

UNIVERSITY *of* DAYTON

# School of Engineering Scholarship

2007—2008



# Faculty Scholarship

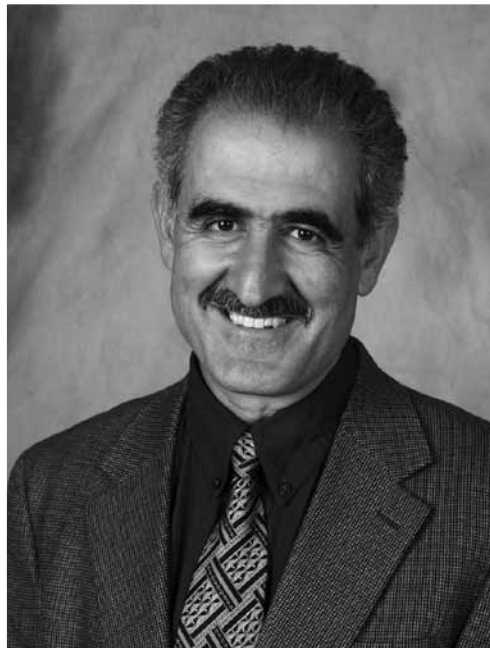
*The School of Engineering faculty is nationally and internationally renowned for scholarly contributions. This brochure represents the broad scope of our scholarship as well as demonstrates the quality and quantity of our research.*

Our research focus areas include advanced manufacturing, combustion and fuels; computational design and optimization; electro-optical devices and systems; renewable energy, energy efficiency and environmental systems; bioengineering; nanophotonics; design and processing of advanced composite and nanomaterials; advanced digital systems; and signal and image processing.

Since the problems of the world do not recognize boundaries, we can best advance through focused initiatives that encourage collaboration across disciplines. Our reputation will deservedly be enhanced by a steady increase in the visibility of our contributions through refereed professional

publications, active participation in respected conferences, and service on committees, panels, and working parties of national and international significance.

We continue to work toward advancing the frontiers of knowledge through collaboration, which is a key source of inspiration, stimulation, and personal satisfaction for our faculty. Advances made by our research teams provide rich and varied employment opportunities for our graduate students. Our faculty members' research successes create an exciting environment of discovery that energizes our



community, informs our teaching at all levels, and strengthens our reputation. Through innovative research and an imaginative spirit, the School of Engineering tackles problems straight from industry and captures the essence of invention rooted in Dayton's history. It is with pride that we present in this issue a glimpse of our research which contributes to improving the human condition, addresses critical global needs and stimulates economic growth.

Tony E. Saliba  
Dean, School of Engineering

# University of Dayton School of Engineering

## SCHOLARSHIP 2007–2008

### Chemical and Materials Engineering

#### BOOK CHAPTERS

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## ROBERT J. WILKENS

DIRECTOR, CHEMICAL ENGINEERING; DIRECTOR, BIOENGINEERING GRADUATE PROGRAM;  
ASSOCIATE PROFESSOR, CHEMICAL AND MATERIALS ENGINEERING

# Fluid Mechanics: Chemical Engineering and Bioengineering

**R**obert Wilkens, known for his research in fluid dynamics, accepted a position with Shell Westhollow Research Center in Houston, Texas after his Ph.D. For over two years, he designed many of the fluid transport systems for Shell's off-shore wells. As evidence, a gulf shore map hangs on his office wall revealing multiple red and green lines that represent subsea oil and gas transport lines stretching from the Gulf of Mexico to the U.S. coastline.

After Shell, Wilkens returned to the University of Dayton (UD) for the research possibilities and for the opportunity to teach. He says, "This region offers a tremendous support system for researchers enabling creativity and collaboration between UD, the University of Dayton Research Institute (UDRI), and Wright Patterson Air Force Base (WPAFB)."

One of the support systems is UD's Wohlleben Hall Unit Operations Laboratory; with its three-story design, Wilkens studies vertical flow within a state-of-the-art laboratory. Wilkens led the upgrade of the Unit Operations Laboratory, which is currently rated among the best undergraduate laboratories in the country.

Wilkens researches vertical flow drag reduction in order to extend the life of previously capped oil wells. Inefficiency closed many low pressure wells. Now Wilkens works toward finding a way to open the wells and provide a higher level of completion because he says, "high-pressure, subsea reservoirs still exist." By drilling to the high pressure zones, adding counterbalances, and equalizing pressure, the life of the wells could be extended.

For the past 11 years, Wilkens has served the Department of Chemical and Materials Engineering in many ways. In addition to his current responsibilities as director of chemical engineering, he was recently appointed director of the M.S. bioengineering graduate program. The program's multidisciplinary format was developed by Wilkens and

others through collaborative teaching and research between departments within the School of Engineering, the College of Arts and Sciences, and UDRI.

Through other collaborative efforts with WPAFB, Wilkens researches nanofluids, which are being considered for improved coolant conductivity, and the flow and heat transfer of coolants within the aircraft.

He also serves as consultant to mixing company ReyNo Inc., Shell Oil Company, and NCR, among others, while conducting research for several companies, including the Materials Directorate at WPAFB.

Dayton's research network has also provided Wilkens with a new interest—the blood flow system. He works with a multidisciplinary team, which includes UD's Carissa Krane, biology, and Margaret Pinnell, mechanical engineering, investigating surgical applications and blood flow during surgery.

Stemming from the research, the team developed a new graduate course, which will be team-taught by Wilkens and Krane—*CME 595, Transport Phenomena in Biological Systems*. The class includes a multidisciplinary laboratory component. Students will study histology stains, in the biology laboratory; pumping saline to measure pressure drop in the chemical engineering fluid mechanics laboratory; and measuring the strength of the structural vessels in the materials' laboratory.

Wilkens believes in the collaborative and networking benefits of professional organizations, such as Sigma Xi. As past president of Sigma Xi, a non-profit membership society of nearly 60,000 scientists and engineers, Wilkens endorses the organization and its mission: "To enhance the health of the research enterprise, foster integrity in science and engineering, and promote the public's understanding of science for the purpose of improving the human condition."



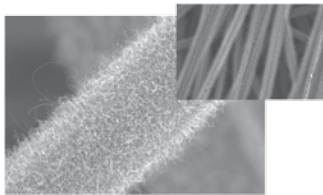
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# Carbon: Multi-scale and Multi-functional

**K**halid Lafdi wrote in the *Handbook of Composites* that carbon fibers exhibit truly outstanding properties...their strength competes with the strongest steels; they can have stiffness greater than any metal, ceramic or polymer; and they can exhibit thermal and electrical conductivities that greatly exceed those of competing materials.

Fuzzy fibers—specifically, carbon nanotube fuzzy fibers—first captured Lafdi’s interest seven years ago. CNT fuzzy fibers are light, conductive and dissipate heat. They are only 10 nanometers in diameter, but their added properties and multi-functionality provide endless possibilities for structural electronic and medical applications. At the University of Dayton (UD), the scale-up of carbon nanotube fibers is continuous; and Lafdi believes that UD is the only university in the world that continuously researches the scale-up and multi-functionality of carbon nanotube fibers.

- Fuzzy Fibers**
- Increase Z properties
  - Tailored Fiber interface



Lafdi says, “We are moving into a carbon civilization... carbon technology has matured.” He analyzes carbon uses that are multi-scale and multi-functional from carbon foams and fibers to carbon nanomaterials and nanotubes. Carbon materials are researched for uses from heat-resistant components on space shuttles to scaffolds and biomaterial implants for orthopedics. The carbon challenge now is how to scale-up manufacturing, keep costs down, and sustain applications in order to benefit all.

Lafdi, in collaboration with Brian Rice, composites’ group leader for the University of Dayton Research Institute (UDRI), received a \$2.1 million grant from the Ohio Third Frontier. The grant enables their team to meet today’s challenge and research commercial development and application of carbon materials.

Commercial industry now manufactures and supplies cost-effective products such as helmets and vests for firefighters, blood sugar sensors for the biomedical industry,

and multi-functional applications for the aeronautical industry.

Lafdi broke his ankle a few years ago, which made him look at carbon applications for the human body. The uncomfortable metal plate in his ankle was a daily reminder that a better material could be developed, a carbon-based application that would be “biocompatible with the human body.” Because of FDA regulations, the biocompatible, carbon-based application is not yet ready for mass production. But, Lafdi believes that carbon-based plates and scaffolding for new bone cells are in the future for orthopedics.



Lafdi received his Ph.D. in physics and chemical engineering and his Sc.D. in material physics in France. To date, he has published over 140 articles on carbon science and technology in refereed journals. His patents include *Method of Growing Carbon Nanotubes and Nanofibers and Whiskers on Carbon Substrates* and *Method of Making Nanofilament Based Carbon-Carbon Composites for Use as Brake Materials*. As Lafdi says, “It is all about carbon.”

At UD’s Shroyer Park Research Laboratory, Lafdi conducts small-scale experiments using equipment “built by UD engineering students.” Taking experiments to the next level, he uses the 200,000 square foot National Composite Center’s large-scale, real-world equipment.

As a UD professor, Lafdi sets the bar high for his students. As he raises his arm and says, “If you set the bar high, students will reach for it; if you set the bar low, the students will only go to that level.”

He encourages French and American students to become involved in UD’s exchange program and to think globally. Eight graduate students work with him in his laboratory, and usually two to four of them are French students through the exchange program.

He believes students should explore all aspects of engineering and “think and move in unknown and uncomfortable zones and—create.” They should be able to take a project from creative inception to final production application. They should know that their work has meaning.

Lafdi follows his advice—theory to resolution. One day, he would like to say to his children, “Look what I have created.” “It is time,” he says, “to give back to humanity.”

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## PRESENTATIONS

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Barklay, C.D., J.Y. Howe, and **D.P. Kramer**. 2008. Investigation of stress rupture tested neutron irradiated tantalum alloys. *26<sup>th</sup> Proceeding of Space Technology and Applications International Forum, American Institute of Physics Conference*, Proceedings 969: 439-445, February, in Albuquerque, New Mexico.

**Kramer, D.P.**, D. McClelland, T. Kissner, A. Conrad, F. Beafore, and T. Darcy. 2008. Accelerated testing of a reformed methanol fuel cell (RMFC). *University Clean Energy Alliance of Ohio*, April 24, in Columbus, Ohio.

**Kramer, D.P.**, S. Hilton, S.M. Goodrich, and C.D. Barklay. 2008. Joining of SiC/SiC ceramic matrix composite to Inconel 718. Proceedings of the *2008 National Space & Missile Materials Symposium*, June, in Las Vegas, Nevada.

**Kramer, D.P.** 2008. Fuel cells. Presented at the Engineers Club, May 9, in Dayton, Ohio.

Janz, E.E., J.B. Fasano, and **K. J. Myers**. 2008. Improving on a good thing: The Chemineer XE-3 high-efficiency impeller. Presented at the *AICHE Annual Meeting*, paper 434b, November 16-21, in Philadelphia, Pennsylvania.

**Sandhu, S.S.**, J.P. Fellner, and G.W. Brutchten. 2007. Lithium/air battery model. Proceedings of the *AICHE Spring National Meeting*. Session 12, recent advances in fuel cell and battery technology, April 22-27, in Houston, Texas.

**Sandhu, S.S.**, and J.P. Fellner. 2008. Mathematical formulation for the performance analysis of a lithium-ion

insertion cell. Presented at the technical review meeting on *Lithium-ion Insertion Cells/Batteries*, the University of Dayton, February 7, in Dayton, Ohio.

**Sandhu, S.S.**, G.W. Brutchten, and J.P. Fellner. 2008. Mathematical formulation for the performance analysis of a lithium-ion insertion cell. *15<sup>th</sup> International Conference on Electrical and Electronic Products*, January 14-15, in White Sulphur Springs, West Virginia.

**Sandhu, S.S.**, G.W. Brutchten, and J.P. Fellner. 2008. Mathematical formulation for the design/performance analysis of a lithium-ion insertion cell. *AICHE Spring National Meeting CD-ROM Proceedings*, Paper# 207b, April 6-10, in New Orleans, Louisiana.

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**Voevodin, A.A.**, B.S. Phillips, C. Muratore, J.J. Hu. 2007. Wear resistant coatings for aerospace and military aircraft. *31st International Conference & Exposition on Advanced Ceramics and Composites*, January 21-26, in Daytona Beach, Florida.

**Voevodin, A.A.** 2007. Adaptive nanocomposite tribological coatings for aerospace applications. Seminar at University of Illinois, March 1, in Urbana-Champaign, Illinois.

**Voevodin, A.A.**, S.T. Patton, J.J. Naninaparampil, and J.H. Sanders. 2007. A nanotechnology for tribology of MEMS contacts. *2<sup>nd</sup> International Conference on Micro and Nano-Tribology*, March 14-16, in Vienna, Austria.

Hager, C., J. Sanders, S. Sharma, and **A.A. Voevodin**. 2007. Gross slip fretting wear of CrCN, TiAlN, Ni, and CuNiIn coatings on Ti6Al4V interfaces. *16<sup>th</sup> International Conference on Wear of Materials*, April 15-19, in Montreal, Quebec, Canada.

Muratore, C., J.J. Hu, J.G. Jones, and **A.A. Voevodin**. 2007. Recent developments in nanocomposite tribological coatings. *18<sup>th</sup> Annual Advanced Coatings and Surface*



*Engineering Workshop*, April 19-21, in Golden, Colorado.

Hu, J.J., J. Zabinski, J.E. Bultman, J.H. Sanders, and **A.A. Voevodin**.

2007. Synthesis and tribological characterization of Mo-(W)-S-Se-(Te) composite coatings by pulsed laser deposition. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Jones, J.G., C. Muratore, A.R. Waite, and **A.A. Voevodin**. 2007. Plasma diagnostics of laser ablation, magnetron sputtering, and cathodic arc using in-situ optical spectroscopy. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Howe, B., C. Muratore, **A.A. Voevodin**, and I. Petrov. 2007. Growth and physical properties of epitaxial and nanocrystalline  $Hf_{1-x}Al_xN$  layers. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Baker, C.C., K.J. Wahl, and **A.A. Voevodin**. 2007. Friction and wear properties of  $A1_2O_3/MoS_2/DLC$  nanocomposite coatings. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Patton, S.T., S. Diamante, R. Vaia, and **A.A. Voevodin**. 2007. Lubrication of RF MEMS switches using nanoparticle fluids. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Phillips, B.S., J. Nainaparampil, K.C. Eapen, **A.A. Voevodin**, and J.H. Sanders. 2007. Ionic liquids as lubricants for macro and micro scale devices. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Wheeler, R., J. Hu, **A.A. Voevodin**, and J. Zabinski. 2007. Novel in-situ characterization of micro-scale wear behavior. *International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Muratore, C., J.J. Hu, J.G. Jones, and **A.A. Voevodin**. 2007. Nanocomposite coatings demonstrating adaptive over multiple thermal cycles from 25-700 °C.

*International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Gorokhovskiy, V.I., C. Hunter, Y.H. Cheng, C. Bowman R.J. Smith, J.J.

Hu, W. Priyantha, **A.A. Voevodin**, Y. Kang, C. Muratore, and H. Chen. 2007. Characterization of DLC coatings deposited by large area filtered arc deposition (LAFAD™) technique.

*International Conference on Metallurgical Coatings and Thin Films*, April 23-27, in San Diego, California.

Patton, S.T., **A.A. Voevodin**, R. Vaia, R. MacCuspie, R. Naik, and J. Slocik. 2007. Nanoparticle liquids for lubrication of RF MEMS switches. *Nanomaterials for Defense Applications*, April 23-26, in San Diego, California.

Kang, Y.S., S.K. Sharma, J.H. Sanders, and **A.A. Voevodin**. 2007. Modeling of nanocomposite tribological coatings for space applications. *Society of Tribologists and Lubrication Engineers*, May 6-10, in Pennsylvania.

Nainaparampil, J.J., K.C. Eapen, J.H. Sanders, and **A.A. Voevodin**. 2007. Pyridine based ionic liquids as lubricants for MEMS devices: A fundamental analysis and device based evaluation. *Society of Tribologists and Lubrication Engineers*, May 6-10, in Pennsylvania.

Hu, J.J., R.A. Wheeler, P. Shade, A. Shively, R.B. Kerns, D.H. Sergison, J.E. Bultman, J.S. Zabinski, J.H. Sanders, C. Muratore, and **A.A. Voevodin**. 2007. Tribological behavior of pulsed laser deposited Mo (W)-S-Se-Te composite thin films in dry and humid environments. *Society of Tribologists and Lubrication Engineers*, May 6-10, in Pennsylvania.

Muratore, C., J.J. Hu, J.G. Jones, and **A.A. Voevodin**. 2007. Adaptive tribological coatings for high temperature sliding in air. *Society of Tribologists and Lubrication Engineers*, May 6-10, in Pennsylvania.

Muratore, C., J.J. Hu, J.G. Jones, and **A.A. Voevodin**. 2007. Adaptive nanocomposite coatings designed to provide lubrication throughout a broad temperature range and over multiple thermal cycles. *French Vacuum Society 16<sup>th</sup> International Colloquium on Plasma Processes*, June 4-8, in Toulouse, France.

**Voevodin, A.A.**, J.G. Jones, C. Muratore, and A.R. Waite. 2007. Hybrid PVD processes and plasma diagnostic for nanostructured coating growth. *MS&T*, September 16-20, in Detroit, Michigan.

Waite, A.R., P.T. Murray, J.G. Jones, E. Shin, and **A.A. Voevodin**. 2007. Spectroscopic, spatial, and temporal investigation of Fe nanoparticle synthesis by through thin film ablation. *54<sup>th</sup> AVS Intern. Symposium*, October 14-19, in Seattle, Washington.

**Voevodin, A.A.**, C. Muratore, J.J. Hu, and J.G. Jones. 2007. Chameleon-like self-adaptive coatings. *International Symposium on Reactive Sputter Deposition*, December 6-7, in Leoben, Austria.

Gudorf, S., S.K. Sharma, and **A.A. Voevodin**. 2007. Sensitivity of RF sensors for bearing health monitoring. *Joint International STLE/ASME Conference*, October 21-25, in San Diego, California.

**Voevodin, A.A.**, C. Muratore, J.J. Hu, and R. Wheeler. 2008. Adaptive nanocomposite tribological materials and an in-situ FIB technique for TEM imaging of sliding contact interfaces (invited). *MRS Spring Meeting*, March 24-28, in San Francisco, California.

**Voevodin, A.A.**, C. Muratore, J.J. Hu, and J.G. Jones. 2008. Low friction nanocomposite coatings with environment adaptive, wear sensing, and corrosion protective functions. *International Conference on Functional Nanocoatings*, March 30-April 3, in Budapest, Hungary.

**Voevodin, A.A.** 2008. Nanocomposite coatings for aerospace applications. *Technical Seminar*, University of West Bohemia, April 4, in Plzen, Czech Republic.

Waite, A.R., J.G. Jones, C. Muratore, H. Jiang, J. Enlow, T.J. Bunning, and **A.A. Voevodin**. 2008. Biomimetic polymer-ceramic multi-functional nanocomposites. *International Conference on Metallurgical Coatings and Thin Films*, April 28-May 2, in San Diego, California.

Hu, J.J., J.E. Bultman, J.S. Zabinski, and **A.A. Voevodin**. 2008. Lubrication mechanism of PLD MoS<sub>2</sub>-Te composite

films at moderate high temperatures. *International Conference on Metallurgical Coatings and Thin Films*, April 28-May 2, in San Diego, California.

Muratore, C., D.R. Clarke, J.G. Jones, and **A.A. Voevodin**. 2008. Smart tribological coatings with wear sensing capability. *International Conference on Metallurgical Coatings and Thin Films*, April 28-May 2, in San Diego, California.

Altfeder, I.B., J. Krim, and **A. A. Voevodin**. 2008. Diamond nanoelectronics. *American Physical Society*, March 10-14, in New Orleans, Louisiana.

**Voevodin, A.A.**, C. Muratore, and J.G. Jones. 2008. Environment adaptive friction reducing nanocomposites with remaining life wear sensor capability. *3<sup>rd</sup> International Conference on SMART Materials and Structures*, June 8-13, in Acireale, Sicily, Italy.

Vaia, R., S. Diamanti, R. MacCuspie, K. Park, H. Koerner, S. Patton, and **A.A. Voevodin**. 2008. Conductive nanoparticle liquids and proto-assemblies: Regenerative surfaces for relays and MEMS. *3<sup>rd</sup> International Conference on SMART Materials and Structures*, June 8-13, in Acireale, Sicily, Italy.

Altfeder, I.B., J. Hu, **A. A. Voevodin**, and J. Krim. 2008. Magic-sized superlattices in boron doped diamond. *AVS 55<sup>th</sup> International Symposium*, October 19-24, in Boston, Massachusetts.

Gudorf, S., S.K. Sharma, and **A. A. Voevodin**. 2008. Sensitivity of RF sensors for coated bearing health monitoring. *Society of Tribologists and Lubrication Engineers Conference*, May 19-22, in Cleveland, Ohio.

Gudorf, S., S.K. Sharma, and **A. A. Voevodin**. 2008. Sensitivity of RF sensors for coated bearing health monitoring. *Integrated Systems Health Management Conference*, August 11-14, in Cincinnati, Ohio.

Waite, A.R., J.G. Jones, C. Muratore, H. Jiang, J.O. Enlow, T.J. Bunning, and **A.A. Voevodin**. 2008. Processing and characterization of polymer-ceramic nanolaminate thin films. *55<sup>th</sup> AVS International Symposium*, October 20-24, in Boston, Massachusetts.

Chauvin, A. and **R.J. Wilkens**, Modeling and elimination of gas flaring in Gabon. *STARS Conference*, March, in Akron, Ohio.

**Wilkens, R.J.** 2008. The RXBT versatile coolant system loop: A system for the evaluation of the combined fluid flow, fluid property, novel material, novel heat exchanger, and interfacial effects. Proceedings of the *Thermal Management Materials Workshop*, September 16-17, in Kettering, Ohio.

Narvaez, J.A., L.J. Gschwender, and **R.J. Wilkens**. 2008. Thermal conductivity measurements of coolants with nanofluids by three measurement techniques. Submitted to *STLE Conference*.

## INVITED LECTURES AND SEMINARS

**Dai, Liming**. 2007. Air Force Research Laboratory *International Workshop on Biotronics*, April 29-May 4.

**Dai, Liming**. 2007. Fundamentals Forum at the *SPE 2007 ANTEC*, May 6-10, in Cincinnati, Ohio.

**Dai, Liming**. 2007. *Central Regional Meeting* of the American Chemical Society, May 20-23, in Covington, Kentucky.

**Dai, Liming**. 2007. *American Chemical Society National Meeting*, August, in Boston, Massachusetts.

**Dai, Liming**. 2007. *172nd Rubber Division Meeting*, in Cleveland, Ohio.

**Dai, Liming**. 2007. *Annual Meeting of AIChE*, November 4-9, in Salt Lake City, Utah.

**Dai, Liming**. 2007. *International Conference on Materials for Advanced Technologies*, July 1-6, in Singapore.

**Dai, Liming**. 2007. *3rd NEDO Conference*, March 25-29, in Israel.

**Dai, Liming**. 2007. *6th Chinese Conference for Advanced Functional Materials (CCAFM)*, November 15-19, in Wuhan, China.

**Dai, Liming**. 2007. *Nanocomposite*, September 4-8, in Las Vegas, Nevada.

**Dai, Liming**. 2007. Chair a session at the *SAMPE Conference*, October 29-November 1, in Cincinnati, Ohio.

**Dai, Liming**. 2007. Plenary talk at *SPIE*, August 26-30, in San Diego, California.

**Dai, Liming**. 2007. *Air Force at the Technology Cooperation Program (TTCP)*, Sept. 25-27, in Annapolis, Maryland.

**Dai, Liming**. 2007. AFRLX, *TechEdge* meeting, December 17.

**Lee, William**. 2007. Series of four one-hour lectures on intelligent processing of composite materials.

**Myers, Kevin**. 2007. Unbaffled angled agitation. Seminar at Eli Lilly, October, in Indianapolis, Indiana.

## GRANTS AND AWARDS

**Wilkens, R.** 2007. Interdisciplinary biological systems engineering as a model for curricular development in bioengineering. LTC Innovation Grant with C. Krane.

**Wilkens, R.** 2007. Investigation of the effects of axial tension on elastic conduit in pulsatile flow to mimic blood vessel performance. Research Council.

**Wilkens, R.** 2007. AFOSR 6.1 Proposal with L. Byrd and L. Gschwender. Understanding heat mass transport at liquid/vapor interfaces and interuses with programmable surface properties.

**Wilkens, R.** 2007. Graduate Faculty Fellows with C. Krane and M. Pinnell. Research opportunities in bioengineering.

## PATENTS

Ohasi, Toshi, and **Liming Dai**. 2007. Touch and auditory sensors based on nanotube arrays. Patent Cooperation Treaty, U.S. Provisional Application 60/811,942.

Wei, Chen, **Liming Dai**, Ajit Roy, and Tia Benson Tolle. 2007. Polymer-carbon nanotube composites for use as sensors. U.S. Patent Application 11/518,832; Patent Cooperation Treaty U.S. 2006/035512; International Filing, International Publication WO/2007/033189.

McClelland, D.A., and **D.P. Kramer**. 2008. Fuel cell test system. U.S. Patent Application No. 20080278183, March.

**Kramer, D.P.** 2008. Method for joining

# Composites:

## Renewable Energy and Biomimetics

Steven Donaldson worked for the Air Force Research Laboratory (AFRL) for 26 years; he retired on a Friday in 2006. The following Monday, Donaldson began his new position as assistant professor with the Department of Civil & Environmental Engineering & Engineering Mechanics at the University of Dayton (UD). He investigates structural load behaviors in aeronautics, astronautics and civil engineering.

Donaldson received his aeronautical and astronautical engineering degree from Purdue University. Later he received an M.S. in mechanical engineering from UD, and the AFRL assisted Donaldson throughout his Ph.D. work in mechanical engineering at Stanford University.

At the AFRL, he focused on aircraft structures and writing technical papers about fiber-reinforced composites. According to Donaldson, "Carbon fiber composites are lighter, stiffer and stronger than metals. They do not corrode and can be less expensive." Working with a multidisciplinary group—material scientists, mechanical engineers, material engineers, and mathematicians—he applied composite research to advanced aircraft and satellite structures.

Today, his research includes stress analysis and in-situ fracture observation, micro-cracking in a cryogenically cycled carbon/bismaleimide composite, advanced hybrid materials, ply-level behavior of carbon/epoxy composites, and damage initiation in composite laminates at cryogenic temperatures.

His papers include *Design and Analysis of Composites* in 2007 at the Society for the Advancement of Materials and Process Engineering Fall Technical Conference and *Strength of Composite Angle Bracket with Nano-Enhanced Resins* in 2008 at the American Society for Composites 23rd Annual Technical Conference.

The state of Ohio sponsors some of his research. This support enables Donaldson to collaborate with the University of Dayton Research Institute's (UDRI) Brian Rice on projects such as developing composite materials for wind turbine glass-fiber blades. "Ohio is well-positioned to support and manufacture wind turbines because of its technical and manufacturing background," says Donaldson.

Describing the massive, impressive wind turbines with the unforgettable whooshing, he states, "With four mega watt generators, the turbines can supply power to hundreds of homes for sustainable, renewable energy."

In his office, viewing a wind-efficiency map, Donaldson explains, "Ohio does not have the wind capacity of the plains; however, Ohio's northern shoreline and the counties of Hardin, Logan, and Champaign should be fairly efficient." The counties are farmland, wide-open space, and the wind turbine is "farming for the 21st century."

Donaldson currently concentrates on two areas of research—nano-enhanced resins and biomimetics.

He collaborates on nano research with graduate students and UDRI. They employ nano-materials to help strengthen the resin used for the blades of wind-turbines. Strengthening the resin reduces the loss of composite material between the layers in the blades by eliminating the stress between the layers.

Working with the AFRL through the Dayton Area Graduate Studies Institute (DAGSI) he investigates biomimetics. "Structures in nature are pretty much all composite; they have a directional nature to their reinforcements," says Donaldson. Looking at systems in nature, he asks, "Can manufacturing benefit from studying insect shells, bamboo pieces, and structures in nature...trees...We want to look at parts that intersect one another; this is my interest. Instead of just joining structures together with adhesives or bolts, how can we improve manufactured strength; how can we synthesize nature in applications for strong, durable, and less costly materials for manufactured applications?"

At UD, Donaldson divides his time into quadrants: research, teaching, advising, and service-learning/professional societies. His work is multidisciplinary—civil engineering, mechanical engineering, and biology. Not ready to retire, he has many composite ideas yet to come and says, "I am a composites geek."



metals to ceramic matrix composites. U.S. Patent Application No. 12/113,296, May.

Janz, E.E.A., **K.J. Myers**, W. Fryers, and J.B. Fasano. 2008. High efficiency mixer impeller. U.S. Patent Application No. 12/274,064, filed November 19.

Aksenov, I.I., V.E. Strel'nitskiy, V.V. Vasylyev, **A.A. Voevodin**, J.G. Jones, and J.S.Zabinski. 2008. Filtered cathodic-arc plasma source. U.S. Patent Application No. 7,381,311, June 3.

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## Civil & Environmental Engineering & Engineering Mechanics

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### BOOKS

Bischof, P. and **F. Malhas**, eds. 2007. *Deflection and Stiffness Issues in FRC & Thin Structural Elements*. Detroit, Michigan: American Concrete Institute.

Salmon, C., J. Johnson, and **F. Malhas**. 2008. *Steel Structures: Design and Behavior*, 5<sup>th</sup> edition, Prentice Hall.

### JOURNAL AND MAGAZINE ARTICLES

Whitney, J.M., and **R.A. Brockman**. 2007. Orthotropic laminates under torsional loading: A revisit. *American Society for Composites 22nd Annual Technical Conference*, September 17-19, in Seattle, Washington.

**Brockman, R.A.**, M.A. Huelsman, and R. John. 2007. Crack detection and monitoring in turbine engine components. *Defense Advanced Research Projects Agency Materials Prognosis PI Review*, January 29-February 2, in St. Augustine, Florida.

Johnson, D.A., **R.A. Brockman**, B. Bartha, H.E. Stumph, W.J. Porter III, S. Jha, M.J. Caton, and J.M. Larsen. 2007. Analysis of microstructural variability. *Defense Advanced Research Projects Agency Materials Prognosis PI Review*, January 29-February 2, in St. Augustine, Florida.

Buchanan, D.J., R. John, and **R. A. Brockman**. 2007. Residual stress relaxation. *Defense Advanced Research*

*Projects Agency Materials Prognosis PI Review*, January 29-February 2, in St. Augustine, Florida.

Gawandi, A.A., J.M. Whitney, **R.A. Brockman**, and G.P. Tandon. 2008. Interaction between a nanofiber and an arbitrarily oriented crack. *J. Composite Materials* 42: 45-68.

**Brockman, R.A.**, R. John, and M.A. Huelsman. Forthcoming. Using deformation modes to identify cracks in turbine engine compressor disks. *Aeronautical Journal of the Royal Aeronautical Society*.

Buchanan, D.J., R. John, **R.A. Brockman**, and A.H. Rosenberger. 2008. A coupled creep plasticity model for residual stress relaxation of a shot peened nickel-base superalloy. *Superalloys 2008*, September, in Champion, Pennsylvania. (Best Paper Award)

Buchanan, D.J., and **R.A. Brockman**. 2008. Relaxation of shot-peened residual stresses in a Ni-base superalloy, *TMS 2008 Annual Meeting*, October, in Pittsburgh, Pennsylvania.

**Brockman, R.A.**, and W.R. Braisted. 2008. LSP/LPB initiative for airframe components: Test plan development. Air Force Research Laboratory, Flight Vehicles Directorate, AFRL/VASM, Wright-Patterson Air Force Base, July, in Dayton, Ohio.

**Brockman, R.A.** 2008. Impact containment recommendations for the compressor aero research laboratory. Air Force Research Laboratory, Propulsion and Power Directorate, AFRL/PRTF, Wright-Patterson Air Force Base, July, in Dayton, Ohio.

Panessa-Warren, B.J., M.M. Maye, J.B. Warren, **K.M. Crosson**. 2008. Single-walled carbon nanotube reactivity and cytotoxicity following extended aqueous exposure. *Environmental Pollution*, (December 11).

Avalon, S.C., and **S.L. Donaldson**. 2008. Strength of composite angle bracket with nano-enhanced resins. Submitted to *Journal of Composite Materials*.

**Eustace, D.**, and V.K. Indupuru. 2007. Drivers' behavior and knowledge regarding the right-of-way at freeway

on-ramp merging area. *Transportation Research Record Journal*.

**Eustace, D.**, V. Griffin, and P. Hovey. 2007. Analyzing the effects of L.E.D. traffic signals on urban intersection safety. *Institute of Transportation Engineers ITE Journal*.

**Fortney, P.J.**, and B.M. Shahrooz. 2008. Boundary detailing of coupled core wall system wall piers. *Journal of Advances in Structural Engineering*, Multi-Science Publishing Company.

**Fortney P.J.**, G.A. Rassati, B.M. Shahrooz. 2008. Investigation on effect of transverse reinforcement on performance of diagonally reinforced coupling beams. *American Concrete Institute Structural Journal*, Farmington Hills, Michigan, (November-December): 1-8.

Hawileh, R. and **F. Malhas**. 2007. Comparison between ACI 318-05 and Eurocode 2 (EC2-94) in flexural concrete design. *Structural Engineering and Mechanics Journal* (December).

### PRESENTATIONS

**Donaldson, Steven**. 2007. Development of a new course on design with fiber reinforced composite materials. *American Society for Engineering Education Annual Conference*, June 24-27, in Honolulu, Hawaii.

**Taylor, D.G.** 2008. Modified flow regime to improve UV effectiveness in turbid industrial waters. *AWWA Water Quality Technology Conference* proceedings.

**Taylor, D.G.** 2008. Modified flow regime to improve UV effectiveness in turbid starch slurries. UDR-TR-2008-00149

Melton, L., D. Lytle, and **D. Taylor**. 2008. Impact of water chemistry on synthetically precipitated copper particles.

### INVITED LECTURES AND SEMINARS

**Brockman, Robert**. 2008. Calibration of crystal plasticity models for polycrystals. AFRL/RX, Wright Patterson Air Force Base, April, in Dayton, Ohio.

**Brockman, Robert**. 2008. Property identification based on full-field

deformation measurements. AFRL/RX, Air Force Materials & Manufacturing Directorate, April, in Dayton, Ohio.

**Brockman, Robert.** 2008. Crack propagation simulation in superalloys. Wright Brothers Institute, May, in Dayton, Ohio.

**Brockman, Robert.** 2008. Correlating analytical models with full-field experiments on notched specimens. AFRL/RXLMN, May, in Dayton, Ohio.

**Brockman, Robert.** 2008. Planning workshop for USAF hybrid disk BAA, March 3, in Dayton, Ohio.

**Brockman, Robert.** 2008. Workshop on crack propagation simulation using FRANC3Dng, May 1, in Dayton, Ohio.

**Brockman, Robert.** 2008. Computational materials science and engineering in AFRL/RX, presentation to Director of AFRL Materials & Manufacturing Directorate and Scientific Advisory Board, September, in Dayton, Ohio.

**Brockman, Robert.** 2008. Planning workshop for USAF hybrid disk BAA, December 15, in Dayton, Ohio.

**Chase, Donald.** 2008. Invited member of EPA expert panel to review proposals for Innovative Urban Wear Infrastructure for the 21st Century (\$10M grant).

**Donaldson, S.L.,** and T.J. Whitney. 2007. Design and analysis of composites. Three-hour tutorial at the *Society for the Advancement of Materials and Process Engineering, Fall Technical Conference and Exhibition*, October 29, in Cincinnati, Ohio.

**Donaldson, S.L.,** D.R. Bowman, and M. Neely. 2008. Modeling of materials and airflow performance for wind turbine generators. *University Clean Energy Alliance of Ohio Second Annual Meeting*, April 24, in Columbus, Ohio.

Avalon, S.C., and **S.L. Donaldson.** 2008. Strength of composite angle bracket with nano-enhanced resins. *American Society for Composites 23rd Annual Technical Conference*, September 9-11, in Memphis, Tennessee.

**Eustace, D.,** and V.K. Indupuru. 2008. Drivers' behavior and knowledge regarding the right-of-way at freeway on-ramp merging area. Presented at *87<sup>th</sup> Transportation Research Board*, January

13-17, in Washington, D.C. and included in the Conference CD-ROM.

Wei, L., W. Liu, H. Cui, and **D. Eustace.** 2008. Sensitivity analysis of large vehicle mix rates impact on traffic flow state parameters. Presented at *First International Symposium on Transportation Innovative Best Practices*, April 24-26, in Beijing, China.

**Eustace, D.** 2008. Survey of Ohio drivers' knowledge and experience regarding freeway merge areas. Invited speaker at the Institute of Transportation Engineers Ohio Section, winter meeting, March 12, in Columbus, Ohio.

**Eustace, D.** 2008. Traffic safety challenges due to aging driver population. Invited keynote speaker at the *Tri-state World Usability Day*, hosted worldwide by LexisNexis and Elsevier Science, November 13, in Miamisburg, Ohio.

**Fortney P.J.,** K.A. Harries, B.M. Shahrooz. 2008. Design compression forces for coupled wall structures. *Proceedings of the ASCE Structures Congress.*

Rassati, G.A., **P.J. Fortney,** B.M. Shahrooz, P.W. Johnson III. 2008. Performance evaluation of innovative hybrid coupled core wall systems. In *Composite Construction in Steel and Concrete V*, ed. Roberto T. Leon, and Joerg Lange. ASCE, in Reston, Virginia.

Hawileh, R., A. Rahman, and **F. Malhas.** 2007. Finite element stress analysis of precast/prestressed hybrid beam-column connections. *11th International Conference on Inspection, Appraisal, Repairs and Maintenance of Structures*, November 15-17, in North Cypru.

## GRANTS AND AWARDS

**Brockman, R.** 2007. AFRL / VASM LSP/ LPB Analysis. \$47K.

**Brockman, R.** 2007. AFOSR, through AFRL/MLLMN, 5 years. \$750K.

**Brockman, R.** 2007. Runway matting analysis, time and materials. Federal Technology Group. TBD.

**Brockman, Robert.** 2008. AFRL/RBSM, rapid design tools for ERS-enhanced structures, five years, \$663K.

**Brockman, Robert.** 2008. Development of unit cell constitutive model for modeling of perforated sheet processing, Procter and Gamble, \$60K.

**Chase, Donald.** 2008. Real-time system optimization for sustainable water transmission and distribution. Great Lakes Protection Fund, five years, \$1.5M.

**Crosson, K.** 2007. University of Dayton Research Council SEED Grant. \$1K.

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**Donaldson, S.** 2007. Commercialization of high-performance nano-tailored structural composites for energy and survivability applications. Third Frontier Research Commercialization Project (State of Ohio). Three years, \$80K.

**Donaldson, S.** 2007. Lightweight composite spring. Ohio Board of Regents, \$10K.

**Donaldson, Steve.** 2008. Nanocomposites technology, design, analyze, and test composite angle brackets using UDRI-developed nanocomposites. State of Ohio Third Frontier Research Commercialization Program, via University of Dayton Research Institute, \$79K/year.

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Ahmad, Gul, Matthew B. Dickerson, Ye Cai, Sharon E. Jones, Eric M. Ernst, Michael S. Haluska, Angela L. Campbell, Jiadong Wang, **Guru Subramanyam**, Rajesh R. Naik, Nils Kröger, and

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## Electrical and Computer Engineering

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**Subramanyam, G.**, K. Leedy, C. Varanasi, R. Neidhard, K. Stamper, and M. Calcatera. 2008. A low voltage tunable analog phase shifter utilizing ferroelectric varactors. *Integrated Ferroelectrics* 100, no. 1: 156-164.

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## INVITED LECTURES AND SEMINARS

Johnson, P., and **M. Chatterjee**. 2007. Leveraging Asian studies. *Asian Studies Development Program, 13th National Conference*, March, in Seattle, Washington.

Jiang, Z., and **R. Ordóñez**. 2007.

Trajectory generation on approach and landing for RLVs using motion primitives and neighboring optimal control. *American Control Conference*, July, in New York, New York.

Jiang, Z., and **R. Ordóñez**. 2007. On-line approach/landing trajectory generation with input deviation bound uncertainty for reusable launch vehicles. *IEEE Conference on Decision and Control*, December, in New Orleans, Louisiana.

Koksal, M.I., V. Gazi, B. Fidan, and **R. Ordóñez**. 2007. Hareketli bir hedefin hisitlamali erkinlerden olusan bir robot surusu ile yapay potansiyel fonksiyonlar ve kayan kip yontemini kullanarak takibi. *Turkish National Conference on Automatic Control (TOK07)*, 329-334, September, in Istanbul, Turkey (in Turkish).

**Penno, R.** 2007. Modeling the RCA's Two-D Wall prototype. *AFRL/SNRA & AFRL/IFTA, Tech Topics*, May 1.

Janning, Dan, John McCann, Michael Corwin, Thomas Dalrymple, Leo Kempel, Daniel Killips, Krishna Pasala, **R. Penno**, Joshua Radcliffe, Stephen Schneider, and Kyle Zeller. 2007. Leaky wave antenna research at AFRL. *Antenna Applications Symposium*, in Monticello, Illinois.

Radcliffe, J., S. Schneider, L. Kempel, and **R. Penno**. 2007. Finite element-boundary integral simulation of a conformal microstrip leaky-wave antenna. *IEEE Antennas and Propagation Society Symposium*, June, in Honolulu, Hawaii.

**Penno, Robert**, Seng Hong, John Glett, Mark Haenni, and Rey Febo. 2008. Development of the Two D Wall for simulation of glint from atmospheric propagation and multipath. *Proceedings of the Aerospace Conference*, March 1-8, in Big Sky, Montana.

Jiang, Hai, Krish Pasala, and **Robert Penno**. 2008. Effects of amplitude dynamics for nonlinear coupled oscillator arrays. *IEEE APS Conference*, June, in San Diego, California.

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Jiang, Hai, and **Robert Penno**. 2008. A large size linear oscillator array with 64 elements. *Stander Symposium*, April 9, University of Dayton, in Dayton, Ohio.

**Subramanyam, G.**, R. Neidhard, K. Stamper, J. Weideman, and M. Calcatera. 2007. Experimental verification of RF power sensitivity in varactor shunt switches. *Proceedings of the IEEE International*.

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Ouchen, F., S.N. Kim, M. Hay, H. Zate, **G. Subramanyam**, J.G. Grote, C.M. Bartsch, and R.R. Naik. 2008. DNA-conductive polymer blends for applications in biopolymer-based field effect transistors (FETs). *Proceedings of the SPIE - The International Society for Optical Engineering Nanobiosystems: Processing, Characterization, and Applications* 7040: 704009-18.

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Patterson, M.A., **G. Subramanyam**, and P. Wheat. 2008. A new wafer treatment cell for control of solution based thin film processing for applications in microelectronics. *51st IEEE International Midwest Symposium on Circuits and Systems (MWSCAS)*, 666-669.

## PRESENTATIONS

**Chatterjee, M.R.**, P.P. Banerjee, and G. Nehmetallah. 2007. Analysis of beam propagation in 90-degree holographic recording and readout using transfer functions and numerical 2-D-laplace inversion. *Adaptive Optics: Analysis and Methods / Computational Optical Sensing and Imaging / Information Photonics / Signal Recovery and Synthesis Topical Meetings* on CD-ROM,

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## RUSSELL HARDIE

PROFESSOR, ELECTRICAL AND COMPUTER ENGINEERING;  
PROFESSOR, ELECTRO-OPTICS GRADUATE PROGRAM

# New Quest to Save Lives: An Emphasis on Medical Image Processing

Russell Hardie's father, who was a professor at Johns Hopkins University in the Department of Earth and Planetary Sciences for over 40 years, inspired him to become a researcher and a professor. His father always welcomed him into his laboratory and classroom and took him on many field trips. As an undergraduate student at nearby Loyola College, Hardie even enrolled in one of his father's geology classes.

After his Ph.D. in electrical engineering from the University of Delaware, Hardie worked as a senior scientist at Earth Satellite Corporation for one year, but then "found the perfect match" at the University of Dayton (UD).

At UD, he was able to combine research with academia in the Department of Electrical and Computer Engineering, and he holds a joint appointment in the Electro-Optics Graduate Program. Hardie's research centers around Digital Signal Processing (DSP), which originally stemmed from his passion for music (he plays guitar and keyboard). DSP involves manipulating and analyzing digital data from sensors, such as cameras, audio systems, and medical systems.

The Computer-aided detection (CAD) system for medical image processing now captures much of Hardie's attention. CAD uses computers to automatically scan medical imagery and alert radiologists to abnormalities.

Hardie leads a team of graduate students in developing advanced CAD systems for the detection of potentially cancerous lung nodules. Lung cancer is the leading cause of cancer death in the U.S. "Unlike people, CAD systems are tireless," says Hardie. CAD is able to scan thousands of images, and help radiologists spot small, subtle lung nodules earlier and at a more curable stage. Hardie says, "Early detection can be enhanced with CAD, and this can save lives."

Hardie's team recently published a paper describing a new system for identifying lung nodules on chest x-rays. The group also has a recently accepted paper that describes a CAD system for processing 3-D computed tomography

(CT) images of the lungs. The UD team refers to this system as FlyerScan CT (shown next to Hardie in the photo). Temesguen Messay, one of Hardie's students, is the lead author on the CT paper.



The FlyerScan CT system was recently used to generate results for an international CAD competition called ANODE09 (<http://anode09.isi.uu.nl/>). The results, as they currently stand, have the UD FlyerScan Team in a close battle for the top performance, recording a close second place result. The field of systems that FlyerScan outperformed includes a commercial Philips CAD system and

those from eight other academic institutions.

Hardie's interest in CAD began during his sabbatical while working with Dr. Steve Rogers, Senior Scientist at the Air Force Research Laboratory (AFRL) and founder and CEO of Qualia Computing (now iCAD).

Hardie may be best known in the research community worldwide for his work on image superresolution (SR). In 1998, Hardie and collaborators received the *Rudolf Kingslake Medal and Prize* from SPIE for the development of multi-frame image resolution enhancement algorithms. SR is a well-known process today, but it is generally not fast enough for real-time processing. Hardie currently works to develop fast SR algorithms that will run on live video in real-time.

In addition to CAD and SR, he is also involved in a variety of student projects from custom guitar effects processors to a computer controlled tracking telescope. And his four teaching awards vouch for his success with students: the *Engineering Professor of the Year Award*, Epsilon Delta Tau; the *Award of Excellence in Teaching*, School of Engineering; the *Professor of the Year Award*, student chapter of the Institute of Electrical and Electronic Engineers; and the *Alumni Award in Teaching*, UD's top university-wide teaching award.

When asked how he balances teaching and research, Hardie says, "Fifty-fifty, I feel fortunate to be at an academic institution where that is possible. It is all about lifelong learning and the students."



OSA Technical Digest (CD), June, in Vancouver, Canada.

**Chatterjee, M.R.**, and P.P. Banerjee. 2007. Examination of energy and group velocities in positive and negative index chiral materials with and without dispersion. *OSA Annual Meeting, Conference Program*, FIO/LS/OMD, in San Jose, California.

**Chatterjee, M.R.**, and M. al-Saedi. 2008. Examination of chaos-based encryption and retrieval in a hybrid acousto-optic device. *Frontiers in Optics (FIO), OSA Annual Meeting*, October 19, in Rochester, New York.

Koksal, V. Gazi, B. Fidan, and **R. Ordóñez**. 2008. Tracking a maneuvering target with a non-holonomic agent using artificial potentials and sliding mode control. *16th Mediterranean Conference on Control and Automation*, June.

Jennings, A.L., **R. Ordóñez**, and N. Ceccarelli. 2008. Dynamic programming applied to UAV way point path planning in wind. *IEEE Multi-conference on Systems and Control*. September, in San Antonio, Texas.

Jiang, Z., and **R. Ordóñez**. 2008. Robust approach and landing trajectory generation for reusable launch vehicles in winds. *IEEE Multi-conference on Systems and Control*. September, in San Antonio, Texas.

Jiang, Z., and **R. Ordóñez**. 2008. Disturbance rejection in approach and landing trajectory generation for RLVs. *IEEE National Aerospace and Electronics Conference*, July, in Dayton, Ohio.

Jennings, Alan L., **Raúl Ordóñez**, and Nicola Ceccarelli. 2008. An ant colony optimization using training data applied to UAV way point path planning in wind. *IEEE Swarm Intelligence Symposium*, September 21-23, in St. Louis, Missouri.

**Subramanyam, G.**, A. Campbell, et al. 2007. SPM of DNA based biopolymers. *Seeing at the Nanoscale Meeting*.

**Subramanyam, G.**, et al. 2007. Invited Speaker, *AFRL/AFPSR Biotronics Workshop*, April, in Kona, Hawaii.

**Subramanyam, G.**, et al. 2007. Invited Speaker, *DARPA Biotronics Workshop*, January, in Dayton, Ohio.

**Subramanyam, G.**, et al. 2007. Invited Speaker, *American Chemical Society CERMACS*, June.

**Subramanyam, G.**, H. Griffith, et al. 2007. *Union Radio Scientific Internationale (URSI) Annual Meeting*, June, in Montreal, QC, Canada.

**Subramanyam, G.**, et al. 2008. Investigation of iron doping in DNA\_CTMA using a resonant sensor test structure. *AFRL Bio Workshop*, November, in Washington, DC.

## GRANTS AND AWARDS

**Hardie, R.** 8/15/07-present. UDRI/IDCAST research support for work on detector nonuniformity correction and image super-resolution.

**Hardie, R.** 1/1/07-9/14/09. Image restoration to combat out-of-focus blur and other degradations. AT&T subcontract, \$98,005.

**Hardie, R.** 1/1/06-12/31/07. Multi- and hyper-spectral image collection and analysis for target detection, change analysis and threat detection. Anteon Corporation subcontract, support expertise for the sensors directorate, \$189,394.

**Ordóñez, R.** 2006-07. GPS based navigation of fixed wing and rotary wing air vehicles. Funded by AFRL, \$65K.

**Ordóñez, R.** 2007-09. Long-duration, eye-in-the-sky monitoring for airfield threat detection. Phase II SBIR with PercepTek, Inc. AFRL, \$749K.

**Ordóñez, R.** 2008. Motoman Robotics Laboratory, PI, funded by Motoman in kind and UD in matching funds, \$771K.

**Ordóñez, R.** 2008. Boeing Welliver Faculty Summer Fellowship.

**Penno, R.** 2007. Development of the Two D Wall for radar signal simulation. SUNYIT, \$5K.

**Penno, R.** 2007. Development of the Two D Wall for radar signal simulation. AFRL/SNRW, \$38K.

**Penno, R.** 2007. Investigation into radar signal simulation. AFRL/RYRA, \$27K.

**Penno, R.** 2008. High fidelity simulation of radar returns from complex scattering objects. AFRL/RYRA, WPAFB.

**Penno, R.** 2008. Ka-Band multifunction radar. AFRL/RYRR, WPAFB, (This work has been supported by Larrell Walters, IDCAST).

**Penno, R.** 2008. Development of the leaky wave antenna. AFRL/RYRR, WPAFB.

**Penno, R.** 2008. Active antenna arrays: Coupled oscillator arrays.

**Penno, Robert.** 2008. AFRL / RYRA. January-May, \$13K.

**Penno, Robert.** 2008. AFRL / RYRA. August-December, \$14K.

**Penno, Robert.** 2008. AFRL / RYRA. May-August, \$35K.

**Subramanyam, G.** 2007. DNA-CNT thin films for biotronics. AFOSR, May, \$100K.

**Subramanyam, G.** 2008. Large Area BST Varactor Development, funded by AFRL RYDD, \$45K (with Dr. Varanasi, UDRI). \$22.5K for Subramanyam's group.

**Subramanyam, G.** 2008. Conductivity enhancement in DNA-CTMA polymers, funded by DARPA MTO, \$400K (PI: Jim Grote, AFRL). \$75K for Subramanyam's group at UD.

**Subramanyam, G.** 2008. BST Varactor development for Analog Bridge Inc., funded by Analog Bridge and IDCAST, \$70K.

**Subramanyam, G.** 2008. Enhancement of dielectric permittivity and magnetic permeability in DNA-CTMA biopolymers, funded by AFOSR, \$100K. (With Dr. Liming Dai). \$50K for Subramanyam's group.

**Subramanyam, G.** 2008. Cryogenic varactor development for SURF program, funded by DARPA STO, \$67K. (with Dr. Varanasi, UDRI). \$28.5K for Subramanyam's group.

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## Electro-Optics Graduate Program

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### BOOK

Jarem, J., **P.P. Banerjee**, and M.R. Chatterjee. 2008. *Computational Methods in Optics and Electromagnetics*, Marcel-Dekker.

# Electro-Optics Graduate Program: Collaboration to Credibility to National and International Recognition

Joseph Haus, director of the University of Dayton's (UD) Electro-Optics (EO) Graduate Program, cannot hide his enthusiasm. Electro-Optics is at the center of changing possibilities in sensors, telecommunications, medicine and manufacturing. UD's program is one of only seven in the U.S. and is poised to become a leader.

Gathering at the new EO facility at College Park Center on the UD campus is a multidisciplinary group of researchers from across campus, the University of Dayton Research Institute, industry, and government. The personnel network forms a strong alliance enabling a strong program. "What we have in Dayton is really unique," says Haus. EO's collaboration and credibility are nationally and internationally known.

As director of EO, he moves the program forward; and in 2008, Haus, through collaborative efforts, facilitated the launch of the new Ladar & Optical Communications Institute (LOCI), which is housed within EO and directed by Haus. UD worked with the U.S. Air Force and regional businesses to initiate LOCI, believed to be the nation's first laser radar curriculum. According to Haus, "It is a 'Nexus for Collaboration' between industry, government and academia." The facility contains five laboratories for research on aperture synthesis and compact laser source development. Recently, LOCI successfully raised endowment funds to hire an endowed chair, a position recently filled by Professor Mikhail Vorontsov.

Paul McManamon is the technology director for LOCI. He was formerly with Wright Patterson Air Force Base (WPAFB) and also helped to build the EO program to what it is today. As Haus states, "He was our Base champion...the catalyst with the right connections to help EO grow from funding graduate students as paid researchers at WPAFB to bringing the funding to our program."

In addition to directing the EO department and LOCI, Haus works internationally and serves as co-chair for the OSA-sponsored *Fourth International Conference of Nanophotonics* in Tsukuba, Japan. He and Dr. Qiwen Zhan are

founding members of this conference and have seen it grow in stature.

Recognized for his research in 2008, Haus received the American Physical Society Fellow award at the Optical Society of America (OSA)/American Physical Society (APS) joint meeting in Rochester, New York. The citation

specifically notes his work in heterogeneous nonlinear materials, especially nonlinear optics of photonic crystals. He is also fellow of the OSA and the SPIE.

More recently, he was awarded the John Carroll University 2009 Physics Department's Distinguished Alumnus Award.

Currently, his research interests include nanophotonics; quantum and nonlinear optics phenomena in heterogeneous systems, especially propagation in photonic crystals and optical metamaterials; and Ladar, a system using infrared lasers to image objects with a very high definition.

Research, an ongoing focus for Haus, "is not a 40-hour work week, you don't just turn it off; it's a vocation...you do it all the time."

Haus, a hands-on investigator, oversees projects from theory to final application.

"The areas merge together in technology; they are not separate from each other," says Haus. "I can give back to society more quickly when the esoteric quickly moves to applications."

EO remains his focal point. "We have excellent faculty with outstanding teaching and mentoring skills," says Haus. It is not easy to get research funding; but his young faculty established a reputation, credibility evolved, and research funding followed.

"The mission of the EO program is research...and staying current with research trends will grow the program" says Haus. He envisions future collaborations in the renewable energy arena. "Nanophotonics is a way to more efficiently get energy out of a source," he explains.

Haus, a hands-on researcher and visionary director, continues to facilitate the growth of UD's EO program.



## BOOK CHAPTERS

Nehmetallah, G., and **P.P. Banerjee**. 2007. Study of solution stabilization in D+1 dimensions using novel analytical and numerical techniques. In *Nonlinear Optics and Applications*, ed. H. Abdeldayem and D. Frazier, ISBN 978-81-308-0173-5. India: TRN.

## JOURNAL AND MAGAZINE ARTICLES

**Banerjee, P.P.**, and G. Nehmetallah. 2007. Spatial and spatiotemporal solitary waves and their stabilization in nonlinear negative index materials. *Journal of the OSA B* 24: A69-A76.

Saleh, M.A., **P.P. Banerjee**, J.L. Carns, G. Cook, and D.R. Evans. 2007. Stimulated photorefractive backscatter leading to six-wave mixing and phase conjugation in iron doped lithium niobate. *Applied Optics* 46: 6151-6160.

Abdelaziez, Y., and **P.P. Banerjee**. 2008. Modeling and characterization of PLZT adaptive microlenses. *SPIE Journal of Microlithography, Microfabrication, and Microsystems* 7, no. 013011 (March): 1-10.

**Banerjee, P.P.** and M.R. Chatterjee. 2008. Negative index in the presence of chirality and material dispersion. *J. Opt. Soc. Amer. B* (October).

**Banerjee, P.P.**, R. Aylo, and G. Nehmetallah. 2008. Baseband and envelope propagation in media modeled by a class of complex dispersion relations. *J. Opt. Soc. Amer. B* 25: 990-994.

**Banerjee, P.P.**, G. Nehmetallah, N. Kukhtarev, and S. Praharaj. 2008. Dynamic holographic interferometry of diffuse objects and its application to determination of airplane attitudes. *Appl. Opt.* 47: 3877-3887.

Schmidt, Jason D., Matthew E. Goda, and **Bradley D. Duncan**. 2007. Aberration production using a high-resolution liquid-crystal spatial light modulator. *Applied Optics* 46, no. 13 (May 1): 2423- 2433.

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sensing and characterization. *Applied Optics* 46, no. 17 (June 10): 3518-3527.

Miller, Nicholas J., Matthew P. Dierking, and **Bradley D. Duncan**. 2007. Optical sparse aperture imaging. *Applied Optics* 46, no. 23 (August 10): 5933-5943.

Greiner, Michael A., **Bradley D. Duncan**, and Matthew P. Dierking. 2007. Bidirectional scattering distribution functions of maple and cottonwood leaves. *Applied Optics* 46, no. 25 (September 1): 6485-6494.

Jameson, Douglas F., Matthew P. Dierking, and **Bradley D. Duncan**. 2007. Effects of spatial modes on ladar vibration signature estimation. *Applied Optics* 46, no. 30 (October 20): 7365-7373.

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**Haus, J.W.**, M. Siraj, P. Prasad, and P. Markowicz. 2007. Self-collimation in photonic crystals anisotropic constituents. *Chinese Optics Letters* 5: 527-530.

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Roppo, V., M. Centini, D. de Ceglia, M.A. Vicenti, **J.W. Haus**, N. Akozbek, M.J. Bloemer, and M. Scalora. 2008. Anomalous momentum states, non-specular reflections, and negative refraction of phase-locked, second-harmonic pulses. *Metamaterials* 2: 135-144.

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Wu, Zhi, Peter E. Powers, **Andrew M. Sarangan**, and Qiwen Zhan. 2008. Optical characterization of wiregrid micropolarizers designed for infrared imaging polarimetry. *Optics Letters* 33, no.15: 1653-1655.

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**Zhan, Q.** 2007. Enhancement of fluorescence signal with one dimensional photonic band gap structure. In *Ultrasensitive and Single-Molecule Detection Technologies II*, ed. Jorg Enderlein, and Zygmunt K. Gryczynski. Proceedings of *SPIE* 6444, January 20,

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Chen, W., and **Q. Zhan**. 2007. Optimal plasmonic focusing with radial polarization. In *Plasmonics in Biology and Medicine IV*, ed. Tuan Vo-Dinh, and Joseph R. Lakowicz. Proceedings of *SPIE* 6450, January 23, in San Jose, California.

**Zhan, Q.**, and W. Chen. 2008. Field enhancement analysis of an apertureless near field scanning optical microscope probe with finite element method. *Chinese Optics Letters* 5, no. 12: 709-711. <http://www.opticsinfobase.org/col/abstract.cfm?URI=col-5-12-709>.

**Zhan, Q.**, J.W. Haus, Z. Wu, and R.L. Nelson. 2008. Long-range surface plasmon devices design using subwavelength metal grating. *Journal of Nonlinear Optical Physics & Materials* 17, no. 4.

**Zhan, Q.**, J.W. Haus, Z. Wu, and R.L. Nelson. 2008. Plasmonic notch filter design based on long-range surface plasmon excitation along metal grating. *Plasmonics/Springer* 3: 103-108. <http://www.springerlink.com/content/dp33322k225504jg/>

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**Zhan, Q.**, and S. Yang. 2008. Third-harmonic generation microscopy with tightly focused radial polarization. *Journal of Optics A: Pure and Applied Optics/IOP* 10, no. 12: 125103. <http://www.iop.org/EJ/abstract/1464-4258/10/12/125103>

## CONFERENCE PUBLICATIONS

**Banerjee, P.P.**, and G. Nehmetallah. 2007. The effects of dispersion, diffraction and nonlinearity management in negative index materials. *Photonic*

*Metamaterials*, proceedings of *SPIE*, 6638: 66380F-1-66380F-6.

**Banerjee, P.P.**, R. Aylo, and G. Nehmetallah. 2008. Optical propagation through a homogeneous mixture of positive and negative index materials. Proceedings of *SPIE*, 7029: 702917-1-702917-10.

**Banerjee, P.P.**, G. Nehmetallah, N. Kukhtarev, S. Praharaaj, and M.R. Chatterjee. 2008. Assessment of 3-D angular movements of diffuse objects using holographic interferometry. Invited paper, *Proc. Digital Holography Conference OSA*.

Pandey, Anup R., **Joseph W. Haus**, and Peter E. Powers. 2008. Measuring and predicting the amplitude and phase for three-wave interactions. In *Nonlinear Frequency Generation and Conversion: Materials, Devices, and Applications VII*, ed. Peter E. Powers, proceedings of *SPIE Photonics West*, 6875: 687503-687503-7, January 19-24, in San Jose, California.

**Haus, J.W.**, **A.M. Sarangan**, and **Q. Zhan**. 2008. Nanophotonics, short course notes, OSA, in Washington, D.C.

**Haus, J.W.**, and **Q. Zhan**. 2008. Nanophotonics, short course notes, taught at the *International Nanophotonics Conference*, May, in Nanjing, China.

**Sarangan, A.M.**, and **Q. Zhan**. 2008. Wiregrid micro-polarizer's for mid-infrared applications. *SPIE Defense and Security Symposium* 6959: 695915.

**Zhan, Q.**, and J. Dai. 2008. Beam shaping with vectorial vortex beams under low numerical aperture illumination condition. In *Andrew Forbes*, ed. Todd E. Lizotte, *SPIE Proceedings* 7062: 70620D, in Seattle, Washington.

**Zhan, Q.**, A.M. Sarangan, A. Widjaja, M. Pan, and J. Gao. 2008. Design and fabrication of an omnidirectional reflector as ultra-sensitive biochemical sensing platform. In *Manijeh Razeghi*, ed. Hooman Mohseni, *SPIE Proceedings*, 7035: 70350W, in Seattle, Washington.

## PRESENTATIONS

**Banerjee, P.P.**, and G. Nehmetallah. 2007. Solitary wave propagation and stabilization in negative index materials.

OSA Nonlinear Optics Topical Meeting, in Kona, Hawaii.

Huang, R., **P.P. Banerjee**, and C. Zhang. 2007. Application of swarm clustering theory to optical self-organization. WorldComp 07, Proceedings of International Conference on Computing: Genetic and Evolutionary Methods, in Las Vegas, Nevada: CSREA Press, ISBN 1-60132-038-8.

Chatterjee, M.R., **P.P. Banerjee**, and G. Nehmetallah. 2007. Analysis of beam propagation in 90 degree holographic recording and readout using transfer functions and numerical 2-D Laplace transform. Proceedings of OSA PMA6, June 18, Vancouver, Canada.

Chatterjee, M.R., and **P.P. Banerjee**. 2007. Energy, group and phase velocities in chiral materials with and without dispersion. Proceedings of OSA Annual Meeting, June, in San Jose, California.

**Banerjee, P.P.**, M. Saleh, D. Evans, and G. Cook. 2007. Stimulated PR backscatter leading to six-wave mixing and phase conjugation in Fe doped LiNbO<sub>3</sub>. Invited paper, AFRL Photorefractives Workshop, in St. Augustine, Florida.

**Banerjee, P.P.** 2007. Wave mixing in photorefractive polymers. Invited paper, AFRL Photorefractives Workshop, in St. Augustine, Florida.

**Banerjee, P.P.**, M. Saleh, D. Evans, G. Cook, and J. Carns. 2007. Analysis of stimulated backscatter during six-wave mixing in photorefractive lithium niobate. OSA Photorefractives Topical Meeting, in Lake Tahoe, Nevada.

**Banerjee, P.P.**, M. Saleh, D. Evans, and G. Cook. 2007. A novel algorithm for self-pumped contra-directional Gaussian beam coupling in photorefractive media. OSA Photorefractives Topical Meeting, in Lake Tahoe, Nevada.

**Banerjee, P.P.**, G. Nehmetallah, M.R. Chatterjee, S.C. Praharaaj and N. V. Kukhtarev. 2008. Assessment of 3-dimensional angular movements of diffuse objects using holographic interferometry. Invited paper, OSA Topical Meeting on Digital Holography, March, in St. Petersburg, Florida.

**Banerjee, P.P.** 2008. Nonlinear theory

of two wave coupling in photorefractive polymers. Invited paper, Photorefractives Meeting, AFRL, in Hilton Head, South Carolina.

Mel'nikov, Igor V., **Joseph W. Haus**, and Anton N. Knigavko. 2007. Super radiance steering and pinning in a two-dimensional resonance photonic crystal. Conference on Coherence in Quantum Optics, June 10-13, in Rochester, New York. OSA Technical Digest (CD).

Siraj, Mohammad M., **J.W. Haus**, Paras Prasad, and Paul Markowicz. 2007. Maximize the input angle for the self-collimation of photonic crystals composed of anisotropic materials by optimizing the dispersion surfaces. Frontiers in Optics, September 16-20, in San Jose, California OSA Technical Digest (CD).

Grajales-Coutiño, Ruben, Baldemar Ibarra-Escamilla, Evgeny A. Kuzin, Olivier Pottiez, and **Joseph W. Haus**. 2007. Experimental investigation of self-starting in a passively mode-locked fiber laser based on a symmetrical NOLM. Frontiers in Optics, September 16-20, in San Jose, California, OSA Technical Digest (CD).

Mel'nikov, I.V., **J. W. Haus**, and A.N. Knigavko. 2007. Spontaneous decay and superradiance in a two-dimensional resonance photonic crystal. Frontiers in Optics, September 16-20, in San Jose, California, OSA Technical Digest (CD).

**Sarangan, Andrew**, Aziz Mahfoud-Familia, Zhi Wu, Qiwen Zhan, David P. Forrai, Darrel W. Endres, John W. Devitt, Robert T. Mack, and James S. Harris. 2008. Wiregrid micro-polarizers for mid-infrared applications. SPIE Defense and Security Symposium, March, in Orlando, Florida.

Pan, Mengshu, **Andrew Sarangan**, and Qiwen Zhan. 2008. Optical birefringence of nano-porous dielectric thin films. OSA Annual Meeting.

Sun, Lirong, and **Andrew Sarangan**. 2008. A novel micromachining technique for achieving optical structures with arbitrary sidewall profiles. OSA Annual Meeting.

**Sarangan, Andrew**, Aziz Mahfoud-Familia, Zhi Wu, Qiwen Zhan, David P. Forrai, Darrel W. Endres, John W. Devitt,

Robert T. Mack, and James S. Harris. 2008. Wiregrid micro-polarizer's for mid-infrared applications. SPIE Defense and Security Symposium 6959: 695915.

Forrai, D.P., D.W. Endres, J.W. Devitt, A.M. Sarangan, **Q. Zhan**, A. Mahfoud-Familia, R.T. Mack, and J.S. Harris. 2007. Development of a MWIR Polarimetric FPA. SPIE Annual Meeting, August, in San Diego, California.

Chen, W., and **Q. Zhan**. 2007. Field enhancement due to optimal plasmonic focusing in a near-field scanning optical microscope probe. OSA Topical Conference on Nanophotonics, June, in Hangzhou, China.

Birchfield, B., J.W. Haus, Z. Wu, **Q. Zhan**, and R. Nelson. 2007. Electro-optic modulation using metal grating structures. The OSA Topical Conference on Nanophotonics, June, in Hangzhou, China.

Powers, P.E., J.W. Haus, and **Q. Zhan**. 2007. A narrow band and broadly tunable terahertz source. CERMACS2007-the Central Regional Meeting of the American Chemical Society, May 20-23, in Covington, Kentucky.

**Zhan, Q.** 2007. Enhancement of fluorescence signal with one dimensional photonic band gap structure. SPIE Photonic West, January, in San Jose, California.

Chen, W., and **Q. Zhan**. 2007. Optimal plasmonic focusing with radial polarization. SPIE Photonic West, January, in San Jose, California.

**Zhan, Q.** 2008. Human eyes, brittle stars and semiconductor metrology tools: What could they have in common? Institute of Bioengineering annual meeting, March, in Chapel Hill, North Carolina.

**Zhan, Q.**, and J. Dai. 2008. Beam shaping with vectorial vortex beams under low numerical aperture illumination condition. SPIE Annual Meeting, August, in San Diego, California.

**Zhan, Q.**, J.W. Haus, Z. Wu, and R.L. Nelson. 2008. Long-range surface plasmon devices design using subwavelength metal grating. OSA Topical Conference on Nanophotonics, May, in Nanjing, China.

- Zhan, Q.**, A.M. Sarangan, J. Gao, M. Pan, and A. Widjaja. 2008. Design and fabrication of an omnidirectional reflector as ultra-sensitive biochemical sensing platform. *SPIE Annual Meeting*, August, in San Diego, California.
- Powers, P.E., **Q. Zhan**, and S. Yang. 2008. Machining nonlinear optical crystals for waveguide frequency conversion. *OSA Topical Conference on Nanophotonics*, OSA, May, in Nanjing, China.
- Powers, P.E., **Q. Zhan**, S. Yang, J.M. Johnson, E.A. Blubaugh, and M.A. Roddy. 2008. Two-photon imaging of TiO<sub>2</sub>-molecular nanoprobe in living cells. *OSA Topical Conference on Nanophotonics*, May, in Nanjing, China.
- Chen, W., and **Q. Zhan**. 2008. Nanofocusing of surface plasmons in metallic nanostructures. *Ohio Nanotechnology Summit*, Center for Multi-functional Polymer Nanomaterials and Devices, April, in Mason, Ohio.
- Yang, S., M.A. Roddy, J.M. Johnson, E.A. Blubaugh, P.E. Powers, and **Q. Zhan**. 2008. Two-photon fluorescence studies of TiO<sub>2</sub>-molecular nanoprobe for measuring intra-cellular redox potential. *Ohio Nanotechnology Summit*, Center for Multi-functional Polymer Nanomaterials and Devices, April, in Mason, Ohio.
- Zhan, Q.** 2008. Organizing committee and technical committee member, session chair, *OSA Topical Conference on Nanophotonics*, in Hangzhou, China.
- INVITED LECTURES  
AND SEMINARS**
- Banerjee, P.P.**, G. Nehmetallah, R. Aylo, and P. Buranasiri. 2007. Dispersion relations for negative index materials and slow light. Invited paper, *Proceedings of SPIE 6698 Photonic Fiber and Crystal Devices*: 66980M-1 – 66980M-8.
- Banerjee, P.P.** 2008. Wave propagation through negative index materials. Invited lecture, Department of Mathematics, Baylor University.
- Schmidt, Jason D., Matthew E. Goda, and **Bradley D. Duncan**. 2007. Emulation of optical effects of atmospheric turbulence using two liquid-crystal spatial light modulators. In *Advanced Wavefront Control: Methods, Devices, and Applications V*, ed. Richard A. Carreras, John D. Gonglewski, and Troy A. Rhoadarmer, proceedings of SPIE 6711, 67110M, September 27.
- Jameson, Douglas F., Matthew P. Dierking, and **Bradley D. Duncan**. 2007. Effects of spatial averaging on coherent Ladar pulse-pair vibration measurements. *14th Coherent Laser Radar Conference*, July 8-13, in Snowmass, Colorado.
- Miller, Nicholas J., Matthew P. Dierking, and **Bradley D. Duncan**. 2007. Sparse aperture imaging. *14th Coherent Laser Radar Conference*, July 8-13, in Snowmass, Colorado.
- Greiner, Michael A., **Bradley D. Duncan**, and Matthew P. Dierking. 2007. Monte Carlo canopy propagation model. *14th Coherent Laser Radar Conference*, July 8-13, in Snowmass, Colorado.
- Duncan, B.D.**, and M.P. Dierking. 2008. Stripmap holographic aperture Ladar. *Aperture Synthesis Symposium of the 21st Annual Meeting of IEEE LEOS*, November 12, in Newport Beach, California.
- Miller, N.J., **B.D. Duncan**, and M.P. Dierking. 2008. Digital holographic image synthesis. *Aperture Synthesis Symposium of the 21st Annual Meeting of IEEE LEOS*, November 12, in Newport Beach, California.
- Haus, J.** 2007. Transparent metallo-dielectric stacks for tunable sub wavelength focusing. *SPIE Conference Photonics: Design, Technology and Packaging III*, December 5, in Canberra, Australia.
- Mel'nikov, Igor V., **Joseph W. Haus**, and Anton N. Knigavko. 2007. Superradiance steering and pinning in a two-dimensional resonance photonic crystal. *Conference on Coherence in Quantum Optics*, paper: CSuA42, *OSA Technical Digest* (CD).
- Siraj, Mohammad, **J.W. Haus**, Paras Prasad, and Paul Markowicz. 2007. Maximize the input angle for the self-collimation of photonic crystals composed of anisotropic materials by optimizing the dispersion surfaces. *Frontiers in Optics*, paper: FTuK6, *OSA Technical Digest* (CD).
- Grajales-Coutiño, Ruben, Baldemar Ibarra-Escamilla, Evgeny A. Kuzin, Olivier Pottiez, and **Joseph W. Haus**. 2007. Experimental investigation of self-starting in a passively mode-locked fiber laser based on a symmetrical NOLM. *Frontiers in Optics*, paper: FTuR2, *OSA Technical Digest* (CD).
- Mel'nikov, I.V. **J.W. Haus**, and A. N. Knigavko. 2007. Spontaneous decay and superradiance in a two-dimensional resonance photonic crystal. *Frontiers in Optics*, paper: FWD7, *OSA Technical Digest* (CD).
- Haus, J.** 2007. Dispersion and anisotropy in photonic crystals. *Workshop on Advances in Photonic Crystals*, September 28, in Capri, Italy.
- Haus, J.** 2007. Ladar and laser communications center. *Coherent Laser Radar Conference*, July 10, in Snowmass, Colorado.
- Haus, J.** 2007. Nanophotonics: Multi-layers and metamaterials two lectures. *Erice Nanophotonics Workshop*, June 27, in Erice, Italy.
- Haus, J.** 2007. Nanophotonics: Photonic crystals. *Erice Nanophotonics Workshop*. June 28, in Erice, Italy.
- Haus, J.** 2007. Maxwell Garnett electro-optic materials. *Photonics West*, January 24, in San Jose, California.
- Rojas-Laguna, Roberto, Jaime Gutiérrez-Gutiérrez, Evgeny A. Kuzin, Baldemar Ibarra-Escamilla, Sergio Mendoza-Vázquez, Julián Moisés Estudillo-Ayala, and **Joseph W. Haus**. 2007. Super continuum generation enhanced by conventional Raman amplification at pumping by nanosecond pulses from a directly modulated DFB laser. In *Nonlinear frequency generation and conversion: Materials, devices, and applications VI*, ed. Peter E. Powers, proceedings of SPIE 6455.
- Pandey, A.R., **J. W. Haus**, P.E. Powers. 2007. Two-stage PPLN parametric amplification for higher conversion efficiency. In *Nonlinear frequency generation and conversion: Materials, devices, and applications VI*, SPIE Photonics West.
- Ibarra-Escamilla, B., O. Pottiez, E. A. Kuzin, R. Grajales-Coutiño, **Joseph W. Haus**, and Roberto Rojas-Laguna. 2007. Experimental investigation of a

- figure-eight fiber laser with a symmetrical NOLM and highly twisted fiber-in-the-loop. In *Fiber lasers IV: Technology, systems, and applications*, SPIE Photonics West.
- Haus, J.W.** 2008. Photonic metamaterials. High school students, February 19, in Dayton, Ohio.
- Haus, J.W.** 2008. Chinese Academy of Science (SIOM), May 21, in Shanghai, China.
- Haus, J.W.** 2008. Selected linear and nonlinear phenomena in negative index materials. Zhejiang University, June 2, in China.
- Haus, J.W.** 2008. Novel approaches for selected problems in nonlinear optics. Student Chapter OSA, Humboldt Universitat, October 14, in Berlin, Germany.
- Haus, J.W.** 2008. Second harmonic propagation through plasmonic materials. International workshop on advances in nanoscale nonlinear optics, October 8-10, in Roma, Italy.
- Haus, J.W., **A.M. Sarangan**, and Q. Zhan. 2008. Nanophotonics – design, fabrication and characterization. OSA Annual Meeting, in Rochester, New York.
- Sarangan, A.M.** 2008. Nano-structured materials for imaging polarimetry. Miami University, November, in Oxford, Ohio.
- Zhan, Q.** 2007. Optimal plasmonic focusing and field enhancement for semiconductor metrology applications. The 6th Asia Pacific Near-field Optics Conference (APNFO6), June, in Yellow Mountain, China.
- Blackshire, James L., Adam Cooney, and **Qiwen Zhan**. 2007. Terahertz radiation as a nondestructive inspection tool. *The 3rd International Conference on Electromagnetic Near-field Characterization and Imaging*. (ICONIC 2007), June, in St. Louis, Missouri.
- Zhan, Q.** 2007. Polarization engineering of light and potential applications in fluorescence imaging. *CERMACS, the Central Regional Meeting of the American Chemical Society*, May, in Covington, Kentucky.
- Zhan, Q.** 2007. Nanometrology using spatially inhomogeneous polarization. Southeast University, June, in Nanjing, China.
- Zhan, Q.** 2007. Human eyes, brittle stars and semiconductor metrology tools: What could they have in common? School of Optometry, Indiana University, April, in Bloomington, Indiana.
- Zhan, Q.** 2007. Recent developments of optical nanometrology techniques using spatially-variant polarization. *Materials Engineering Seminar*, University of Dayton, April, in Dayton, Ohio.
- Zhan, Q.** 2007. Spatially inhomogeneous polarization and their potential applications in semiconductor metrology. Fraunhofer Institute for Nondestructive Testing, February, in Dresden, Germany.
- Zhan, Q.** 2008. Cylindrical vector beams and their applications in nanoscale imaging and manipulation. *Physics Seminar*, Lehigh University, October, in Bethlehem, Pennsylvania.
- Zhan, Q.** 2008. Subwavelength metal gratings and their applications. *Optics Seminar*, Institute of Optics and Electronics, Chinese Academy of Sciences, July, in Chengdu, China.
- Zhan, Q.** 2008. Human eyes, brittle stars and optimal plasmonic focusing for semiconductor metrology tools: What could they have in common? *Physics Seminar*, University of Science and Technology of China, May, in Hefei, China.
- Zhan, Q.** 2008. Recent developments of optical techniques for semiconductor characterization and metrology. *Materials Seminar*, University of Florida, April, in Gainesville, Florida.
- GRANTS AND AWARDS**
- Banerjee, P.P.** 2007. Attitude determination of aircraft using holographic interferometry. With DMS Tech, AEDC, SBIR, \$100K.
- Banerjee, P.P.** 2007. Holographic techniques for detecting raindrops and for biosensing. DMS, \$10K.
- Banerjee, P.P.** 2007. High speed non-invasive measurement technique for the visualization of droplet clouds. With DMS Tech, Army/SBIR, \$100K.
- Banerjee, P.P.** 2007. Metamaterial lens. With DMS Tech, DARPA/SBIR, \$100K.
- Banerjee, P.P.** 2008-09. Studies and evaluations of dynamic optical materials technology AFRL/ATT, October-April, \$91K.
- Banerjee, P.P.** 2008. Droplet characterization Phase I, January-October, \$100K, UD amount \$42K.
- Banerjee, P.P.** 2008. Metamaterial lens Phase I Army/DMS, January-October, \$100K, UD amount, \$33K.
- Banerjee, P.P.** 2008. Organic photorefractives characterization, ASEE, May-August, \$24K.
- Duncan, Bradley D.** 2007. Aperture synthesis research support. Optometrics/AFRL, \$117K.
- Duncan, Bradley D.** 2008. Sub-aperture based EO imaging systems. Phase I STTR Topic No. AF08-T021 in collaboration with RNET Technologies, Inc., Dayton, Ohio, \$50K.
- Haus, Joseph W.** 2005-08. Development and commercialization of long-wavelength infrared focal plane arrays. Ohio Third Frontier Wright Project, \$1,092,800.
- Haus, Joseph W.** 2006-08. LOCI AFRL/R Y Cooperative Agreement, \$4.7M.
- Haus, Joseph W.** 2007-09. IDCAST \$22.5M.
- Haus, Joseph W.** 2007-11. BAE Systems Grant to support the Ladar and Optical Communications Institute, \$250K.
- Haus, Joseph W.** 2007-11. Boeing Grant to support the Ladar and Optical Communications Institute, \$250K, 5 years.
- Haus, Joseph W.** 2007-11. Lockheed-Martin Grant to support the Ladar and Optical Communications Institute, \$250K, 5 years.
- Haus, Joseph W.** 2007-11. Raytheon Grant to support the Ladar and Optical Communications Institute, \$250K, 5 years.
- Haus, Joseph W.** 2007-11. Textron Systems Grant to support the Ladar and Optical Communications Institute, \$250K, 5 years.
- Haus, J.** 2007. Ladar development. Federal Appropriations, \$1.52M.

**Haus, J.** 2007. DAGSI student faculty research grant. DAGSI, \$48,510.

**Haus, J.** 2007. Image restoration to combat out of focus blue and other degradations. ATT Federal Solutions, \$25K.

**Haus, J.** 2007-09. IDCAST. ODOT, \$28M.

**Haus, Joseph W.** 2008. Fellow, American Physical Society.

**Sarangan, A.** 2007. Multispectral/polarimetric imaging camera program. AFRL/L3-CE, \$202K.

**Sarangan, A.** 2007. Micro-optic IR FPA Project. L3-CE, \$21K.

**Sarangan, A.** 2007. Advanced anti-reflection coating. General Dynamics, \$10K.

**Sarangan, Andrew M.** 04/08-10/09. Anti-reflection coatings. AFRL (Subcontract through General Dynamics Information Technology), \$20K.

**Sarangan, Andrew M.** 10/08 - 09/09. Development of advanced infrared detectors. AFRL, \$78,016.

**Sarangan, Andrew M.** 02/07-01/10. Polarimetric imaging technology. Institute for the Development and Commercialization of Advanced Sensors Technology (IDCAST), \$200K.

**Sarangan, Andrew M.** 09/04-12/08. Micro-optic IR FPA project L3. Cincinnati Electronics, \$126,727.

**Sarangan, Andrew M.** 01/05-03/09. Development and commercialization of long-wavelength infrared focal plane arrays. Ohio Third Frontier Wright Project, \$1,092,800.

**Sarangan, Andrew M.** 10/08-09/10. Interdisciplinary technology development for future MAV systems. AFRL, \$1,506,500.

**Sarangan, Andrew M.** 2008. Noland Award for Excellence in Research, University of Dayton Sigma Xi Chapter.

**Zhan, Q.** 2007. Modeling of the curvature sensing capability for ReSTOR optics metrology. Alcon Research Labs, \$12,500.

**Zhan, Q.** 2007. Bio-engineering fellowship. University of Dayton

Graduate School, \$33K.

**Zhan, Q.** 2007. DAGSI full fellowship. DAGSI, \$100K.

**Zhan, Q.** 2007. Applied materials graduate fellowship. Applied Materials, \$35K.

**Zhan, Q.** 2008. Nanoporous films for low cost high efficiency solar cell. SEE Program, \$10K.

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**Haus, Joseph W.** 2008. *Chinese Optics Letters*, Associate Editor-in-Chief.

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## Engineering Management and Systems

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## BOOK CHAPTERS

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**Ebeling, Charles.** 2007. A comparative analysis of distance learning versus on-campus course deliveries. *American Society of Business and Behavioral Sciences Conference*.

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## CONFERENCES

**Doty, J.H.,** J.A. Camberos, and R.M. Kolonay. 2008. Development of a surrogate lift coefficient model for more efficient aerospace engineering analyses. *33<sup>rd</sup> AIAA Dayton-Cincinnati Aerospace Sciences Symposium*, March 4, in Dayton, Ohio.

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**Doty, J.H.,** J.A. Camberos, and D.J. Moorhouse. 2008. Benefits of exergy-based analysis for aerospace engineering applications. *40<sup>th</sup> AIAA Thermophysics Conference*, 4355, June 23-26, in Seattle, Washington.

**Doty, J.H.,** R. Deep, C. Ebeling, J. Litko, and D. Shaw. 2008. A comparative analysis of student perceptions of live classroom teaching, live distance learning and recordings. Presented at the *American Society of Business and Behavioral Sciences' 15<sup>th</sup> Annual Meeting*, February, in Las Vegas, Nevada.

## REPORTS AND RESEARCH

**Doty, J.H.** 2007. Exergy-based analysis for design of aerospace vehicles. AFRL, *Summer Faculty Report*, January.

**Doty, J.H.** 2008. Designed experiments for computational fluid dynamics. AFRL, *Summer Faculty Report*, August.

## INVITED PRESENTATIONS

**Doty, J.H.** 2008. Advanced statistical methodologies applied to computational fluid dynamics: Validation of results. AFRL, *Faculty Research Program*, February.

**Doty, J.H.** 2008. Advanced statistical methodologies applied to computational fluid dynamics: Extensions to surrogacy. AFRL, *Faculty Research Program*, March.



## Teaching Plus: University of Dayton Design and Global Focus

Rebecca Blust, encouraged by her parents not to follow a traditional career path, attended the University of Dayton (UD) and graduated with a B.S. in mechanical engineering technology. She followed her undergraduate degree with an MBA from Wright State University and an M.S. in management science from UD.

Blust worked for Goodyear Tire as their business center manager for automotive manufacturing and traveled internationally with their global management team. Not far from the UD network and after twelve years with Goodyear, she joined UD's Department of Engineering Technology. Today, Blust teaches for engineering technology and also coordinates design projects for UD's Innovation Center Design and Manufacturing Clinic (DMC).

DMC is one of the top design clinics in the nation, and Blust serves as liaison between industry and the international student design teams.

Her challenges include finding appropriate projects and facilitating international teams, so DMC students will benefit from team-based global knowledge. A letter sent to Blust from a former student revealed that the "international design team experience was painful when going through it; it was challenging from a technical and emotional perspective...but now I realize it was one of the best courses that I could have taken to prepare me for what I am doing in industry today."

As Blust says, "Every semester is different...different personalities, thoughts, and experiences...but working together will benefit all."

Blust also teaches through UD's study abroad program. In 2006, in China, she taught *Lean Manufacturing Methods* and *Project Management*; and in 2009, in Germany, she taught *Lean Manufacturing Methods*.

Her research includes: lean manufacturing, project management, engineering management, dynamics, statics, and strengths of materials.

She co-authored a paper with Scott Schneider: *Integrating Chinese Students into an American Capstone Engineering Technology Design Course*, which she presented at the 2008 International Association of Journals and Conferences / International Journal of Modern Engineering conference.

She also worked with Margaret Pinnell, Jayne Brahler and Margy Stevens and co-authored: *Can Service Learning in K-12 Math and Science Classes Affect a Student's Perception of Engineering and Their Career Interests?* and *Making Connections: Resources for K-12 Service-Learning and Experiential Learning in STEM Disciplines*, which she presented at the 2008 Frontiers in Education Conference. The team received a \$200,000 grant award from the National Science Foundation for their work.

Blust was also part of a committee that secured a successful \$50,000 grant award from the Kern Entrepreneurship Education Network (KEEN). The Kern Family Foundation's award is to instill and to integrate an entrepreneurial mind set in engineering students. The Foundation has invited the committee to re-apply for the award in 2010, and Blust will again be a part of the team.

Through a National Science Foundation Advance Grant, she was recently appointed Equity Advisor through UD's School of Engineering to monitor and assess institutional policies and progress in developing and maintaining an equitable environment for all STEM (Science, Technology, Engineering, and Mathematics) faculty. Her responsibilities include faculty recruitment, advancement and compensation equity. As Equity Advisor, Blust also assists the LEADER Consortium, a collaborative effort between UD, Wright State University, Central State University, and the Air Force Institute of Technology. The LEADER Consortium aims to implement best practices to increase STEM recruitment, advancement, and retention of tenure-track women faculty in the Dayton region by providing women scientists and engineers an environment that promotes equity, satisfaction, and success.

Blust volunteers for the School of Engineering's Women in Engineering Summer Camp and other programs and is faculty advisor for Phi Sigma Rho, the women's engineering sorority at UD.

One of her favorite roles is director of *Camp Invention*. *Camp Invention*, modeled after UD's DMC, is a popular camp for children K-5 – using broken appliances, the children fix, create, or invent by following a project design process/method.

Enjoying roles from global to local, Blust says, "we can make it better."



**Doty, J.H.** 2008. Advanced statistical methodologies applied to computational fluid dynamics: Applications to design. AFRL, Faculty Research Program, April.

## GRANTS AND AWARDS

**Doty, J.H.** 2008. NASA contract to enhance life-cycle costing models for manned, unmanned, reusable, and expendable launch vehicles. \$70K.

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## Engineering Technology

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**Blust, R.P.,** and **S. Schneider.** 2008. Integrating Chinese students into an American capstone engineering Technology Design Course. *International Journal of Modern Engineering* (October).

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**Falkowski, S.** 2008. Analysis of the curriculum of manufacturing engineering technology programs. Proceedings of the *ASEE Annual Conference*.

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**Myszka, D.** 2008. Singularity analysis of rigid body, closed-loop, shape-changing mechanisms. *ASME Design Engineering Technical Conference (DETC)*.

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**Myszka, D.** 2008. Mechanization of shape-changing, rigid-body linkage. *ASME Dayton Engineering Sciences Symposium*.

**Myszka, D.** 2008. Fatigue testing of out-of-plane counterweights for a high speed application. *ASME Dayton Engineering Sciences Symposium*.

**Schneider, S.** 2008. Using programming projects in an operating systems course as a capstone software engineering experience. Proceedings of the *American Society of Engineering Educators Annual Conference & Exposition*, June, in Pittsburgh, Pennsylvania.

**Schneider, S.,** and **R. Blust.** 2008. Integrating Chinese students into an American capstone engineering technology design course. Proceeding of the *International Journal of Engineering International Conference*, November.

**Summers, D.** 2008. Increasing awareness about service industries opportunities for IET and IE graduates. *ASEE Annual Conference*, June, in Pittsburgh, Pennsylvania.

### GRANTS AND AWARDS

**Blust, R.** 2008. Making connections: Resources for K-12 service-learning and experiential learning in STEM disciplines. National Science Foundation, Research on Gender in Science and Engineering, \$200K over 24 months.

**Falkowski, S.** 2008. Member of national advisory board for NCME. Detailed plans, new clearinghouse for manufacturing engineering education materials. Funded at \$1.6M.

**Globig, J.** 2008. Eleven tons of marble sheeting saved from demolition, Marycrest Hall, recycled into sculptures to be located throughout UD campus. Member of UD Sustainability Sculpture Design, grant funded by Enhancing Student Culture for Academic Engagement and Excellence.

**Schneider, S.,** and **D. Myszka.** 2008. Developed low-cost signal conditioning module for use in data acquisition and instrumentation laboratories, ECETDHA Grant.

**Wolff, R.** 2008. *Enhancing the role of the National Center for Manufacturing Education.* Contracted with NCME and the AIM Center. National Science Foundation, \$1.8M grant. This NSF effort has been awarded more than \$20M to date.

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## Mechanical and Aerospace Engineering

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### JOURNAL AND MAGAZINE ARTICLES

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Kaplan, Sergey, **Aaron Altman,** and Michael Ol. 2007. Wake vorticity measurements for low aspect ratio wings at low Reynolds number. *Journal of Aircraft* 44, no. 1, (January-February): 241-251.

Garnet, Mark, and **Aaron Altman.** 2008. Identification of any aircraft by its unique turbulent wake signature. *Journal of Aircraft*, (August).

Hong, Young Sun, and **Aaron Altman.** 2008. Lift from spanwise flow in simple flapping wings. *Journal of Aircraft* 45, no. 4 (July-August): 1206-1216.

Kang, H., N. Genco, and **A. Altman.** 2008. Gap and stagger effects on biplanes with end plates, Part I. *47<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 09-1085, January, in Orlando, Florida.

Genco, N., and **A. Altman.** 2008. Parametric study of the performance of a biplane joined at the tips. *47<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 09-0206, January, in Orlando, Florida.

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Orlando, Florida.

Stanley, D., and **A. Altman**. 2008. An investigation of flow three-dimensionality using a flat plate and insects. *47<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 09-0389, January, in Orlando, Florida.

Rausch, J., and **A. Altman**. 2008. Effect of plunge velocity profile on formation parameter applied to flat plates. *47<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 09-0388, January, in Orlando, Florida.

Landolfo, G., and **A. Altman**. 2008. Aerodynamic and structural design of a small nonplanar wing UAV. *47<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 09 -1068, January, in Orlando, Florida.

Bichal, A., **A. Altman**, A. Briones, and Scott Stouffer. 2008. Comparative study of three flow diagnostic techniques applied to a near-body flowfield. *47<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 09 -0844, January, in Orlando, Florida.

**Altman, A.** 2008. Investigation into the application of formation parameter to flapping wings, final report. Air Force Office of Scientific Research, Grant/ Contract Number: FA9550-07-1-0583, December.

**Altman, A.** 2008. Unique stealth UAV Houck aircraft design program, final report. Wright Brothers Institute, Sub-recipient Agreement # WBSC 9017UDA, June.

Briones, Alex, Scott Stouffer, Abhishek Bichal, Hantae Kang, **Aaron Altman**, Edwin Corporan, and Vincent Belovich. 2008. Aspiration efficiencies of a soot-particulate sampling probe with dilution under gas turbine conditions. *44<sup>th</sup> AIAA / ASME / SAE / ASEE Joint Propulsion Conference and Exhibit*, 08-4877, July, in Hartford, Connecticut.

Kang, H., A. Bichal, and **A. Altman**. 2008. Aerodynamic performance effects of joining biplane wings with end plates. *46<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 08-317, January, in Reno, Nevada.

Stanley, D., J. Rausch, and **A. Altman**. 2008. An application of formation

parameter to various species of insect. *46<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 08 -418, January, in Reno, Nevada.

Corrigan, E., and **A. Altman**. 2008. Survey of small UAV electric propulsion systems, *46<sup>th</sup> AIAA Aerospace Sciences Meeting and Exhibit*, 08 -179, January, Reno, Nevada.

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McCarty, R., **K.P. Hallinan**, B. Sanders, and T. Sophomone. 2007. Enhancing thermoelectric energy recovery via modulations of source temperature for cyclical heat loadings. *ASME J. of Heat Transfer* 129, no. 6 (June): 749-755.

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Carpenter, K., and **K. Kissock**. 2007. Energy efficient process heating: Managing air flow. Society of Automotive Engineers 2006 Transactions, *Journal of Engines* (March).

Carpenter, K., and **K. Kissock**. 2007. Energy efficient process heating: Insulation and thermal mass. Society of Automotive Engineers 2006 Transactions, *Journal of Engines* (March).

**Kissock, K.**, and C. Eger. 2008. Measuring industrial energy savings. *Journal of Applied Energy* 85, no. 5 (May): 347-361.

Eger, C., and **K. Kissock**. 2008. Guiding industrial energy management by measuring savings from energy-efficient practices. Society of Automotive Engineers 2007 Transactions, *Journal of Materials and Manufacturing* (August).

Thokchom, J.S., and **B. Kumar**. 2007. Ionically conducting composite membranes from the  $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{TiO}_2-\text{P}_2\text{O}_5$  glass ceramic. *J. Amer. Ceram. Soc.* 90, no. 2: 462-466.

**Kumar, B.**, and C. Chen. 2007. Ionic conductivity of scandia-stabilized zirconia and alumina composites. *Trans. Indian Ceramic Society* 66, no. 1: 17-22.

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## Living in the Maelstrom

**K**evin Hallinan, contemplating a mechanical engineering career, was undecided until he heard a speech about energy by President Jimmy Carter. A connection was made, and his decision was made.

Now, as chair and professor of the University of Dayton's (UD) Department of Mechanical and Aerospace Engineering, Hallinan commits to administration, academics and research. He does not slow down and says, "I live in the maelstrom."

In January 2009, he helped launch a new *Renewable and Clean Energy Graduate Program* within the department. It sparked hundreds of inquiries nationally and internationally. The question now, according to Hallinan, is how to integrate bringing renewable energy and energy efficiency into the world.

The *Renewable and Clean Energy Program* is designed to help address the need for stable, clean and economical energy sources. In cooperation with Wright State University, Central State University, and the Air Force Institute of Technology, the program offers designing building systems such as geothermal, solar, and wind systems and creating efficient and sustainable energy for commercial buildings, industrial manufacturing processes, and residences.

As director of the program, Hallinan is also part of the *Center for Strategic Energy and Environmental Informatics*, which was recently selected by Ohio Governor, Ted Strickland, to be one of seven university energy centers in the state.

This center combines world class strengths in energy, environmental and biological informatics to help Ohioans improve energy efficiency and reduce environmental impacts. Strategic opportunities for reductions in energy consumption and environmental impacts yield the potential to save Ohioans and Ohio's industry billions of dollars.

In addition to energy programs and centers, Hallinan supports service-learning programs and encourages participation in the School of Engineering's program—Engineers for Technical Humanitarian Opportunities for Service-Learning (ETHOS). He believes that it is a "broad umbrella that all engineers should be under." The National

Science Foundation agrees and recently awarded the ETHOS Sustainable Engineering Learning Community \$750,000.

And by combining ETHOS with energy-efficiency, the local United Way benefits. Mechanical engineering undergraduate and graduate students collect and analyze energy data from local United Way buildings for energy-efficient solutions, and their results produce energy-positive changes.

Recently, the City of Yellow Springs Committee Partnership Organization requested help with an efficient and sustainable energy plan for their city. Hallinan, Kelly Kissock, mechanical engineering; Bob Brecha, physics; and Austin Mitchell, senior mechanical engineering student collected electricity data about every residential and commercial building in the city. Using methodologies that

Kissock initiated, the team analyzed historical billing energy data and monthly usage; and correlated it with weather data, average monthly temperatures and other relative information to personalize energy-saving plans for every structure in Yellow Springs. They also accumulated intellectual energy data and methodologies for development of an energy-savings tool. As Hallinan says, "Yellow Springs may become a social change agent for the U.S."

Investigating heat exchangers in combination with solar-paneled roofs for transitioning homes from natural gas heat to solar heat was another project that he worked on with Brendan O'Grady. Today, they have integrated the solar/thermal system into the roof. The solar panels are not in addition to the roof; they are the roof. It was basic technology with a creative, innovative twist.

As chair of the mechanical and aerospace department, Hallinan's main responsibility is to almost 500 undergraduate students and over 100 graduate students.

He also enjoys teaching at least one sophomore class a semester, twisting textbook problems with "real-life situation designs" and watching students grow and discover.

Hallinan, living in the maelstrom, maintains balance as a lifelong learner studying music, poetry, literature and theology – the humanities.



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- Elgafy, A., and **K. Lafdi**. 2007. Engineering solution in monitoring nanoparticle-fluid flow during nanocomposites processing. *Journal of Nanoparticle Research* 9, no 3: 441-454.
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- Tyler, C., **A. Altman**, T. Fry, and M. Neeley. 2007. Evaluation of conceptual aircraft through experimentation and computation. *25<sup>th</sup> AIAA Applied Aerodynamics Conference*, June, in Miami, Florida.
- Bichal, Abhishek, and **Aaron Altman**. 2008. Particle shadow velocimetry validation of near-body flowfield computational results. *AIAA Region III Regional Student Conference*, April, at Western Michigan University.
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- Rausch, Jonathan, and **Aaron Altman**. 2008. The effect of hysteresis on the vortex formation and formation parameter for flat plates. *AIAA Region III Regional Student Conference*, April at Western Michigan University. (First Place, Graduate Division, presentation only)
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- Ervin, J.S.**, and T.M. Bartsch. 2007. Simulations of fuel tank temperatures within U.S. Air Force cargo aircraft as part of a JP-8 replacement study. Presented at the *10<sup>th</sup> International Conference on Stability, Handling and Use of Liquid Fuels*, October, in Tucson, Arizona.
- Jiang, H., **J.S. Ervin**, S. Zabarnick, and P. Ramineni. In progress. Simulations of jet fuel flow under supercritical conditions.
- Kocoloski, M., R. McCarty, C. Eger, **K. Hallinan**, and K. Kissock. 2007. Industrial solid-state energy harvesting: Mechanisms and examples. *ACEEE Summer Study on Energy in Industry*, July 24-27, in White Plains, New York.
- Romanin, Vince, and **Kevin Hallinan**. 2007. Net zero energy building. *3<sup>rd</sup> Dayton Engineering Sciences Symposium*, October.
- Robbins, Thomas, and **Kevin Hallinan**. 2007. Organic one-dimensional thermoelectric devices. *3<sup>rd</sup> Dayton Engineering Sciences Symposium*, October.
- Romanin, V., **K. Hallinan**, and K. Kissock. 2008. Building integrated solar thermal and hydronic heating/cooling system. *Intl. Mechanical Engineering Congress and Exposition*, November.
- Hallinan, K.**, K. Kissock, and M. Pinnell. 2008. Teaching energy engineering and practice for a sustainable future in undergraduate mechanical engineering. *Intl. Mechanical Engineering Congress and Exposition*, November.
- Mazdiyazni, S. and **V.K. Jain**. 2007. Opportunities and challenges in NDE and health monitoring of turbine engine components. Presented at the *Review of Progress in Quantitative NDE*, July 22-27, in Golden, Colorado.
- Kashani, R.** 2008. Low-frequency screech mitigation via tuned vibro-acoustic damping. Submitted to the *ASME International Gas Turbine Institute Conference*.
- Mahmoudian, P., and **R. Kashani**. 2008. Active stiffness control of an air-mounted isolation systems. Submitted to the *ASME International Mechanical Engineering Conference and Exposition*.
- Kashani, R.** 2008. Low frequency room acoustics. *Audio Engineers Society meeting*, October, in San Francisco, California.
- Kashani, R.** 2008. Active boom noise damping in a car-cabin. VOLVO heavy construction equipment, December, in Shippensburg, Pennsylvania.
- Kocoloski, M., R. McCarty, C. Eger, K. Hallinan, and **K. Kissock**. 2007. Industrial solid-state energy harvesting: Mechanisms, and examples. *ACEEE Summer Study on Energy in Industry*, July 24-27, in White Plains, New York.
- Syed, R., P. Kleinhenz, and **K. Kissock**. 2007. Net energy costs of skylights. *ACEEE Summer Study on Energy in Industry*, July 24-27, in White Plains, New York.
- Carpenter, K., and **K. Kissock**. 2007. Common excess air trends in industrial boilers with single-point positioning control and strategies to optimize efficiency. *ACEEE Summer Study on Energy in Industry*, July 24-27, in White Plains, New York.
- Eger, B., and **K. Kissock**. 2007. Understanding industrial energy use through sliding regression analysis. *ACEEE Summer Study on Energy in Industry*, July 24-27, in White Plains, New York.
- Trombley, D., and **K. Kissock**. 2007. Economics of energy efficiency in a carbon constrained world. *ACEEE Summer Study on Energy in Industry*, July 24-27, in White Plains, New York.
- Gilbert, R., and **K. Kissock**. 2007. The effect of thermal mass on thermal transmission loads. *ASME International Solar Energy Conference*, June 27-30, in Long Beach, California.
- Mirza, K., and **K. Kissock**. 2007. An analytical solution for determining dynamic thermal loads through walls. *ASME International Solar Energy Conference*, June 27-30, in Long Beach, California.
- Raffio, G., O. Isambert, G. Mertz, C. Schreier, and **K. Kissock**. 2007. Targeting residential energy assistance programs. *ASME International Solar Energy Conference*, June 27-30, in Long Beach, California.
- Mertz, G., G. Raffio, and **K. Kissock**. 2007. Cost optimization of the University of Dayton net-zero energy house. *ASME International Solar Energy Conference*, June 27-30, in Long Beach, California.
- Kissock, K.** 2007. Inside-out approach

- to energy-efficient process cooling. *Society of Automotive Engineers World Congress and Exposition*, April 16-19, in Detroit, Michigan.
- Eger, C., and **K. Kissock**. 2007. Guiding industrial energy management by measuring savings from energy-efficient practices. *Society of Automotive Engineers World Congress and Exposition*, April 16-19, in Detroit, Michigan.
- Kissock, K.**, K. Hallinan, M. Pinnell, and P. Doepker. 2008. Teaching energy engineering for a sustainable future. *ASME International Mechanical Engineering Congress and Exposition*, October 31-November 6, in Boston, Massachusetts. (Abstract accepted)
- Kissock, K.** and S. Mulqeen. 2008. Targeting energy efficiency programs using advanced billing analysis. *ACEEE Summer Study on Energy Efficiency in Buildings*, August 17–22, in Pacific Grove, California.
- Carpenter, K., **K. Kissock**, C. Schmidt. 2008. Common boiler excess air trends and strategies to optimize efficiency. *ACEEE Summer Study on Energy Efficiency in Buildings*, August 17-22, in Pacific Grove, California.
- Persinger, J., J. Schmiedeler, and **A. Murray**. 2007. Synthesis of planar shape-changing rigid-body mechanisms approximating closed curves. *ASME International Design Engineering Technical Conferences*, September 4-7, in Las Vegas, Nevada.
- Myszka, D., **A. Murray**, and J. Schmiedeler. 2007. Assessing position order in rigid body guidance: An intuitive approach to fixed pivot selection. *ASME International Design Engineering Technical Conferences*, September 4-7, in Las Vegas, Nevada.
- Grimm, E., **A. Murray**, and M. Turner. 2007. Software for the kinematic synthesis of coupler-driven spherical four-bar mechanisms. *ASME International Design Engineering Technical Conferences*, September 4-7, in Las Vegas, Nevada.
- Perkins, D., M. Turner, and **A. Murray**. 2007. Static analysis of torque and coupler driven spherical four-bar mechanisms with an applied load. *ASME International Design Engineering Technical Conferences*, September 4-7, in Las Vegas, Nevada.
- Murray, A.**, and F. Pierrot. 2007. Design of a high-speed spherical four-bar mechanism for use in a motion common in assembly processes. *ASME International Design Engineering Technical Conferences*, September 4-7, in Las Vegas, Nevada.
- Turner, M., E. Grimm, D. Debrosse, K. Kosmac, and **A. Murray**. 2007. Software for investigating the kinematics, statics and dynamics of coupler-driven four-bars for two position synthesis. *ASME International Design Engineering Technical Conferences*, September 4-7, in Las Vegas, Nevada.
- Turner, M., E. Grimm, D. Debrosse, K. Kosmac, and **A. Murray**. 2007. Statically equivalent serial chains. *Journées Nationales de la Robotique Humanoïde*, March, in Montpellier, France.
- Cotton, S., **A. Murray**, P. Fraisse. 2008. Statically equivalent serial chains for modeling the center of mass of humanoid robots. Proceedings of the 2008 IEEE-RAS International Conference on Human Robotics, December 1-3, in Daejeon, Korea.
- Myszka, D.H., **A. Murray**, and J.P. Schmiedeler. 2008. Singularity analysis of rigid-body, closed-loop, shape changing mechanisms. Proceedings of the 2008 ASME International Design Engineering Technical Conferences, August 3-6, in New York.
- Grabinski, C., **K. Lafdi**, and S. Hussain. 2007. Biocompatibility of carbon nanomaterials. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Grabinski C., S. Shaikh, and **K. Lafdi**. 2007. Effect of carbon nanomaterials on respiratory mucus. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Almajali M., S. Shaikh, and **K. Lafdi**. 2007. PCM encapsulated carbon foam behavior under transient heat flux. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Debelak, B., and **K. Lafdi**. 2007. Growth mechanisms of graphite nanoflakes. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Debelak, B., and **K. Lafdi**. 2007. Use of exfoliated graphite filler to enhance polymer physical properties. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Shaikh, S., and **K. Lafdi**. 2007. The effect of a CNT interface on the thermal resistance of contacting surfaces. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Shaikh, S., and **K. Lafdi**. Thermal conductivity improvement in carbon nanoparticle doped PAO-oil. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Shaikh, S., and **K. Lafdi**. 2007. Effect of carbon materials on thermal wear of sliding surfaces. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Czarnecki, J., **K. Lafdi**, and P. Tsonis. 2007. Osteoblast proliferation on carbon-based materials. *International Carbon Conference*, July 15-20, in Seattle, Washington.
- Petrykowski, John C.** 2007. Axial motion of UO<sub>2</sub> vapor bubbles in sodium cooled fast reactor safety experiments. *American Nuclear Society -European Nuclear Society 2007 Winter Meeting*, November, in Washington, D.C.
- Pinnell, M.**, et al. 2007. Failure analysis of explanted Ti Alloy Screws. *NACE International Corrosion Conference and Exposition*, March.
- Pinnell, M. F.**, C. Schreier, and C. Eger. 2007. International technical service immersions: Model for developing global scientists and engineers in small to mid-size universities. *ASEE Annual Conference and Exposition*, June.
- Blust, R., and **M. Pinnell**. 2007. Making connections: Resources for K-12 service-learning and experiential learning in STEM disciplines. *ASEE Annual Conference and Exposition*, June.
- Pinnell, M.**, M. Strunks, and S. Wallace. 2008. Infusing service-learning and mentorship into pre-engineering programs as a means for encouraging diversity in the field of engineering. *ASEE North Central Section Conference*, March.

- Pinnell, M. F.**, and S.I. Hill. 2008. Assessment of techniques used to measure strain during high rate tensile testing of polymeric materials. *SAE World Congress*, April.
- Pinnell, M.**, R. Blust, and J. Brahler. 2008. Making connections between service and engineering in K-12 education. *ASEE International Conference and Exposition*, June.
- Pinnell, M.F.**, M. Vehar, and P. Aaron. 2008. Integrating international service-learning experiences in multiple engineering courses. *3rd Conference on International Service-Learning: Advancing Research and Practice*, February 29-March 1.
- Corporan, E., M. Kahandawala, M. DeWitt, and **S. Sidhu**. 2007. Ignition and emission characteristics of synthetic jet fuels. *International Workshop on Combustion-Generated Fine Carbon Particles*, May 13-16, in Anacapri, Italy.
- Sidhu, S.**, V. Belovich, M. Colket, M. Kahandawala, V. Katta, D. Liscinsky, T. Litzinger K. McNesby, R. Pawlik, M. Roquemore, R. Santoro, and S. Stouffer. 2007. The effects of phosphorus compounds on PAH and soot across a suite of laboratory devices. *5th U.S. Combustion Meeting*, March 25-28, at University of California, in San Diego, California.
- Colket, M., T. Litzinger, M. Kahandawala, V. Katta, S.L. Lee, D. Liscinsky, K. McNesby, A. Menon, M. Roquemore, R. Santoro, **S. Sidhu**, S. Stouffer. 2007. The effects of nitrogen-containing compounds on PAH and soot across a suite of laboratory devices. *5th U.S. Combustion Meeting*, March 25-28, at the University of California, in San Diego, California.
- Litzinger, T., M. Colket, M. Kahandawala, V. Katta, S.Y. Lee, D. Liscinsky, K. McNesby, R. Pawlik, M. Roquemore, R. Santoro, **S. Sidhu**, S. Stouffer, and J. Wu. 2007. The effects of oxygenated compounds on PAH and soot across a suite of laboratory devices. *5th U.S. Combustion Meeting*, March 25-28, at the University of California, in San Diego, California.
- Grinstead, Keith D., Sukesh Roy, Terrence R. Meyer, Moshan Kahandawala, **Sukh S. Sidhu**, Campbell Carter, and James R. Gord. 2007. Measurements of temperature and OH concentration in a shock tube using TDLAS. *32nd Annual Dayton-Cincinnati Aerospace Science Symposium*, March 6, in Dayton, Ohio.
- Fullana, Andres, **Sukh Sidhu**, Phil Taylor, Omar Mendoza and Thomas Naguy. 2007. Conversion of plastic media blast waste to usable fuel. *Alternate Energy Now*, February 21-22, in Orlando, Florida.
- Sidhu, Sukh**. 2007. Impact of flame retardants on soot and PAH emissions. *18th International Karasek Conference*, June, in Varrena, Italy.
- Varanasi, P., and **S.S. Sidhu**. 2007. Mercury transformation reactions on coal and model fly ashes. The *10th International Congress on Combustion By-Products and their Health Effects*, in Ischia, Italy.
- Kondaveeti, Rajiv, Moshan Kahandawala, and **Sukh Sidhu**. 2007. Impact of brominated compounds on combustion emissions. The *10th International Congress on Combustion By-Products and their Health Effects*, in Ischia, Italy.
- DeWitt, M.J., R. Striebich, L. Shafer, **S. Zabarnick**, W.E. Harrison III, D.E. Minus, and T. Edwards. 2007. Evaluation of fuel produced via the Fischer-Tropsch Process for use in aviation applications. Paper 58b, Proceedings of the *AICHE Spring National Meeting*.
- DeWitt, M.J., **S. Zabarnick**, T. Williams, Z. West, L. Shafer, R. Striebich, S. Breitfield, C. Delaney, and D. Phelps. 2007. Determination of minimum required FSII dosage for use on USAF aircraft. Proceedings of the *10th International Conference on Stability, Handling and Use of Liquid Fuels*.
- Zabarnick, S.**, Z. West, M.J. DeWitt, L. Shafer, R. Striebich, C. Delaney, and D. Phelps. 2007. Development of alternative fuel system icing inhibitor additives that are compatible with aircraft tank topcoat material. Proceedings of the *10th International Conference on Stability, Handling and Use of Liquid Fuels*.
- Shaeffer, S.K. 2007. Loss of fuel system icing inhibitor additive during fuel transport and storage. Presented by **S. Zabarnick**, at the *10th International Conference on Stability, Handling and Use of Liquid Fuels*, October, in Tucson, Arizona.
- Zabarnick, S.**, and M.J. DeWitt. 2007. AFRL fuel system icing inhibitor programs – FSII reduction and DiEGME replacement. *SAE Aerospace Fuel, Oil, and Oxidizer Systems AE-5 Committee*, April, in Orlando, Florida.

#### INVITED LECTURES AND SEMINARS

- Ballal, D.R.** 2007. Alternative fuels in aviation. University of Toronto, in Toronto, Canada.
- Ballal, D.R.** 2007. Alternative fuels and combustion research for military applications. Seminar at Naval Postgraduate School, May, in Monterey, California.
- Ballal, D.R.** 2008. Alternative fuels in gas turbine applications. *ASME Turbo Exposition and Congress*, June, in Berlin, Germany.
- Doyle, G.** 2008. Presentations at ASME District B Student Leadership Seminar.
- Doyle, G.** 2008. Presentations at ASME District B Senior Leadership Seminar.
- Hallinan, K.**, K. Kissock, M. Pinnell, J. Allen, and R. Bailey. 2008. Teaching energy engineering and practice for a sustainable future in undergraduate mechanical engineering. *Intl. Mechanical Engineering Congress and Exposition*, November.
- Kashani, R.** 2007. Cabin/room acoustics and power systems on-board large watercrafts. *Project USA* for marine industry, May, in San Diego, California.
- Kashani, R.** 2007. Computer controlled air isolation system for diesel generators on-board large watercrafts. *Global Superyacht Forum*, October, in Amsterdam, Netherland.
- Kissock, K.** 2007. Insights on energy: The impact of efficiency, DPL energy. University of Dayton Industrial Assessment Center, November 6, in Dayton, Ohio.
- Kissock, K.** 2007. Energy efficient technologies and measures. Bryan Municipal Electric, September 13, in Bryan, Ohio.



- Kissock, K.** 2007. Energy efficient technologies and measures. Bowling Green Municipal Utilities, September 18, in Bowling Green, Ohio.
- Kissock, K.** 2007. Energy efficient technologies and measures. Minster Municipal Utilities, September 20, in Minster, Ohio.
- Kissock, K.** 2007. Energy efficient technologies and measures. Painesville Municipal Electric, October 18, in Painesville, Ohio.
- Kissock, K.** 2007. Energy audit best practices. *3rd Annual E Source Major Accounts Training Conference and Summit*, May 9-11, in Boston, Massachusetts.
- Kissock, K.** 2007. Targeted energy efficiency with multi-facility benchmarking. *E Source Energy Managers' Roundtable*, May 9-11, in Boston, Massachusetts.
- Kissock, K.** 2007. E/3 and beyond. *Green Energy Ohio*, April 26, in Cincinnati, Ohio.
- Kissock, K.** 2007. Energy efficiency in a carbon constrained world. *Ohio Energy Management and Restructuring Conference*, February 27-28, in Columbus, Ohio.
- Kissock, K.** 2008. Net-zero energy buildings. *ASHRAE*, October, in Dayton, Ohio.
- Kissock, K.** 2008. Energy efficient technologies and measures. Tipp City Municipal Utilities, May 21, in Tipp City, Ohio.
- Kissock, K.** 2008. Manufacturing energy efficiency. Techsolve P2 Training, May, in Cincinnati, Ohio.
- Kissock, K.** 2008. The biggest energy saving opportunities in your plant. *Ohio Energy Management and Restructuring Conference*, February 26-27, in Columbus, Ohio.
- Romanin, V., K. Hallinan, and **K. Kissock.** 2008. Cost competitive zero energy structural building system with multifunctional structural, insulative, and renewable energy wall and roofing panels. *ASME International Mechanical Engineering Congress and Exposition*, October 31-November 6, in Boston, Massachusetts.
- Mulqueen, S., T. Wenning, and **K. Kissock.** 2008. Workshop on green industrialization. University of Dayton Industrial Assessment Center, University Clean Energy Alliance of Ohio, April 24, in Columbus, Ohio.
- Lafdi, K.** 2007. Carbon nanomaterials in heat transfer. April 4, University of Cincinnati.
- Lafdi, K.** 2007. Carbon science and technology. SAMPE Tutorial at Cincinnati, Ohio.
- Lafdi, K.** 2007. Nanomaterials in aeronautics. *ACMA 2007*, May 22-24, School of Technology (ESTA), in Agadir, Morocco.
- Lafdi, K.** 2007. Nanotechnology in the new era of aircraft materials. Challons en Champagne, November 25-26, in France.
- Murray, A.** 2007. Shape-changing rigid-body mechanisms. *LIRMM*, February, in Montpellier, France.
- Murray, A.** 2008. PODs, shape changing mechanisms, and humanoids. *Laboratoire d'Informatique, de Robotique et de Micro-electronique*, March, in Montpellier, France.
- Pinnell, M.,** R. Blust, J. Brahler, and M. Stevens. 2008. Can service-learning in K-12 math and science classes affect a student's perception of engineering and their career interests, *ASEE/IEEE Frontiers in Education Conference*, October 22-25.
- Pinnell, M.,** et al. 2008. Innovation entrepreneurship and international experience. *Proceedings of the Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, ASME, August 3-6.
- Pinnell, M.,** et al. 2008. Making connections between service and engineering in K-12 education. *Proceedings of the Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, ASME, August 3-6.
- Pinnell, M.F.,** and S.I. Hill. 2008. Assessment of techniques used to measure strain during high rate tensile testing of polymeric materials, *2008 SAE World Congress*, April.
- Pinnell, M.F.,** M. Strunks, and S. Wallace. 2008. Infusing service-learning and mentorship into pre-engineering programs as a means for encouraging diversity in the field of engineering. *ASEE North Central Section Conference*, March.
- Pinnell, M.F.** 2008. Invited participant to the *Global Education for Engineers*. Sponsor: National Science Foundation, September 5-6.
- Pinnell, M.F.** 2008. Invited participant to the *Problem Based Service-Learning Workshop*. Sponsor: National Science Foundation, February 9.
- Pinnell, M.F.,** P. Aaron, and M. Vehar. 2008. Integrating an international service-learning experience in multiple engineering courses. *3rd Annual Conference on International Service-Learning*, IUPUI, February 29-March 1.
- Klapheke, A., C. Gardner, E. Kitchin, E. Whitney, K. Timms, **M. Pinnell,** and C. Krane. 2008. Effect of infusion solution characteristics on mammalian artery hydration state. Presented at the *Stander Symposium*, at the University of Dayton, in Dayton, Ohio.
- Timms, K., C. Gardner, E. Kitchin, A. Klapheke, E. Whitney, C. Krane, and **M. Pinnell.** 2008. Viscoelastic properties of porcine blood vessels. Presented at the *Stander Symposium*, at the University of Dayton, in Dayton, Ohio.
- Whitney, E., C. Gardner, K. Timms, E. Kitchin, A. Klapheke, C. Krane, and **M. Pinnell.** 2008. The burst pressure of hemostatic porcine artery seals under static pressures. Presented at the *Stander Symposium*, at the University of Dayton, in Dayton, Ohio.
- Nienhaus, E., and **M. Pinnell.** 2008. Tensile strength of porcine blood vessels. Presented at the *Stander Symposium*, at the University of Dayton, in Dayton, Ohio.
- Pinnell, M.** 2008. Invited panelist. *SAE World Congress*, panel discussion on CAE in automotive interiors.
- Zabarnick, S.** 2007. Prediction of jet fuel oxidation and deposition. Invited lecture, Rolls-Royce plc, June, in Derby, United Kingdom.
- Zabarnick, S.** 2007. Invited session

chair, *1st Ohio Summit on Supply Chain Opportunities in Alternative Energy*, June, in Dayton, Ohio.

## GRANTS AND AWARDS

- Altman, A.** 2007. Investigation into application of formation parameter to flapping wings. AFOSR Unsolicited (UDRI R-16391A), May, 12 Months, \$50K.
- Altman, A.** 2007. Research engineer and wind tunnel support. USAF AFRL/VAAI (50% buyout), January, 12 Months, \$90K.
- Altman, A.** 2007. Aerodynamic testing component of unique stealth UAV Houck aircraft design program. USAF AFRL/VA, UDRI R-16131, January, 12 months.
- Altman, A.** 2007. Equipment to complete Houck aerodynamic testing. USAF AFRL/VA, UDRI R-16054, January, 12 months, \$110K.
- Altman, A.** 2008. Perching MAV aerodynamics. AFRL/RBSA, 36 Months, \$225K.
- Altman, A.** 2008. Photo-fueled flapping wings. AFRL/RXP [Internal to AFRL/RX] LDF, 12 Months, \$60K.
- Altman, A.** 2008. Creating a wind turbine aerodynamic design/build/test package for use in renewable energy courses. Sustainability, Energy and the Environment Seed, 4 Months, \$4,500.
- Altman, A.** 2008. Research engineer and wind tunnel support. USAF AFRL/RBAI, 12 Months, \$75K.
- Ballal, Dilip.** 2007. Parker Hannifin Corporation, one year, \$80K.
- Ballal, Dilip.** 2007. GE Aviation, one year, \$250K.
- Ballal, Dilip.** 2007. AVETEC Inc, April-December, \$255K.
- Ballal, Dilip.** 2007. State of Ohio OCAPP Grant, \$320K.
- Stouffer, S.C., R. Pawlik, J. Zelina, and **D.R. Ballal.** 2007. Combustion performance and emissions characteristics for a WSR for low-volatility hydrocarbon fuels. Presented at the *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, July, in Cincinnati, Ohio.
- Doepker, P.** 2008. *Innovation Center*. Corporate Grant: Emerson Climate Technologies, \$1M.
- Ervin, J.** Thermal energy storage. ARRL/PRP, December 2007-December 2008, \$70K.
- Ervin, J.** Thermal management and combustion studies, AVETeC, (D.Ballal and J.Ervin Co-PIs) March-December 2007, \$200K.
- Ervin, J.S.** 2008. Thermal management sciences research and development program. AFRL, Thermal Science and Electrochemistry Branch, 5 years, \$5M.
- Ervin, J.S.,** D. Ballal, S. Zabarnick, M. DeWitt, T. Williams, and S. Stouffer. 2008. Versatile affordable advanced fuels and combustion technologies. AFRL Fuels Branch, Extension of Cooperative Agreement, 1 year, \$6M.
- Hallinan, K.** Train graduate and undergraduate students and perform industrial assessments to help industry reduce energy and waste and improve productivity, *University of Dayton Industrial Assessment Center*. Sponsor: U.S. Department of Energy, September 1, 2006-August 31, 2011, \$900K.
- Hallinan, K.** Potential for energy efficiency and demand response in Ohio. Review and formulate energy policies. Sponsor: American Council for an Energy Efficient Economy, October, 2008-June, 2009, \$20K.
- Kashani, Rezi.** Developing low frequency passive radiator dampers with low weight penalty for control of combustion instabilities in augmenters. The Air Force SBIR Phase II, May 2007-May 2009.
- Kissock, K.** Train graduate and undergraduate students and perform industrial assessments to help industry reduce energy and waste and improve productivity. *University of Dayton Industrial Assessment Center*. Sponsor: U.S. Department of Energy; September 1, 2006-September 30, 2007; \$117,054.
- Kissock, K.** Train graduate and undergraduate students, perform industrial assessments to help industry reduce energy and waste and improve productivity. *University of Dayton Industrial Assessment Center*. Sponsor: U.S. Department of Energy, October 1, 2007-September 30, 2008, \$110K.
- Kissock, K.** 2007. Train graduate and undergraduate students and perform industrial assessments per year to help industry reduce energy and waste and improve productivity, *University of Dayton Industrial Assessment Center: Energy Assessments for MEP and ESA Clients*. Sponsor: U.S. Department of Energy; September 1, 2007-March 31, 2008, \$92K.
- Murray, A.** 2007. Travel grant. National Science Foundation, \$6K.
- Pinnell, M.** 2007. Proposal No. R 16380, Assessing the causes of variability in seal quality and tissue changes resulting from the use of the Ethicon Harmonic R Surgical System Phase 2: Evaluating the contribution of vessel type, infusion fluid, composition and temperature on seal quality, Ethicon Endo-Surgery, 12 months, \$100,948.
- Pinnell, M.** 2007. Assessing the structural and mechanical properties of porcine carotid and renal arteries, Research Council Grant, \$11K.
- Pinnell, M.F.** 2008. Assessing the intraluminal ultrasonic tissue welder. Ethicon® Endo-Surgery, 12 months, \$217,303.
- Pinnell, M.F.** 2008. Engineering in urban education: Robotics outreach and intersession camp at Kiser PK-8 School. Great Cities Great Service Mini-Grant Proposal, submitted on behalf of Douglas Smith, 12 months, \$11,825.
- Pinnell, M.F.** 2008. Graduate School Faculty Fellows Program, 25% summer funding for Pinnell, 10% summer funding for Krane and Wilkens.
- Pinnell, M.F.** 2008. Assessing the structural and mechanical properties of porcine carotid and renal arteries. Research Council Seed Grant, 3 months, \$11,000.
- Sidhu, S.** Combustion science to reduce PM emissions from military platforms. Department of Defense, Strategic environmental research development program, 2007-2011, \$430K.
- Sidhu, S.** Toxic air emissions from outdoor wood-fired boilers. Great Lakes Commission, 2007-2009, \$123,850.
- Sidhu, S.** Surface catalyzed mercury transformation reactions. Ohio Coal

Development Office, 2007-2008, \$100K.

**Sidhu, S.** 2007. Development of nano-catalytic process to destroy lindane. Environmental Chemical Corporation, 2007, \$46,500.

**Sidhu, S.** Environmental characterization of outdoor wood-fired hydronic heaters. NYSERDA, 2007-2009, \$25K.

**Zabarnick, S.** 2007. Diesel fuel injector control valve sticking issue. Cummins Engines, \$29K.

**Zabarnick, S.** 2007. Fuel compatibility of fiber optic cable. Goodrich Corporation, \$10K.

**Zabarnick, S.** 2007. Evaluation of BASF additives. BASF AG, \$143,868.



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