

AME Highlights

Department of Aerospace and Mechanical Engineering



Summer 2005

Dear AME Alum,

Once again, as the new academic year begins, I would like to provide you with some of the **Highlights** of the AME department. I hope that you enjoy this newsletter and that it is helpful in keeping you apprised of some of the activities in AME. I know many of you are "connected" on the internet, and thus I encourage you to periodically visit the Notre Dame, College of Engineering and AME web sites as they provide additional information and update activities. As you well know, our over 5000 AME alums are our best "marketing and public relations" department and we hope that by keeping you informed of our aspirations and activities you can assist us in the ongoing development of our programs and also let your friends and colleagues know that many exciting things are happening in aerospace and mechanical engineering at Notre Dame.

As with our professions, hallmarks of the activities in the Department are ongoing change and the quest for continuous growth and improvement. To those ends, this year we will be adding four new faculty members and a new building, along with extending the scope of both our research and educational programs. We have recently completed our comprehensive assessment self-study in preparation for a formal visit by the Accreditation Board for Engineering and Technology (ABET) this fall, and continue to work to develop programs that focus on leadership in the profession and excellence in education and scholarship.

I want to mention that often **Highlights** focuses on the students and faculty in the department, but much of our success is the result of the professional and untiring efforts of our administrative and technical staff, whose contributions often go unheralded. For every activity in the department, including **Highlights**, there are numerous dedicated individuals working to contribute to our collective efforts.

Lastly, if you are on campus and want to stop by the AME office in Fitzpatrick or the Hessert Laboratory, you are always welcome. If you can't visit, I urge you to share your experiences, insights and concerns with us via email. It is always nice to hear from you. In parting, on behalf of the current students, faculty and staff of the Department of Aerospace and Mechanical Engineering, I wish you the best in all your personal and professional endeavors and I thank you for your ongoing interest and support of the Department and the University. May Our Lady, patroness of Notre Dame, watch over you and pray for you.

Sincerely,

Stephen Batill, Professor and Chair

2005 College of Engineering Honor Award Mr. Richard Stanley



Dr. Stephen Batill, Richard Stanley, Dean Frank Incropera

Richard L. Stanley (BSME '80) was the 2005 College of Engineering Honor Award recipient from the AME Department. After graduation, Rick joined GE Aircraft Engines and since that time has held positions of increasing responsibility. Rick is now the Vice President and General Manager for the GE Aircraft Engines Engineering Division. He also holds an M.S. degree from the University of Cincinnati in Engineering Science and has an extensive list of other professional and service related contributions during his career, including serving as the engineering manager for the company's Structures Center of Excellence and the Combustion & Configuration Center of Excellence. Rick is a professional engineer, holder of five U.S. patents and has served as GEAE campus coordinator and university recruiter for Notre Dame. He has supported a number of other GE/ND interactions and through his leadership and outstanding technical skills, Rick exemplifies the Notre Dame engineer.

ASME DESIGN COMPETITION



During the Fall 2004 semester, two design teams in AME 470, ME Senior Design Project, worked to develop entries for the Regional Design Contest sponsored by ASME. The challenge presented by ASME was to develop remotely controlled devices that could ascend and descend stairs while carrying a payload with potential applications to bulk material handling at a construction site. Two ND teams participated with 13 others from regional universities at the competition held at the University of Illinois in March. As the competition took place during their senior year spring break, the participation of the individual team representatives was even more significant. Team Burja, represented by **William Sirokman (BSME, '05)** received 3rd place and Team ACME, represented by **Thomas Lauducci (BSME '05)**, 4th place. Considering the timing and nature of the

competition, this was outstanding. Details of all the projects and some contest "videos" can be accessed on the AME Department webpage (ame.nd.edu)

INDUSTRY SUPPORTERS

Each year AME receives financial support from both individual and corporate donors. These funds are used to assist in the mission of the Department in many important ways. The University is well-known for the generous support of its alumni, but it is particularly helpful when organizations, with the encouragement of our alums, contribute either by participation in events such as Industry Day, by supporting intern programs or through grants or gifts. This year we wish to recognize those organizations that have provided direct support to AME; they include DaimlerChrysler, Rockwell Automation, Honeywell, Procter & Gamble, Materials Science Corp., and CTB, Inc.

AME Industry Advisory Group

The AME Industry Advisory Group held its spring meeting in May. The focus of the meeting was an industry assessment of the recently completed ABET accreditation self-study. The participants in the group were **Jose Eguiguren**(Ricardo, Inc.), **John Kutney**(BSAE '73) (GE AircraftEngines), **Thomas A. Mastaler** (DeWalt Industrial Tool Company), **Robert Chou**(BSEE '61) (CompuTime Technology), **Paul Bevilaqua**(BSAE '67) (Lockheed-Martin Company), and **Todd Taylor**(BSAE '87) (EDS). Two new members of the Advisory Group who participated this year were **Dale Swarts** (Zimmer Corp.) and **Stephen Bartoli**(BSME '82) (DaimlerChrysler Corp.). This group's contribution to the Department has grown each year, and their time and the support of their organizations is greatly appreciated.

AME FACULTY UPDATES

After 40 years of outstanding service as a scholar, educator and administrator, **Thomas J. Mueller** was promoted to Professor Emeritus this spring. Tom's "retirement" luncheon was attended by family, friends and many distinguished University colleagues. Tom intends to remain active in various aspects of his research and will continue to contribute in valuable ways to the department.

John Koenigshof, Assistant Professional Specialist, retired this summer after 5 years of University service. John was responsible for the engineering support of many of the AME research and instructional labs in Fitzpatrick and Cushing Halls. John's ND service was the icing on the cake after a long career as a mechanical engineer and his contributions were valued.

Four new faculty members will be joining AME this year:

Katherine Liu, who recently received her PhD from Carnegie Mellon University and works in the area of micro and nano-scale heat transfer, begins teaching this fall.

Diane Wagner, received her PhD at the U. of California, Berkeley and is now completing a post-doctoral fellowship at Stanford and will be arriving in November. She will be working and teaching in the area of biomaterials and biomedical engineering.

Vikas Tomar is completing his Ph.D. at Georgia Tech in the area of computational modeling of advanced material systems and will join the faculty in January.

Meng Wang, who is a Senior Research Scientist at the Center for Turbulence Research at Stanford, will be an Associate Professor beginning in January. Meng specializes in computational fluid dynamics.

The Department is excited about the capabilities each will add and *Highlights* will focus on their activities in future issues.



Thomas Mueller, Tim O'Meara, Robert Nelson



Design and Control of Agile Legged Robots

With increased focus on the development of legged robots such as humanoids, bipeds, quadrupeds, and hexapods, the need to improve their mobility has become an issue receiving great attention. Most work in this area addresses the generation of periodic motions, referred to as gaits, as a means of producing stable locomotion. However, these systems typically move fairly slowly and none of them has been able to produce high-speed, agile motions which include quick direction changes at high speed as well as abrupt stops and starts. The agile motion issue is one of the key research areas being studied in the Robotics and Dynamics Systems Laboratory headed by **Assistant Professor Alan Bowling**. The approach towards addressing the agility issue has three aspects:

Performance Analysis: The key to addressing the agility problem lies in examining the robot's ability to generate the accelerations required to change its velocity vector, a requirement for making quick direction changes while moving.



Thus the goal of the performance analysis is to quantify, or analytically describe, how well a legged system can utilize ground contact forces, in conjunction with its actuators, to accelerate itself. Lab members who have worked on this aspect of the project include **Dr. Chang Hwan Kim, Xiaolei Yin (MSME '04),**

Pedro Berges (Ph.D.candidate), and **Jeremy Newkirk (Ph.D.candidate).**

Design:The performance analysis is used as the basis for development of methodologies for the design of legged systems more capable of agile locomotion. This involves the development of analytical design tools as well as the use of optimization techniques to improve the design of legged systems with respect to acceleration capability, or agility. A lot of work has been done in this area and new legged robot designs are currently under development. Lab members who have worked on this aspect of the project include **Michael Hatton (BSME '03), Yanto Go (MSME '04), Timothy Kish (BSAE'04), Adam Whelan (BSME'04), Stefan Campbell (BSME'05), Timothy Culbertson (BSME'05), David Millar (BSME'05), William Bezouska (ME '06), John Chris Danesi (ME '06), Anton Radman (EE '06), Berges and Newkirk.**

Control: The final aspect of this project involves developing a motion controller which can generate agile motions for a legged robot. The effort involves using aspects of the performance analysis to determine underlying fundamental principles of legged locomotion which can form the basis for an agile motion controller. **Sean Harmeyer (Ph.D.'07)** is currently working on this project. The project is supported by a grant from the National Science Foundation and the results of this work have been presented at several international conferences. For more information visit the laboratory web site at <http://www.nd.edu/~loco>.

Student and Faculty Awards and Honors

Professor **Hafiz Atassi** presented the talk "Fluid-Structure Interaction and Acoustics" as the ASME Noise Control and Acoustics Division 2004 Rayleigh Lecturer. The Rayleigh Lecture is given at the Society's International Mechanics Engineering Congress and Exposition (IMECE) by invitation. Lecturers are selected amongst those who have made pioneering contributions to the sciences and applications of noise control and acoustics.

Professors **Patrick F. Dunn** and **Thomas C. Corke** were elected to the rank of Fellows of the ASME. The Fellow Grade recognizes significant engineering achievements and contributions to the engineering profession.

The Editorial Board of the Journal of Biomechanics has invited **Dr. Glen Niebur** to serve as a member of the Board of Editorial Consultants.

Michaela Logue (PhD Candidate, Advisor- **Hafiz Atassi**) received a National Defense Science and Engineering Grant Fellowship (NDSEG). The NDSEG fellowship program is a highly competitive, distinguished three-year fellowship that provides stipend and tuition support.

Yifei Dai (PhD candidate, Advisor **Glen Niebur**) won an Honorable Mention award for research presented at the 2005 ASME Summer Bioengineering Conference related to computational modeling of lumbar inter-body spinal fusions.

Xiang Wang (PhD '05) received a Young Investigator Award from the Chinese Hard Tissue Society for a paper related to the bone damage accumulation.

Michael Lisman (BSAE, '05) received Senior Thesis Distinction at graduation for his senior thesis entitled, "*On Reciprocity Measurements in an Annular Duct*" (Advisor **Scott Morris**). Mike is the first AME graduate to formally complete the College's senior thesis requirement.

Robert Woods (ME '06) was awarded a football scholarship for his senior year after being a walk-on player in the past. Woods has a 3.95 GPA in the Mechanical Engineering program and was awarded the scholarship by Coach Weis for representing "everything Notre Dame stands for on and off the field."

Rockwell Automation Design Award was presented this year to **Stefan Campbell (BSME '05)** and **William Sirokman (BSME '05)** for their outstanding performance in the capstone mechanical engineering design course. **Nicholas Werner (BSAE '05)** received the Vincent P. Goddard Award for the outstanding performance in the aerospace design course.



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Special Publication

Thomas Mueller and **Robert Nelson(BSAE '64)** completed a monograph entitled *Aeronautics to Aerospace at the University of Notre Dame*. Limited printed supplies are available upon request and efforts are underway to provide an electronic version on the Department's web site - keep an eye out for it as it is an enjoyable summary of over 100 years of activities at Notre Dame.

BIOENGINEERING IN AME

Ground was broken this spring for a new research facility that will house the College's laboratories in the area of bioengineering. The AME Bioengineering Group, which is the largest in the College, will be the main beneficiaries of this new facility. Professors **Tim Ovaert**, **Steve Schmid**, **Glen Niebur**, **Ryan Roeder**, and **Diane Wagner** will establish their research activities in this new building and it will provide an important step forward in the development of the AME and Notre Dame initiatives in the area of bioengineering and biomaterials. The facility is located immediately adjacent to the Hessert Laboratory so now AME will find itself in four different buildings - more details in next year's *Highlights!*

ALUMNI NEWS

Dr. Paul Bevilaqua(BSAE '67) was elected to the National Academy in Engineering for his theoretical contributions, practical innovations and increased operational utility in vertical takeoff and landing aircraft. Election to the academy is one of the highest professional distinctions accorded an engineer.

Dr. Alfred Morrison(BSAE '68, MS '70, PhD'72) was elected to the rank of Fellow in the American Institute of Aeronautics and Astronautics. Fred's son **James Morrison(BSME '05)** decided to pursue his studies on the "other side" of the AME Department.

Lt. General Trey Obering III(BSAE '73) is the Director of the Missile Defense Agency in the Office of the Secretary of Defense. Trey's son **Henry** is a member of AE Class of 2006.

Michael Doherty(BSME '80) was presented with a Silver Snoopy Award from NASA Space Flight Awareness Program as Project Manager for a series of microgravity experiments on the International Space Station.

Dr. Fred Haan(MS '95, PhD '00) is currently an Assistant Professor in the Department of Aerospace Engineering at Iowa State University and Fred's work in the area of wind engineering, particularly related to tornados, was recently highlighted on the NBC national evening news.

Dr. Ken Visser(M.S. '88, PhD '91) was promoted to Associate Professor in the Mechanical and Aeronautical Engineering Department at Clarkson University, and those in the academy know that is a key promotion in any professor's career.

Casey Koreki(BSME '03) currently a PhD student at the University of Vermont, received a First Place Award in the student paper competition at the ASME Bioengineering Conference in Vail, CO this summer.

Robert S. Kraemer(BSAE '50) spent a career in space exploration capped by serving as Director of NASA's Planetary Exploration Program. Bob is the author of *Beyond the Moon: Golden Age of Planetary Exploration 1971-1978*, a part of the Smithsonian History of Aviation and Spaceflight Series, and sent us copies of this interesting book that were used as academic awards for some of our 2005 graduates.