and risk assessment of electronic products.

Professor Ashwani K. Gupta Awarded James N. Landis Medal


Gupta

Professor of Mechanical Engineering **Ashwani K. Gupta** has been awarded the James N. Landis Medal. The award consists of an honorarium, bronze medal, and certificate in recognition for his work in the development and implementation of revolutionary high temperature air comubustion technology that has resulted in significant energy savings, reduced pollution, and a better quality of product for a range of applications using fossil fuels and waste fuels.

The James N. Landis Medal is presented for outstanding personal performance related to designing, constructing, or managing the operation of major steam-powered electric stations using nuclear or fossil fuels. The candidate must also demonstrate personal leadership in humanitarian pursuits, which may include committee activity, Section leadership, or the broad non-technical professional activity of the nominee's engineering society.

Professor Ashwani K. Gupta has been a faculty member in the Mechanical Engineering Department at the University of Maryland, College Park since 1983, following six years at MIT as a member of the research staff in the Energy Laboratory and Department of Chemical Engineering, and three years at Sheffield University as an independent research worker and research fellow in the Department of Chemical Engineering and Fuel Technology. He has over 30 years of experience in combustion engineering since his graduation from Southampton University in 1970.

Shapour Azarm Appointed Associate Editor of Design Journal


Azarm

Professor of Mechanical Engineering **Shapour Azarm** has been appointed as an Associate Editor of ASME Transactions, Journal of Mechanical Design for a three year term starting in October 2004. Azarm was previously the Associate Editor of this journal from January 1993 to December 1995. He is also the Associate Editor of Mechanics Based Design of Structures and Machines (formerly Mechanics of Structures and Machines) since January 1998.

Dr. Azarm is Professor and Director of the Design Decision Support Laboratory (DDSL) of the Department of Mechanical Engineering, University of Maryland, College Park. His current research areas of interest lie in optimal design of mechanical engineering systems, including multi-criteria and multi-disciplinary design optimization and decision making.

Dr. Azarm has numerous publications in these areas and has taught many related undergraduate and graduate courses. He was formerly the Conference and Paper Review Chair of the ASME Design Automation Conference in 1993, 1995 and 1996. He was a Navy Senior Faculty Fellow at NSWC, Carderock Division (Summer 1995) and a NASA Faculty Fellow (Summer 1994). He was a Visiting Scientist at NASA Langley Research Center (Fall 1992), a Visiting Professor at the Research Center for Multidisciplinary Analysis and Applied Structural Optimization of the University of Siegen in Germany (Spring 1992), and Design Institute of Technical University of Denmark (Summer 1990).

Bongtae Han Appointed Associate Editor of Packaging Journal


Han

Associate Professor of Mechanical Engineering **Bongtae Han** has been appointed as an Associate Editor of ASME Transactions, Journal of Electronic Packaging for a three year term. Han was previously an Associate Editor of an international journal, "Experimental Mechanics" from 1999 to 2002.

Dr. Han was also awarded a three-year research grant entitled *Extension of Displacement Measurement Techniques into Nano-mechanics Domain* from the Semiconductor Research Corporation, for the development of a measurement technique for nanoscale deformation. The results of the proposed research will be utilized to provide mechanical reliability guidelines for interconnect technology and to identify potential mechanical reliability issues for the 50nm technology node and beyond.

Han was also awarded an additional grant from the Intel Corporation for a two year study entitled *Development of Experimental Apparatus using far Infrared Fizeau Interferometry*, for the development of a laboratory device to measure the warpage of packages and assemblies without any sample preparation. The results of the proposed research will be used to characterize the warpage behavior of current and future high performance packaging solutions.

Smela Earns Presidential Early Career (PECASE) Award

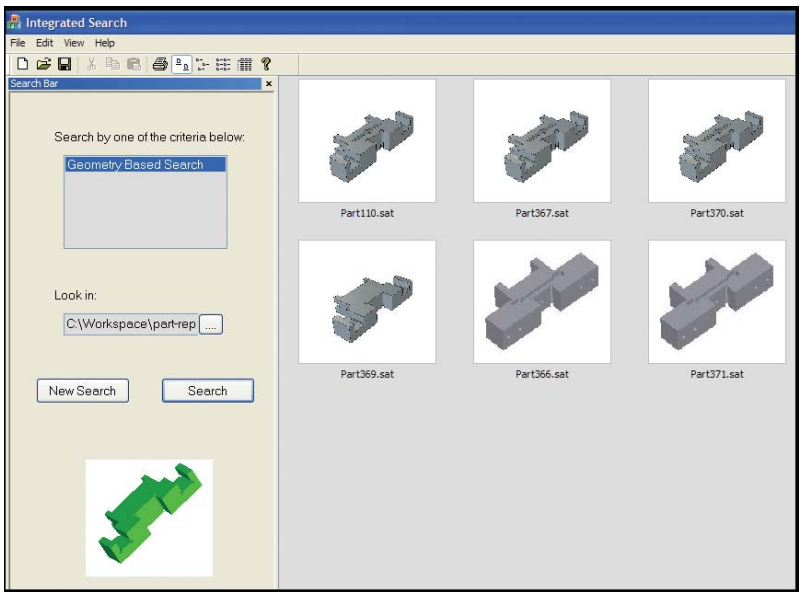

Smela

Assistant Professor of Mechanical Engineering **Elisabeth Smela** was the recipient of the highly prestigious Presidential Early Career (PECASE) Award for 2003, presented on September 9, 2004. The award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers.

New 3D Geometry Search Engine Allows Design Engineers to Perform Efficient Searches

S.K. Gupta

A fast search engine for use in the engineering design process is being developed by a team of University of Maryland researchers at the Center for Energetics Concept Development (CECD) in the Department of Mechanical Engineering at A.J. Clark School of Engineering. Partnering with the Naval Surface Warfare Center (NSWC) at Indian Head, Maryland Professor **Satyandra K. Gupta**'s team has developed a new search engine that will one day aid design engineers.



Geometry Based Search Results

In the world of engineering design, easy access to information is an essential part of rapid product development and design. Unlike a typical online researcher or graphic designer, the engineering designer needs fast search capability for 3D solid models in addition to information about functionality and the rationale behind various design decisions.

Manually searching through electronic files and folders for design information is time consuming and the chance of actually finding what you are looking for is hit or miss—at best. This task is even more difficult for new employees who lack the experience. In order to improve "time to market" and reduce production costs, design engineers need to come up with more efficient ways of finding relevant design information.

Popular search engines like Google and Yahoo or data management tools available as a part of computer-aided design (CAD) systems only support text-based searches. There are no content-based search engines commercially available for finding 3D models and associated knowledge - until now.

Researchers led by Professor Satyandra K. Gupta at the University of Maryland Center for Energetic Concepts Development (CECD) in the Mechanical Engineering Department at the University of Maryland believe they have come up with a possible solution while working on a project for the US Navy's Naval Surface Warfare Center (NSWC) at Indian Head, Maryland.

Gupta's research strives to solve the problem of how to accelerate the design process by eliminating unnecessary steps in the information gathering phase of the engineering decision making process. Designers new to a project can use the 3D geometry-based search engine developed by his team to readily locate and view the parts involved in similar design projects.

"There are two main distinguishing characteristics of our work that set us apart from other groups that are developing geometry-based search engines to be used in engineering design," says Gupta. "First, we can support searching for both individual parts as well as assemblies of parts. Second, by utilizing appropriate shape features, we can customize the search for different applications."

Preferred by Engineers & Navy Senior Management

Dave Williams, Director of the CAD/PAD Joint Program Office at Indian Head has held several leadership positions in defense manufacturing. "If we can avoid reinventing the wheel it is of great help. We feel that the 3D geometry-based search technology can help us create new designs through minor modification of existing designs at huge savings of lead times and cost," says Williams. "It will also help reduce the total number of parts for which an inventory is maintained and, hence, reduce life cycle costs."

"Geometry-based search can give ideas for product improvement based on previous designs. This has the potential to significantly reduce costs and design time associated with product improvement projects," states Frank Valenta, Senior Technologist at NSWC, Indian Head, who has been designing energetic devices for 30 years.

Ian Wexler, an engineer at NSWC, Indian Head has led several product improvement projects in the past. "One of the unique aspects of 3D geometry-based search is that it can be used to perform quick cost estimation by finding similar designs and examining their costs. This capability will help designers make more accurate cost and performance trade-off decisions early in the design process and ultimately, create better and more cost-effective products."

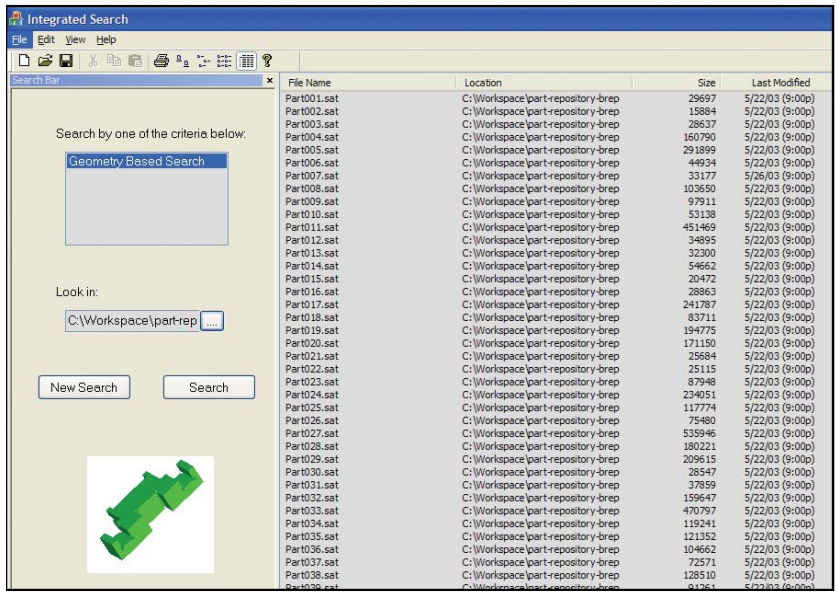
Dennis Chappell, Vice President with Port Tobacco Consulting has worked in the defense manufacturing field for many years. He notes that 3D geometry-based search can potentially help in finding previously designed products with appropriate characteristics. "Designers can reuse these models directly or after making minor changes to them," says Chappell. "This capability will significantly reduce effort required in modeling complex parts and in creating new parts."

Commercializing the Technology

Professor Gupta and his team believe that the 3D geometry-based search technology being developed by them will soon be a key tool in the lives of design engineers in the defense industry as well as in the private sector. "Our new search system has the potential of bring about revolutionary changes in how products are designed," adds Gupta.

Over the next few years, Iktara and Associates, a local company headed by Dr. Dave Anand, who recently retired from the University of Maryland, plans to develop an end-to-end design information management tool called Design Navigator that works with CAD systems. The envisioned system will consist of several different modules to support a wide variety of designers' knowledge management needs. Iktara hopes to license 3D geometry-based search technology developed by Gupta's team and use it as one of the modules in its system.

Mukul Karnik, Principal Software Developer at Iktara, received his MS degree in mechanical engineering at the University of Maryland. He strongly believes developing the underlying technology behind the Design Navigator system requires a new kind of engineer—an engineer that is familiar with the basics of engineering design as well as state of the art information technologies. Karnik adds, "I was fortunate to receive this kind of education in the Mechanical Engineering Department at Maryland."



Specifying the Search

Advanced Roadway Simulator Offers Vehicle Dynamics and Test Engineering Research Opportunities

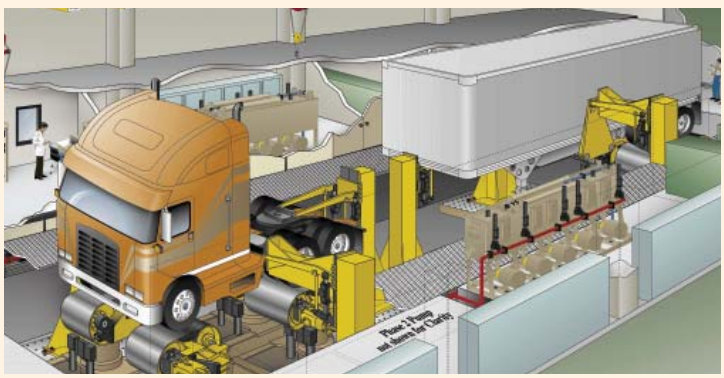
An agreement between the U.S. Army Aberdeen Test Center (ATC) and the Department of Mechanical Engineering will provide engineering students interested in vehicle dynamics, powertrain performance and vibration testing in a practical lab environment with access to a roadway simulator as early as this Fall.

Schultz

"The Roadway Simulator is the largest automotive simulator for vehicle dynamics in the world," says Dr. **Greg Schultz**, who obtained his Ph.D. from Maryland in 2002. "It will offer engineering students practical, real-life experience in automotive testing which is not available to engineering students at other universities." Schultz teaches the ENME 489V Vehicle Dynamics course, and is the advisor for the Formula SAE racing team and Mini Baja vehicle project, which are part of the ENME 408 course.

Dr. Schultz, ME alumnus and lecturer, has been working at the Aberdeen Proving Grounds in Maryland since 1988, and has been developing an advanced Roadway Simulator at the ATC since 1994. The simulator tests the performance of vehicles ranging from 5,000 pound, 2-axle light trucks to 80,000 pound tractor trailers. The simulator will be available for student research within the year, catering to mechanical, electrical and reliability engineering students interested in vehicle dynamics and test engineering. This opportunity will become part of the research efforts of the Maryland Center for Automotive Research (MCAR) at the University of Maryland.

Imagine the Roadway Simulator as system of high-tech treadmills, with each of the vehicle's wheels resting on a treadmill. The treadmills are set below floor level in a pit, supported by some of the largest hydraulic actuators on the East Coast. A vehicle is "driven" on the treadmills by a set of robotic actuators without the need for a driver or large test track. The vehicle's



The final phase of the Roadway Simulator will enable testing of tractor-trailer combination vehicles as heavy as forty tons

Vehicles tested on the Roadway Simulator ride on treadmill-like actuators that measure vertical, cornering and traction capabilities

performance is monitored by instrumentation that records how the vehicle handles on a simulated roadway. The vehicle is constrained at its center of gravity with a restraint bar, and is put through vertical, cornering and traction tests to determine how it handles in predetermined situations.

The simulator can be operated in two control modes – road load and road speed. The principle of its operation is based on satisfying Newton's second law of motion, or $F = ma$. The simulator reacts kinematically to forces exerted by the truck. In other words, the truck drives on the simulator instead of over a road.

One of the biggest benefits of the simulator is test repeatability, which can't always be achieved in a real road situation. Simulated wipe-outs can be observed over and over again. With a robotic arm as a driver, it is also a safer option than road testing. Vehicles can also be tested faster on the Roadway Simulator, which in the end saves money. Dr. Schultz is also working on the development of a vehicle durability simulator which should be available for testing in a few years.

Most of the vehicles currently tested on the Roadway Simulator are heavy, military-grade trucks, but the simulator can test typical passenger-sized vehicles as well. At present the simulator can test vehicles as heavy as thirty tons, such as trucks with tandem rear axles. With added features, at the next stage of development the simulator will be able to test tractor-trailer combination vehicles as heavy as 40 tons.

Ivan Tong, a 2002 graduate from the Mechanical Engineering Graduate program, is one of seven staff members who work with the simulator. "It has been exciting working on something that no one has done before," says Tong. When asked how working with the simulator would generally benefit a Maryland graduate, Tong responded, "The simulator offers hands-on experience and exposure to real automotive industry customers in addition to the army products."

Current mechanical engineering students involved with the simulator include graduate students Vincent Nguyen, who is analyzing tandem axle slip angle simulation; and Steve O'Hara, who is studying closed loop control of lane change steering tests. Ph.D. candidate Kevin Kefauver, a part-time employee at the roadway simulator, is studying the controls for aerodynamics loading and the capability for the final phase of the simulator's development.

Maryland to Host Inaugural Johannes M. Burgers Symposium for Fluid Dynamics


Sengers

On Thursday, November 18, 2004, the University of Marlyand Burgers Program for Fluid Dynamics will host the Inaugural Johannes M. Burgers Symposium for Fluid Dynamics. Speakers will include Gijs Ooms, who will give a presentation on the legacy of J.M. Burgers in The Netherlands, and Professor **Jan V. Sengers** who will speak about the J.M. Burgers Program at the University of Maryland. The keynote lecture will be given by Bruno Eckhardt, the First Visiting Burgers Professor at Maryland.


Wallace

Mechanical Engineering faculty directly involved in the development of the Burgers Program on campus include Professor **James Wallace** and Affiliate Professor of Mechanical Engineering and Distinguished University Professor Emeritus **Jan Sengers**.

Associate Professor of Mechanical Engineering Ken Kiger spent the fall of 2003 at the J.M. Burgers Center at the Technical University of Delft performing research for the development of improved Particle Image Velocimetry (PIV) techniques for in vivo flow measurement.

Inspired by the intellectual heritage of J.M. Burgers, the mission of the Burgers Program is to enhance the quality and international visibility of fluid dynamics research and educational programs at the University of Maryland with the help of an endowed Burgers Fund. Fluid dynamics in this context is viewed to include a broad range of dynamics, from nanoscales to geophysical scales, in simple and complex fluids.

Examples of Burgers Program activities:

- Providing an environment and precendence for knowledge exchange and networking within the fluid dynamics community on the University of Maryland Campus.
- Maintaining a close collaboration with the J.M. Burgers Centre in The Netherlands.
- Creating and building a Burgers Fund.

The Burgers Program is supported by faculty from the College of Computer, Mathematical and Physical Sciences and the A.J. Clark School of Engineering. For more information, please visit their website:
www.enme.umd.edu/burgers/

Mechanical Engineering Undergraduate Program Ranks 23rd

U.S. News & World Report's "America's Best Colleges 2005" ranks the A. James Clark School of Engineering Department of Mechanical Engineering undergraduate program as one of the strongest in the nation. The Mechanical Engineering undergraduate program ranked 23rd overall, and 14th among public schools, at schools whose highest degree is a doctorate The department ties with Yale University for this position, ranking just below Johns Hopkins University. The top three universities were the Massachusetts Inst. of Technology, University of Michigan–Ann Arbor, and Stanford University (CA), respectively.

The Clark School of Engineering undergraduate program as a whole ranked 25th, tied with the University of Southern California and the University of Washington. The Clark School of Engineering Aerospace undergraduate program ranked 10th in the same announcement, which was released on August 18, 2004.

"This is a tremendous vote of confidence by our colleagues around the country and shows that our dedication, investment, and "smarts" are making a difference," states Mechanical Engineering Chair Professor **Avram Bar-Cohen**.

In Memoriam


Neviaser

Daniel H. Neviaser of Madison, Wisconsin died peacefully on June 16, 2004 at the age of 81. Neviaser graduated in 1946 from the University of Maryland with a Bachelor of Science degree in mechanical engineering, having started his education at Maryland in 1943. Contributions in memory of Daniel Neviaser may be made to the Daniel H. Neviaser Entrepreneurship Fund, care of The University of Wisconsin Foundation, 1848 University Ave., Madison, WI 53705. The fund was established in Dan's honor by his son Bruce to provide scholarships and seed money grants for young entrepreneurs at the UW School of Business.

The Department of Mechanical Engineering extends its condolences to the family of **Joel Patrick Jorgenson** of Annapolis, Maryland. Jorgenson, age 31, died suddenly on June 5, 2004 from a heart illness. Joel graduated from the University of Maryland with a degree in Mechanical Engineering in the spring of 2004, and was active with the human powered submarine competition projects.

Women In Engineering Offers Engineering Summer Camps for Young Women

This summer the Women in Engineering (WIE) program in the A. James Clark School of Engineering offered several programs for young women interested in engineering as a possible career or major.

The Exploring Engineering program offered two one-week summer opportunities in July for rising junior and senior high school women who are considering engineering as a career or major. The two-week Research Internship in Science and Engineering (RISE) Program, also in July, targeted young women about to enter the engineering undergraduate program at Maryland, preparing them for campus life at College Park.

Exploring Engineering students construct and program their robots for an obstacle course

Both programs offered exposure to various disciplines within the math, science, and engineering fields. The students conducted hands-on activities, laboratory tours and experiments, informative workshops, team LEGO challenges, and seminars with professional engineers.

The Exploring Engineering program received primary funding from the Maryland Space Grant Consortium. RISE received funding from the National Science Foundation, the Office of the Provost and the A.J. Clark School of Engineering. The National Science Foundation grant request was co-written by ME faculty Linda Schmidt.

The Women in Engineering program is dedicated to the recruitment and retention of women engineering students at the pre-college, undergraduate, and graduate levels. For more information about WIE or the summer programs mentioned above, please contact the following coordinators:

Jenn Smist
Exploring Engineering Coordinator
http://www.eng.umd.edu/wie/prestudents/eumd.html
(301) 405-3282
jsmist@umd.edu

RISE Program
http://www.eng.umd.edu/wie/rise.html
(301) 405-2257

Dr. Paige Smith
Director, Women in Engineering Program
http://www.eng.umd.edu/wie/
(301) 405-3931
pesmith@umd.edu

Using ROBOLAB software and LEGO® Mindstorms™ kits, Exploring Engineering students built robots that integrate robotics with computer programming

The highlight of the week is a daily team LEGO Challenge that provides participants with exposure to engineering problem solving

photos by Jim Barrett

CALCE Offers Integrated Health Monitoring and Prognostics for Electronic Products and Systems

For the past five years the CALCE Electronic Products & Systems Center (ESPC) in the mechanical engineering department has been conducting research on health monitoring and prognostics for electronic systems. The purpose is to provide advance warning of failure as a means to enhance product sustainment, maintenance, reuse, and take-back.

CALCE's strategies include: the use of sensor technologies with physics-of-failure analysis to assess real-time life consumption monitoring of electronic systems; the use of diagnostic built-in-test (BIT) software-firmware systems to identify and locate faults that incorporate error detection and correction circuits and self-checking and self-verification circuits; the use of in-situ semiconductor prognostic monitors consisting of pre-calibrated cells (circuits) to predict remaining life due to semiconductor faults, defects, and failure mechanisms; and the use of software modules (data collection, simplification and damage accumulation and remaining life estimation) to support environment and usage data collection that enables health management.

CALCE has already conducted a remaining life assessment of the space shuttle remote manipulator system electronics for NASA. They are now conducting health and life assessment for the space shuttle rocket booster electronics hardware.

CALCE's methodologies have also been successfully demonstrated for an electronic board operating in an automotive underhood environment. In contrast to traditionally-used electronics reliability prediction methods, the CALCE methodology was shown to effectively predict remaining life.

Current research at the Center focuses on developing an integrated hardware-software solution that can enable real-time health and usage monitoring of electronic products in the application environment. Software takes environmental and operational sensor data as input, and processes it using data-reduction and cycle-counting algorithms to predict the remaining life of the product using appropriate stress-damage models.

CALCE's vision for the future is to develop micro-programmable modules that will enable health monitoring and prognostics of electronics. In addition, CALCE is investigating biological systems and health improvement monitoring methods to address conditions such as diabetes.

For further information about CALCE, please visit their homepage at *www.calce.umd.edu*

Reliability Program Offers Distance Education Courses

The Department of Mechanical Engineering Reliability Engineering Program delivered a distance education program on Reliability and Maintainability to Naval Air Systems Command (NAVAIR) personnel and contractors in early August. The course offering was developed in response to a request from ManTech Systems Engineering Corporation and NAVAIR under the Reliability and Maintainability Teaming Agreement between ManTech and the University of Maryland (UMD), Center for Risk and Reliability (CRR). It is the first time this distance education course was offered on-site for a specific audience. The initial offering and all course materials were electronically captured for video reproduction. The digital production of the course will be used for subsequent distance offerings of the course. NAVAIR students will be able to review the course either via the web or from a CD from any location.

The August session provided a graduate level Reliability and Maintainability Engineering course taught by Professor Emeritus Marvin Roush at Lexington Park, Maryland. The course was part of a three-course offering by the Reliability Engineering Program which includes Applied Reliability Engineering I and Applied Reliability Engineering II. The third graduate course will be designed specifically in consultation with NAVAIR to meet their internal reliability and maintainability educational needs. In the future, an additional two courses may be added to the series: Reliability Engineering Management and Maintenance Effectiveness Engineering. Both are existing available distance courses offered by the Reliability Engineering Program and of specific interest to NAVAIR's Reliability and Maintainability Team.

The goal of the Reliability Engineering distance education program is to offer each initial course at ManTech in an intensive two-week format, with the instructor, TA, and support staff on location.

Participating NAVAIR students applied to the University of Maryland's Graduate Certificate in Engineering program. "The course was all I expected and more from a professional standpoint," says Hugh Youngblood, who is pursuing his certification. Following their admission into the program the courses from the series may be used to obtain a Graduate Certificate in Reliability Engineering. All of these courses can later be used towards Master's or Doctoral degrees at the University.

For more information about the Reliability Program, please visit their homepage at *www.enre.umd.edu*

ME Major David Kerske Joins Engineers Without Borders Project in Thailand

Three engineering majors decided to do something practical and worthwhile after the Spring 2004 graduation. As members of the campus chapter of Engineers Without Borders, they joined other Maryland students (and students from other American universities) in June for their first project - building a wastewater treatment system for a health clinic in the rural Thai community of Samli.

Maryland students Michael Bronson, Amanda Gassman and David Kerske

David Kerske is a Bethesda native who attended Good Counsel High School in Wheaton, Maryland. A mechanical engineering major, David enjoyed learning a little bit more about himself and other cultures while working on the humanitarian project. "This experience will best help insure my success in the job market and in life by helping me to keep my priorities in perspective," he says. Kerske adds that the best time for students to get involved is their freshman year. "It's vital to the success of projects" like these, he says. Kerske was joined by engineering majors Michael Bronson and Amanda Gassman in Samli.

Spring 2004 Senior Design Award Winners

Two winning teams were announced for the Spring 2004 Senior Design Award, in recognition to the work of students enrolled in the ENME 472 undergrad course Senior Capstone Design. The course was taught by Lecturer Henry Haslach and Professor Edward Magrab, with the awards judged by the instructors and guest judges Emeritus Professor of Mechanical Engineering George Dieter, Associate Professor of Mechanical Engineering Linda Schmidt, and James A. Poulos, III, Executive Director of the UM Office of Technology Commercialization.

The course teaches vital mechanical engineering concepts such as integration of product development with the development process, design strategies, product architecture, design manufacturing, selection of materials, and design for assembly. Students were challenged to create a device with interactive subsystems from scratch. The project consisted of three phases: information gathering on the device, a conceptual design phase, and a detailed design plan. The final phase required a report detailing the device's dimensioning, engineering analysis, assembly and manufacturing plans, material choices, engineering drawings, cost and device originality.

One award was given for the design of a Volleyball Blocking Apparatus for Spiking Training, and the second award was granted for the design of a Portable Tailgate Lift.

Spring 2004 Mechanical Engineering Student Awards

The Department of Mechanical Engineering is pleased to announce the winners of the Spring 2004 Student Awards in recognition for academic achievement and outstanding contributions:

American Society of Mechanical Engineers Senior Award
Presented to the senior member who has contributed most to the student chapter
Jonathan Shumake

Pi Tau Sigma Outstanding Service Award
Presented to a student for outstanding service and contributions to the chapter
Mike Liszka

Pi Tau Sigma Memorial Award
Presented to the senior in mechanical engineering who has made the most outstanding contributions to the University
Raleigh Stewart

Pi Tau Sigma Outstanding Sophomore Award
Presented to the most outstanding sophomore in mechanical engineering on the basis of scholastic average
Brittany Blueitt & Derrick Treichler

Department of Mechanical Engineering Academic Achievement Award
Presented to the junior in mechanical engineering who has attained the highest overall academic average
Jessica Galie

Department of Mechanical Engineering Chair's Award
Presented for excellence in academics, outstanding service to the Department, or leadership in the Department
Aaron Johnson

The American Nuclear Society Student Chapter Award
Presented to the senior in the Nuclear Engineering Program in recognition of demonstrated leadership and contributions to the student chapter
Craig Douglas Gerardi

Engineering Cooperative Education Award
Presented to a student who has demonstrated scholastic excellence, exceptional work performance, and outstanding potential for a successful engineering career while participating in the co-op program
Ryan E. Schoonmaker

Kim A. Borsavage and Pamela J. Stone Student Award for Outstanding Service
Selin Mariadhas

Michael Armani and Eric Shields Awarded ASME FACT Scholarships

Mechanical Engineering undergrad student Michael Armani and Eric Shields were awarded an ASME Fuels & Combustion Technologies (FACT) Division Student Scholarship.

With the scholarships, the FACT Division of ASME intends to encourage and promote the involvement and participation of young engineers in the society and its technical divisions.

Michael Armani's accomplishments in the field of mechanical engineering revolve around gaining hands-on experience by doing research and working on many projects in his spare time. So far, he has made significant advances towards fully understanding combustion regimes in a Kerosene Spray Flame, which is a powerful facility enabling researchers to reduce pollutants. Furthermore, he has been working towards creating a non-invasive particle control system by means of a computational fluid dynamics model.

Michael has invested a lot of time and energy into learning basic MEMS fabrication techniques in the clean room. He also has been working on optimizing a two-stroke engine mounted to a mountain bike.

Eric Shields has participated in many aspects of mechanical engineering since declaring his major in the fall of 2001. He worked for several months on the construction phase of the University of Maryland solar house which competed with fourteen other universities in the U.S. Department of Energy Solar Decathalon in the fall of 2002, a competition created to engender a broader interest in clean energy and a better understanding of the latest solar technologies. In 2003 he began work with Professor A.K. Gupta in the field of combustion. Eric helped create two apparatuses; the first was designed to gain a better understanding of the effects of preheated air on combustion, and the second was a study on the gasification of cellulose. This gasification experiment sought to further the understanding of hydrogen, carbon monoxide, and carbon dioxide emissions from gasification to determine whether useful gases and energy can be harvested from waste materials. He is an active participant in Pi Tau Sigma, the Mechanical Engineering Honors society and will soon begin work with Professor Greg Jackson on fuel cell research for his graduate studies, having been accepted to the combined M.S./B.S. program. Eric's future plans include completing graduate research for his master's degree and entering into either a defense contracting company or one involved with energy management.

2003-2004 Distinguished Teaching Assistants Selected

Mechanical Engineering Teaching Assistants Christopher Douglas Henry and Philip Leland Knowles were selected by the Department of Mechanical Engineering as Distinguished Teaching Assistants for the 2003-2004 school year. The award recognizes the commitment, professionalism, and creativity given by Christopher and Philip, which enhances the academic experiences of their students.

The Center for Teaching Excellence and the Graduate School honored Mr. Henry and Mr. Knowles at the annual reception for Distinguished Teaching Assistants in May.

At the beginning of each spring semester, Distinguished Teaching Assistants are nominated by their departments. As this award is meant to honor the most outstanding teaching assistants within a department, only the top 10% of all teaching assistants within a are eligible for the award.

ME Undergrad Selin Mariadhas Awarded ASME Foundation Scholarship

Mariadhas

Mechanical Engineering undergraduate senior Selin S. Mariadhas has been awarded a 2004 American Society of Mechanical Engineers (ASME) Foundation Scholarship. Selin is the only recipient of the award from the University of Maryland College Park campus in 2004.

The scholarship fund was established in 1999 through the generous endowment of an anonymous donor. Only 15 such awards are granted by ASME each year, in the amount of $1,500 each.

Applicants must be ASME student members in good standing at the time of application, enrolled in an ABET accredited or substantially equivalent mechanical engineering, mechanical engineering technology or related baccalaureate program. The award recipients are selected on the basis of scholastic ability and potential contribution to the mechanical engineering profession.

Ms. Mariadhas has been researching under Professor Elisabeth Smela since April 2002, and is currently a summer intern in the Research and Development department of Proctor & Gamble. Selin was the recipient of the 2004 Clark School of Engineering Kim A. Borsavage and Pamela J. Stone Student Award for Outstanding Service and dedication to the college, and is actively involved in many student activities within the A.J. Clark School of Engineering, including Women in Engineering, Society of Women Engineers and the QUEST program. She recently received the Daily Record's Circle of Excellence scholarship in the amount of $3,000.

Figuring it All Out

By Ed Kracz

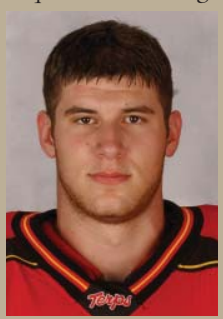
Reprinted with Permission From the May 3 issue of The Intelligencer

The University of Maryland's football playbook is no short story.

It spans about 700 pages. It has more X's and O's than a tic-tac-toe tournament. It has more verbiage than Rush Limbaugh's radio show.

Try walking into a huddle and thinking your way through this: Shop to far right, fake motion, fake hag 46 gap, naked boot left, 239. It's one of thousands of plays and formations tucked inside the playbook. And, to make things even more fun, everything is waggled into the huddle from the sideline in a series of hand and arm signals.

While inhaling that, try digesting thermodynamics, electrodynamics physics, differential equations, and any other course required in earning a mechanical engineering degree.



Hollenbach

It has taken Sam Hollenbach nearly two full years, but he finally looks ready to excuse himself from the table and get into a ballgame for the Terrapins.

Heading into Maryland's spring practice, he was the No. 2 quarterback behind redshirt freshman Joel Statham, who attempted 25 passes last season.

Coming out of spring practice, and on the heels of a strong performance in the Red-White Spring Game on April 24, Hollenbach has forced the Terps' coaching staff to declare the starting job open again.

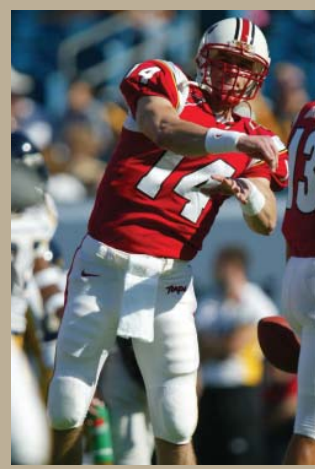
"I'd say prior to Saturday, Joel, if we were to play the next day or next week, Joel would've been the (starter)," said Charlie Taaffe, Maryland's offensive coordinator and quarterbacks coach. "But he fell off a bit and Sam gave a good account of himself."

Taaffe added that it would probably be the end of summer before a starter is anointed, and even then, a final decision may not be made until a couple weeks into the season.

Hollenbach, a redshirt sophomore after graduating from Pennridge in 2002, played the first half of the spring game with the second-team offense against the second-team defense. He began the second half on the first-team offense against the first-team defense and promptly orchestrated an 80-yard scoring drive, capped with a 24-yard TD pass. A second TD pass was dropped in the end zone. Statham, for his part, threw three interceptions.

Head coach Ralph Friedgen told the Baltimore Sun in an interview following the game, "I don't think Joel has the position sewed up. I saw the gap narrow some. We'll wait and see."

While the coaches wait and see, Hollenbach will continue doing the things that put him on the brink of becoming the starting quarterback for a school that has produced about a dozen NFL quarterbacks, including notables such as Boomer Esiason, Neil O'Donnell and Frank Reich.



Photos Courtesy of the University of Maryland

That means continuing to lift weights. Able to bench 325 pounds and squat 550 pounds, he is already one of the strongest quarterbacks to ever play at Maryland, Taaffe said.

That means keeping up with the heavy course load in his mechanical engineering curriculum. And that means, of course, keeping his nose in the playbook whenever and wherever possible.

"There are so many variations to (the playbook)," he said. "You could run so many different plays off so many different formations. ... It's confusing sometimes."

It most certainly isn't high school, where Hollenbach guided the Rams' Wing-T offense for his head coach and father, Jeff, for two years, completing 52 percent of his passes for 2,696 yards, 26 touchdowns and 19 interceptions.

Taaffe said when Hollenbach first arrived at Maryland, he would drop back to pass and freeze, not quite certain where to go with the ball or where his hot reads were on blitzes.

"I was definitely frustrated, especially my freshman year," said Hollenbach, who is 6-foot-5, 223 pounds. "It wasn't something like being in the weight room where you try harder and you get stronger. It was more a mental thing, something you have to put time in to. You have to allow yourself time to learn and not get frustrated."

Taaffe said he already has seen Hollenbach improve by leaps and bounds.

Much of that improvement can be traced to Hollenbach getting the hang of the offense, of slowly and steadily learning the nuances of, Shop to far right, fake motion, fake hag 46 gap, naked boot left, 239.

It also helped that he got more repetitions during spring practices and scrimmages because the Terps' top two quarterbacks from last year have moved on.

"I'm just trying to do the best I can on the field and leave it up to the coaches," Hollenbach said. "Joel's worked hard (and) I've worked hard. We both have good and bad days. I just want to do the best I can every day and be the best I can be."

Graduate Students Awarded ASHRAE Grant-in-Aid Funds

ME graduate students **Vytenis Benetis & Sourav Chowdhury** have received American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Grant-in-Aid monetary awards for the scholastic year to support their research in fields of interest to the heating, ventilating, air-conditioning, and refrigerating (HVAC&R) industry.

The ASHRAE Graduate Student Grant-in-Aid Award Program provides research funds to full-time graduate students in support of the development of innovative ASHRAE-related technologies. It is awarded once each year for use in the following academic year. Normally 10 to 25 grants are made each year. Competition is open to both students in the U.S. and abroad. The department congratulates Benetis and Chowdhury for their outstanding achievement.

Their advisor Professor **Michael Ohadi** adds, "Our laboratory has been very successful in receiving these awards. During each of the past ten years at least one of our students received an ASHRAE Grant-in-Aid award."

ME Student Juan Mendieta Awarded GE Foundation Scholarship

Mechanical Engineering undergraduate student **Juan Mendieta** was selected by the University of Maryland as a GE Foundation Scholar. The scholarship recognizes Juan's high achievements and potential. The award is also granted to 49 other outstanding scholars in 28 of the nation's universities.

The GE Foundation Scholars program supports scholarships at selected universities and through selected organizations for students chosen by those universities and organizations who are from under-represented or disadvantaged backgrounds.

alumni LETTERS

Memories from 1950

"*Thank you for sending me an issue of your newsletter. It appears that much has changed since I was an engineering student for the period of 1946 through 1950. I actually completed my studies in December 1950, although commencement exercises were held at the end of January 1951. However, when I graduated, S.S. Steinberg was Dean of the College of Engineering. My senior year classes were held in the then relatively new Glenn L. Martin building on University Lane. The Wind Tunnel was also relatively new. I remember that the buildings were constructed under a well-publicized funding grant from The Martin Co.*"

Seymour Schwartz
Fairfield, PA

Editor's Note: The Engineering Building was constructed in 1950. Monuments honoring the 100th anniversary of the engineering program and the campus chapter of Tau Beta Pi, the national engineering honors society, grace the outside of the building. In 2005, the Clark School will also occupy the Jeong H. Kim Engineering Building, currently under construction on the site of parking lot G3.

Let Us Hear You ROAR!

WE ARE ALWAYS EAGER TO HEAR HOW YOU ARE DOING! The department is eager to hear about alumni stories, accomplishments and updates.

Please share your news and views with Jim Barrett, Marketing and Communications Coordinator by e-mail at *jcb@umd.edu*, or by phone at (301) 405-2097. You can also send a letter to the following mailing address:

Jim Barrett
Marketing and Communications Coordinator
Department of Mechanical Engineering
A.J. Clark School of Engineering
2181M Glenn L. Martin Hall
University of Maryland, College Park 20742

Metrics is published twice a year for alumni and friends of the Department of Mechanical Engineering at the A. James Clark School of Engineering.

Your alumni news and comments are welcome. Please send them to: Editor, Department of Mechanical Engineering, 2181 Glenn L. Martin Hall, College Park, MD, 20742-3035.

Phone: 301.405.2410
Fax: 301.314.9477

Visit our Web site at
www.enme.umd.edu

Department Chair:
Dr. Avram Bar-Cohen
Editor: Jim Barrett

upcoming EVENTS

CALCE EPSC Six Sigma Workshop
October 18, 2004
Greenbelt Marriott
Contact Dr. Diganta Das
digudas@calce.umd.edu

West Coast Mechanical Engineering Alumni Event
Wednesday, November 17, 2004
Hilton Anaheim
Anaheim, California
For more information, e-mail: *jcb@umd.edu*

Inaugural Johannes M. Burgers Symposium for Fluid Dynamics.
November 18, 2004
Washington, DC
For more information, visit *www.enme.umd.edu/burgers/*

A. JAMES CLARK
SCHOOL OF ENGINEERING

Department of Mechanical Engineering
University of Maryland
College Park, MD 20742-3035

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