



**University of Dayton**  
**School of Engineering**  
*Scholarship 2012*



UNIVERSITY OF DAYTON  
SCHOOL OF ENGINEERING

SCHOLARSHIP 2012

Our distinguished faculty and staff epitomize our School's vision to deliver "transformational learning experiences that prepare engineering students for leadership, service and success in life, profession and society." They inspire future faculty, researchers and students to join them in their endeavors.

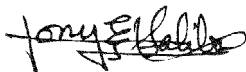
They've cultivated world-class research partnerships with prestigious universities and companies across the world and have built a global research reputation of excellence.

Our School's healthy enrollment, with a record number of undergraduate and graduate students, directly correlates to our faculty and staff who develop innovative curricula, stress entrepreneurial thinking and generate research opportunities with top engineers and scientists.

The *Best in Class Award* from the Kern Entrepreneurship Education Network (KEEN), Kern Family Foundation, received by our Innovation Center, is in recognition of the efforts by our faculty and staff who helped to create a collaborative venue that educates the global engineer of the future. Through the Innovation Center, students and faculty connect on project-based design teams to creatively solve real-world issues.

Our ETHOS program (Engineers in Technical Humanitarian Opportunities of Service-Learning) engages undergraduate and graduate students in national and international technical, service-learning projects. The students, faculty and staff apply appropriate technology in order to resolve domestic and global engineering challenges.

We invite you to read and discover within this booklet our expansive outreach from graduate research to K-12 programs because we take great pride in our faculty and staff as they continue to lead our School of Engineering on its successful journey.



Tony E. Saliba  
Dean, School of Engineering



*"The School's healthy enrollment . . . directly correlates to our faculty and staff who develop innovative curricula, stress entrepreneurial thinking and generate research opportunities with top engineers and scientists."*



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**DEPARTMENT OF CHEMICAL AND MATERIALS ENGINEERING (CME)**

////// *Through the minds of the young:  
A successful international research exchange program.*

**K**halid Lafdi, professor, Department of Chemical and Materials Engineering and Wright Brothers Endowed Chair in Nanomaterials, admits that he must guard against a research routine and believes that research exchange gives him the needed "fresh look."

Recently, Lafdi collaborated with a Ph.D. student and says, "The quality of the Ph.D. work was unbelievable — a fresh look." The student is maturing as an engineer, entrepreneur and business strategist and leads engineering development at Nanocytomics. There, he works on technology to revolutionize the risk stratification of patients. He also helps physicians identify those patients who are likely to benefit from gold-standard diagnostic procedures as early as possible when cancer treatments are most effective. Additionally, he focuses on his own engineering consulting group, Honeycomb Design LLC, which develops life-changing medical and consumer products.

For over sixteen years, Lafdi has conducted research with exchange students, first at the University of Southern Illinois and then at the University of Dayton. He communicates frequently with international scholars and says that his network "wouldn't exist without exchange students." On Skype weekly, Lafdi collaborates with like-minded individuals from France, Italy, Romania, Spain and Africa. He gives three excellent reasons to develop a research exchange program:

- ▶ Students have an opportunity to spend time solely on research, no classes.
- ▶ Research funding nurtures existing international collaborations.
- ▶ Establishment of a dual program, with high-caliber students, creates innovative possibilities.

Two funding programs interest Lafdi: the International Research Fellowship Program (IRFP), a National Science Foundation program, and the Horizon 2020 program, one of the largest publicly funded programs in the world that unites funding for EU's research and innovation. "An exchange of research students produces unparalleled results," says Lafdi, "and the students gain language, cultural and bench experience."

In France, Lafdi arranges student exchanges through the highly selective École Nationale Supérieure d'arts et Métiers (ENSAM) and École Centrale de Nantes. These exceptional students have an educational foundation heavy in math and physics and are funded through NATO or private industry scholarships. Lafdi then pairs them with senior researchers at UD, and the teams gain innovative points-of-view as well as long-standing alliances. Last year, his students were involved in three papers, and their combined strengths produced unique work.

In his graduate student research group at UD's Department of Chemical and Materials Engineering, Lafdi has used this exchange program successfully for the last twelve years. According to Lafdi, "It has been surprisingly effective at enhancing the growth of my research students, their productivity and their lab morale in general." In addition, the research exchange has helped Lafdi establish new colleagues worldwide, which has been instrumental in winning new research grants and elevating the program's research stature. *(continued)*



Dr. Khalid Lafdi  
CME professor  
Wright Brothers Endowed  
Chair in Nanomaterials

*"A fresh  
look is vital.  
Collaboration  
is vital. Look  
from the eyes  
of children  
and their  
imaginations."*



Recently, Lafdi's group moved into a renovated, expanded research facility at UD's Eugene W. Kettering Engineering and Research Laboratories building on the fifth floor. The entire team now works in one space in the heart of campus.

Khalid Lafdi, a passionate researcher and educator, has formulated a fresh, strong perspective through the international exchange of knowledge.

## Chemical and Materials Engineering

### BOOK CHAPTERS

**Gold, S.A.** 2012. *In Low temperature fuel cell technology for green energy*, vol. 4, ed. W.-Y. Chen, and J. Seiner, 1657-1702. Springer.

### JOURNAL ARTICLES

**Fried, J.** Forthcoming. The insertion of gas molecules into polyhedral oligomeric silsesquioxane POSS cages: Understanding the energy of insertion using quantum chemical calculations. *Physical Chemistry Chemical Physics*.

**Fried, J.** 2012. Computational simulations of hydrolysis of a phosphazene oligomer utilizing atom-centered density matrix propagation. *International Journal of Quantum Chemistry* 1131: 63-70.

**Fried, J.** 2012. Molecular simulations of poly(2,5-benzimidazole): Effect of water concentration, phosphoric acid doping, and temperature on hydrogen bonding and vehicular diffusion. *Polymer Engineering and Science*.

**Fried, J.** 2012. Molecular simulations of polyphosphazenes for biomedical applications. *Journal of Inorganic and Organometallic Polymers and Materials* 22: 973-984.

**Shaikh S. and K. Lafdi.** 2012. A carbon nanotube based composite for thermal control of heat loads. *Carbon* 50, no. 2 (February): 542-550.

**Boehle, M., Q. Jiang, L. Li, A. Lagounov and K. Lafdi.** 2012. Carbon nanotubes grown on

glass fiber as a strain sensor for real time structural health monitoring. *International Journal of Smart and Nano Materials* 3, no.2 (June): 162-168.

**Memon, Muhammad Omar, and Khalid Lafdi.** 2012. Use of carbon nanostructures in transient spike power applications. *International Journal of Thermal Sciences* 53 (March): 1-7.

**Ciobanu, C., S. Iconaru, E. Gyorgy, M. Radu, M. Costache, A. Dinischiotu, P. Le Coustumer, K. Lafdi, and D. Predoi.** 2012. Biomedical properties and preparation of iron oxide-dextran nanostructures by MAPLE technique. *Chemistry Central Journal*.

**Czarnecki, J.S., K. Lafdi, R.M. Joseph, and P.A. Tsonis.** 2012. Hybrid carbon-based scaffolds for applications in soft tissue reconstruction. *Journal of Tissue Engineering*.

**Park, Wonchang, Kyungwho Choi, Khalid Lafdi, and Choongho Yu.** 2012. Influence of nanomaterials in polymer composites on thermal conductivity. *Journal of Heat Transfer* 134, no. 4 (April). doi: 10.1115/1.4005201

**Yoon, Y., L. Li, E. Shin, K. Lafdi, and M.P. Bouchard.** 2012. The effect of carbon-nanotubes on the electrochemical sensing behavior of aluminum alloys. *ECS Transactions* 41.

**Fasano, J.B., K. Myers, and E.E. Janz.** 2012. Design mixers to minimize effects of erosion and corrosion erosion. *International Chemical Engineering*, Article ID 171838, 8.

**Sandhu, S.** 2012. Simulation of a solid-state lithium-based cell. *The Indian Chemical Engineer*, official journal of Indian Institute of Chemical Engineers/Taylor and Francis, Manuscript: 20.

**Sandhu, S., and J.P. Fellner.** 2012. Model

formulation and simulation of a solid-state lithium-based cell. *Electrochimica Acta-The Journal of the International Society of Electrochemistry* 88: 495-506. www.elsevier.com/locate/electacta

**Athmer, C., C. Ruef, T.J. Jones, and R.J. Wilkens.** 2012. Desalination of Kaolin Soil using radial electromigration and electroosmosis. *ASCE Journal of Hazardous, Toxic, and Radioactive Waste* 171: 16-20.

**Sarica, C., H.Q. Zhang, and R.J. Wilkens.** 2012. Sensitivity of slug flow mechanistic models on slug length. *Journal of Energy Resources Technology* 133: 043-001-1 - 043-001-6.

### PAPERS PUBLISHED AT CONFERENCE PROCEEDINGS

**Brubaker, J., and S.A. Gold.** 2012. Modeling of voltametric behavior of nanostructured electrodes. 2012 AIChE Annual Meeting, in Pittsburgh, Pennsylvania.

**Ma, Z., and S.A. Gold.** 2012. An electrochemical impedance study of formic acid electrooxidation on palladium. 2012 AIChE Annual Meeting, in Pittsburgh, Pennsylvania.

**Lafdi, K.** 2012. Aligned nanotube as thermal interface. Carbon Conference, in Clemson, South Carolina.

**Lafdi, K.** 2012. C/C composite, carbon nanotube and paraffin wax hybrid systems for the thermal control of pulsed power in electronics.

**Lafdi, K.** 2012. Comparison of novel carbon-based scaffolds to graft jacket in tendon repair applications.

**Lafdi, K.** 2012. Design of carbon foam heat exchanger for thermoelectric cooler system.

**Lafdi, K.** 2012. Designing hybrid foam as heat exchanger for thermoelectric cooler in cooling vest.

- Lafdi, K.** 2012. Development of a Fuzzy Fiber sensor for real time structural health monitoring.
- Lafdi, K.** 2012. Effect of copper coating on thermo-mechanical properties of carbon foam.
- Lafdi, K.** 2012. Exfoliated graphite as a filler to enhance the EMI shielding of polymers.
- Lafdi, K.** 2012. Friction of carbons part 1: Friction and wear transitions.
- Lafdi, K.** 2012. Metalized carbon nanofiber based nanocomposites for electrochemical sensing.
- Lafdi, K.** 2012. Novel carbon foam/polycaprolactone scaffolds for tissue engineering applications.
- Lafdi, K.** 2012. PCM/hybrid foam system in temperature control application.
- Lafdi, K.** 2012. PCM/foam under uniform heat load.
- Lee, C.W.** 2012. Influence of temperature, moisture and thermal cycling on thermo-mechanical properties of MVK-14 resin. SAMPE Tech 2012, in North Charleston, South Carolina.
- Sandhu, S.** 2012. Extended abstract of model formulation and simulation of a solid-state lithium-based cell. AIChE Annual Meeting, April, in Houston, Texas.

### INVITED LECTURES

- Browning, C.E.** 2012. History of advanced composites. American Society of Composites Annual Meeting, ASC, in Dayton, Ohio.
- Eylon, D.** 2012. Ancient arts of sword-making. ASM Chapter of GE, March 21, in Evendale, Ohio.
- Gold, S.A.** 2012. Contact line pinning and modeling of direct write and related processes. Materials Directorate, Wright Patterson Air Force Base, January 16, in Dayton, Ohio.
- Sandhu, S.** 2012. Simulation of a solid-state lithium based cell. CHEMCON 2012-presented at the INDO-US International Conference on Energy, Department of Chemical Engineering, Dr. Ambedkar National Institute of Tecnology (NIT), December 30, in Jalandhar, Punjab, India.

- Sandhu, S.**, and J.P. Fellner. 2012. Model formulation and simulation of a solid-state lithium-based cell. Guest Speaker Series at The Dr. Ambedkar National Institute of Science, Engineering and Technology, January 9, in Jalandhar, Punjab, India.

### PRESENTATIONS

- Ciric, A.**, M. Elsass, D. Comfort, E.S. Hart, and R.J. Wilkens. 2012. A curriculum review process: A top-down learning outcome approach to revising the University of Dayton chemical engineering curriculum. AIChE National Conference, AICHE, November, in Pittsburgh, Pennsylvania.
- Elsass, M.J., D. Comfort, **A. Ciric**, E. Hart, and R.J. Wilkens. 2012. Integrating the chemical engineering curriculum into a common academic program at the University of Dayton. AIChE Annual Meeting 2012, American Institute of Chemical Engineers, October 30, in Pittsburgh, Pennsylvania.
- Comfort, D.** 2012. Social justice through bioenergy. STARS - Spotlight on Technology, Arts, Research and Scholarship, University of Dayton, September 20, in Dayton, Ohio.
- Comfort, D.**, M.J. Elsass, A.R. Ciric, E. Hart, and R. Wilkens. 2012. A curriculum review process: A top down learning outcome approach to revising the University of Dayton chemical engineering curriculum. AIChE Annual Meeting 2012, American Institute of Chemical Engineers, October 30, in Pittsburgh, Pennsylvania.
- Elsass, M., **D. Comfort**, A.R. Ciric, E.S. Hart, R.J. Wilkens. 2012. Integrating the chemical engineering curriculum into a common academic program at the University of Dayton. American Institute of Chemical Engineers 2012 National Conference, American Institute of Chemical Engineers, October 30, in Pittsburgh, Pennsylvania.
- Wang, H., **D. Comfort**, P. Shah, A.M. Sarangan, and J.J. Rowe. 2012. The effect of electron donor on microbial fuel cell performance. AICHE 2012 Annual Meeting, American Institute of Chemical Engineers, November, in Pittsburgh, Pennsylvania.
- Wang, H., **D. Comfort**, P. Shah, W. Wang, J. Rowe, and A. Sarangan. 2012. Fabrication and

flow characterization of a micro-laminar flow device for use as a miniature microbial fuel cell. Dayton Engineering Sciences Symposium, October 29, in Dayton, Ohio.

- Fried, J.** 2012. Molecular simulation of membrane transport. Symposium on Multi-Scale Characterization of Functional & Structural Materials, Universal Technology Corporation (UTC), August 15, in Beavercreek, Ohio.
- Fried, J.** 2012. Computational simulation of the hydrolysis of phosphazene oligomer utilizing atom-centered density matrix propagation. ACS Central Regional Meeting (CERN 2012), ACS Central Region, June 6, in Dearborn, Michigan.
- Fried, J.** 2012. Computational study of heptapeptide-based synthetic anion transporter dynamics. ACS Central Regional Meeting (CERN 2012), ACS Central Region, June 6, in Dearborn, Michigan.
- Fried, J.** 2012. Fully atomistic molecular dynamics simulations of artificial Na<sup>+</sup> channel/transporter dynamics. ACS Central Regional Meeting (CERN 2012), ACS Central Region, June 6, in Dearborn, Michigan.
- Lafdi, K.**, and J. Czarnecki. 2012. Carbon engineered scaffolds may provide optimum balance of biologic and mechanical properties for use in tendon repair surgery. 69th Annual ACFAS Scientific Conference, The American College of Foot and Ankle Surgeons, in Fort Lauderdale, Florida.
- Lafdi, K.**, and O. Ochoa. 2012. Fracture toughness study of fuzzy fabric interface. IMECE 2011-ASME, ASME, in Colorado.
- Tandon, G.P., T. Gibson, **C.W. Lee**, T. Storage, and R. Hill. 2012. Influence of temperature, moisture and thermal cycling on thermo-mechanical properties of MVK-14 resin. SAMPE TECH 2012, SAMPE, October, in North Charleston, South Carolina.
- Heimovitz, M.A., **K. Myers**, E.E. Janz, and J.B. Fasano, 2012. Power consumption of turbine agitators in continuous operation. Mixing XXIII, June 17, in Mayan Riviera, Mexico.
- Heimovitz, M.A., **K. Myers**, E.E. Janz, and J.B. Fasano, 2012. Agitator power draw in continuous systems. 2012 AIChE, November 2, in Pittsburgh, Pennsylvania.
- Myers, K.**, W. Fryers, E.E. Janz, and J.B. Fasano. 2012. Solids loading effect on just-

suspended speed presentation. Mixing XXIII, June 17, in Mayan Riviera, Mexico.

**Myers, K.**, A.K. Pandit, E.E. Janz, and J.B. Fasano. 2012. Drawdown floating solids with up-pumping impellers. 2012 AIChE, November 2, in Pittsburgh, Pennsylvania.

**Sandhu, S.** 2012. Model formulation and simulation of a solid-state lithium-based cell. AIChE Annual Meeting, April, in Houston, Texas.

**WORKSHOPS**

**Lee, C.W.** 2012. Non autoclave technology workshop. February, in Coronado, California.

**POSTERS**

Strong, R., H. Koerner, R. Vaia, **S.A. Gold.** 2012. High temperature shape memory polymer with applications in circuit/antennae design. Midwest SAMPE 2012, SAMPE.

Narvaez, J., and **R.J. Wilkens.** 2012. Heat transfer and drag reduction for water/NaSal/Ethoquad in a mock aviation loop. AIChE, in Minneapolis, Minnesota.

Nathaniel, H.N., E. Okodiko, and **R.J. Wilkens.** 2012. Effects of diameter and orientation on multiphase flow patterns. AIChE, in Minneapolis, Minnesota.

**CONTRACTS, GRANTS AND SPONSORED RESEARCH**

**Browning, C.E.** (Principal). Ohio research scholar in materials. State of Ohio, \$4,500,000.00.

**Browning, C.E.** (Principal). Minority leaders. Clarkson Aerospace, \$2,000,000.00. (September 2006 - Present).

**Browning, C.E.** (Principal). Center of excellence in STEM and STEM education. Central State University, \$342,497.00. (June 3, 2011 - June 2, 2016).

**Browning, C.E.** (Co-Principal). Separation of nanotubes. AFRL, \$30,000.00. (January 2010 - Present).

**Comfort, D.** Assessment of the state-of-the-art technologies for biosensor manufacturing. AFRL, \$80,000.00. (May 16, 2012 - May 15, 2014).

**Comfort, D.** (Principal), and E. Untener. Bio-effects of gold nanorods as a function of aspect ratio

and surface chemistry. Dayton Area Graduate Studies Institute (DAGSI), \$65,000.00. (May 15, 2011 - May 14, 2012).

**Comfort, D.** (Principal). Assessment of the state of the art technologies for biosensor manufacturing. AFRL RXBM, \$80,000.00. (July 2012 - July 2014).

**Eylon, D.** (Principal). NDE Titanium microstructure. THIBRON, \$90,000.00. (February 28, 2012 - December 31, 2013).

**Eylon, D.** (Principal). NDE Titanium KF9. Fraunhofer, \$143,000.00. (August 1, 2011 - July 31, 2013).

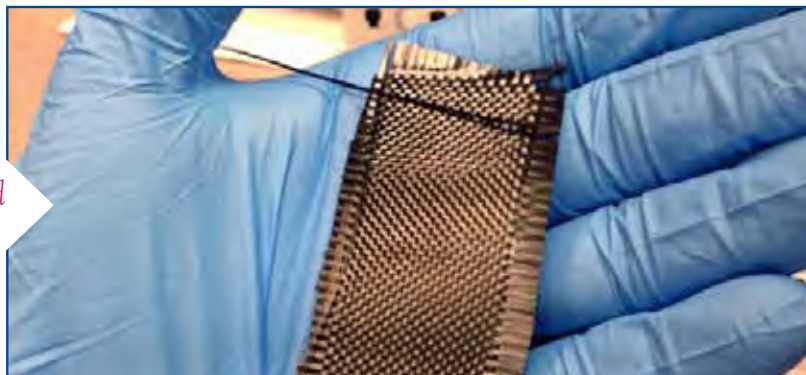
**Eylon, D.** (Principal). NDE Titanium KDT. Q-Net, \$60,000.00. (June 21, 2011 - July 31, 2013).

**Eylon, D.** (Principal). NDE Titanium KCP. Fraunhofer, \$112,000.00. (April 26, 2011 - April 25, 2013).

**Lee, C.W.** (Co-Principal). Composite, hybrid, and thermally engineered materials. AFRL. (August 15, 2010 - August 15, 2015).

**Wilkens, R.J.** (Principal), and J. Narvaez (Supporting). Performance of drag reducing agents in heat transfer applications. DAGSI, \$150,000.00. (May 2010 - May 2013).

*Carbon Scaffold*



*Carbon Veil*



## DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING AND ENGINEERING MECHANICS (CEE)

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////// *Water treatment and analysis for a healthier world.*

**D**onald Chase, chairperson of the Department of Civil and Environmental Engineering and Engineering Mechanics, creates genetic algorithms that help water treatment plants monitor energy use and emissions output.

In the United States, water utilities consume a large percentage of energy, so Chase partnered with Wayne State University researchers on a Great Lakes Water Protection project to elicit optimal solutions for energy and emissions management. The team engineered a genetic algorithm for large companies to help them decrease their energy consumption. As Chase says, "The software optimizes emission controls enabling reduction in their carbon footprint."

The genetic algorithm processes, selects and ranks potential solutions to create a software program that efficiently analyzes energy needs and satisfies water demands, which will decrease costs and decrease negative environmental outcomes.

Part of the team's research centered around the shift of power-usage timetables, so the water treatment facilities would run their equipment with minimal emissions. The software automatically directs pumps to operate when power is supplied by the cleanest available sources of energy, and the shift of timetables could be incorporated in the facility's management plan.

Complementing Chase's environmental efforts, Professors Kenya Crosson and Denise Taylor along with the School of Engineering's ETHOS (Engineers in Technical Humanitarian Opportunities of Service Learning) program perform water analysis and systems research. According to Chase, "Civil engineers save millions of lives through water transmission and distribution systems research in order to eradicate waterborne diseases and eliminate illnesses and infections."

In the ETHOS program, civil engineering students have connected with Barombi Mbo, Cameroon, Africa, since 2007. The village's chief told the students during their ETHOS immersion that his village was dying because of lack of water. The students creatively and successfully acted on the plight of the village with a new, cleaner water delivery system that is in place today.

ETHOS assists domestically as well as globally. "Civil engineering students participate heavily in ETHOS," says Chase. Applying their talents and skills, they design water infrastructures for potable water while using site-appropriate technology.

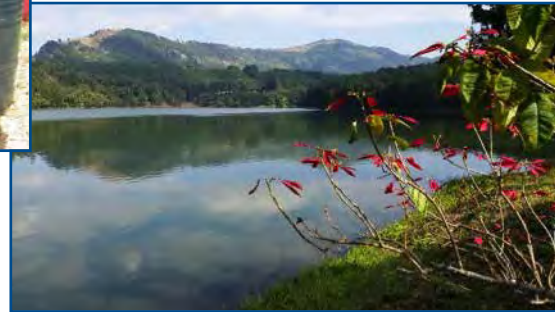
"Since the late 1800's, wholesale changes have been made in the quality of life because of civil engineering innovations," says Chase.



Dr. Donald Chase,  
CEE chairperson

*"Civil engineers  
save millions of  
lives through their  
water transmission  
and distribution  
systems research in  
order to eradicate  
waterborne  
diseases and  
eliminate illnesses  
and infections."*





ETHOS

## Civil and Environmental Engineering and Engineering Mechanics

### BOOK CHAPTERS

**Eustace, D.**, E.R. Russell, and E.D. Landman. 2012. In *Incorporating robustness analysis into urban transportation planning decision process*, ed. D.M. Levinson, H. Liu, and M.G.H. Bell, 97-114. New York: Springer.

### JOURNAL ARTICLES

**Bilgin, Ö.** 2012. Lateral earth pressure coefficients for anchored sheet pile walls. *International Journal of Geomechanics* 12.

Kim, R.Y., and **S.L. Donaldson**. 2012. Experimental and analytical studies on the damage initiation in composite laminates at cryogenic temperatures. *Composite Structures* 76: 62-66.

Miao, S., **S.L. Donaldson**, and E. Toubia. 2012. Parametric study of sandwich panel buckling in composite wind turbine blades. *Journal of*

*Engineering and Technology* 2, no. 2: 3-15.

Mergia, W.Y., M. Qumsiyeh, and **D. Eustace**. 2012. Exploring factors contributing to injury severity at freeway merging and diverging locations in Ohio. *Transportation Research Record*.

Lintz, J.M., and **E. Toubia**. (Forthcoming). In-plane loading of brick veneer over wood shear walls. *The Masonry Society*.

Miao, S., S.L. Donaldson, and **E. Toubia**. 2012. Parametric study of sandwich panel buckling in composite wind turbine blades. *Journal of Engineering and Technology* 2, no. 2: 3-15.

### PAPERS PUBLISHED IN CONFERENCE PROCEEDINGS

**Bilgin, Ö.** 2012. Studying buried pipeline behavior using physical and numerical modeling. Geo-Congress 2012, ASCE, March, in Oakland, California.

### INVITED LECTURES

**Crosson, K.M.** 2012. Research on emerging and potential water contaminants: Water analysis and treatment. Water Analyst Laboratory Workshop, Operator Training Committee of Ohio, Inc., Deer Creek State Park, May 17, in Mt. Sterling, Ohio.

**Donaldson, S.L.** 2012. Nanocomposites in high

interlaminar stress part geometries. World Congress of Advanced Materials, June, in Beijing, China.

### PRESENTATIONS

**Bilgin, Ö.** (Presenter) 2012. Studying buried pipeline behavior using physical and numerical modeling. Geo-Congress 2012, ASCE, March, in Oakland, California.

Aylo, A., and **D. Eustace**. 2012. Developing a GIS-based safety analysis system. 91st TRB Annual Meeting, Transportation Research Board (TRB), January 23, in Washington, D.C.

Mergia, W., **D. Eustace**, and M. Qumsiyeh. 2012. Exploring factors contributing to injury severity at freeway merging and diverging locations in Ohio. 91st TRB Annual Meeting, Transportation Research Board (TRB), January 24, in Washington, D.C.

Gibson, T.T., S. Safriet (Author), A.B. Morgan (Author), and **T.J. Whitney** (Author). 2012. Processing of titanium, carbon fabric, and polyimide hybrid using laser deposition and resin infusion. HiTemple Workshop, University of Dayton, January 31, in Palm Springs, California.

### CONTRACTS, GRANTS AND SPONSORED RESEARCH

**Bilgin, Ö.** (Principal). Analysis of aggregate pier

systems for stabilization of subgrade settlement. ODOT, \$455,636.00. (October 2012 - October 2016).

**Bilgin, Ö.** (Principal). Enhanced models for predicting soil consolidation parameters and settlements. University of Dayton, \$6,500.00. (October 1, 2012 - September 1, 2013).

**Bilgin, Ö.** (Principal). Contact surface characteristics of viscoelastic materials. University of Dayton, \$6K. (October 1, 2011 - September 1, 2012).

**Chase, D.V.** (Supporting). Real-time system optimization for sustainable water transmission and distribution. Great Lakes Protection Fund, \$293,745.00. (September 8, 2008 - Present).

**Chase, D.V.** (Supporting). Developing water distribution system analysis modules. National Science Foundation, \$35K. (July 1, 2011 - June 30, 2014).

**Crosson, K.M.** Efficacy of oxidation treatment for the removal of a bittering agent potentially released to water supplies. Ohio Water Development Authority, \$113,143.00. (January

2011 - May 2013).

Hallinan, K.P. (Principal), M.F. Pinnell (Co-Principal), D.G. Taylor (Supporting), and **K.M. Crosson** (Supporting). ETHOS sustainable engineering scholars. National Science Foundation, \$650K. (February 2009 - February 2014).

**Eustace, D.** (Principal). Developing a GIS-based tool for traffic crash analysis and modeling accident occurrences. Ohio Transportation Consortium (OTC), \$28K. (October 26, 2011 - Present).

**Eustace, D.** (Principal). Location and design manual turn lane length storage validation/update. Ohio Department of Transportation (ODOT), \$18,476.00. (February 15, 2011 - Present).

**Taylor, D.G.** Research Fellows Grant-In-Aid, LTC, University of Dayton, \$1,500.00.

**Taylor, D.G.** (Principal). Bacteriophage selective against filamentous bacteria. Ohio Water Development Authority, \$103,232.00. (January 2009 - January 2012).

**Toubia, E.** (Principal). Advanced structural development of naval hovercraft ramps. WebCore-U.S. Navy, \$25K. (December 13, 2011 - December 10, 2012).

**Toubia, E.** (Principal), Contract, Technical support for the advanced composite personnel transport module. WebCore-U.S. Navy, Local, \$24K. (August 22, 2011 - November 24, 2012).

**Whitney, T.J.** (Supporting), D.R. Bowman (Principal), G.J. Frank (Supporting), and S.C. Mitchell (Supporting). M&P Trade Study for Composites, AVX, Inc., \$30K. (January 1, 2012 - August 15, 2012).

**Whitney, T.J.** (Supporting), and A.B. Morgan (Principal). Rapid development of hypersonic materials (RIDHM). AFRL/RXBC, \$50K. (January 1, 2011 - August 15, 2012).



*City of Dayton, Ohio, Stewart Street Bridge*

////// *A global reputation with world-class partners.*

**E**CE at the University of Dayton flourishes under the watchful eye of chairperson, Dr. Guru Subramanyam. The Department has steadily gained a reputation for research in robotics, unmanned aerial vehicles (UAVs), communication systems, computer engineering, micro- and nano-electronics, electro-optics, and signal and image processing.

Their global reputation invites world-class partners to join the electrical and computer engineering efforts, such as Agilent Technologies, Air Force Research Laboratory, Cisco, GE Aviation's Electrical Power Integrated Systems Research and Development Center (EPISCENTER), L-3, Motoman Robotics, Persistent Surveillance Systems, Riverside Research, Sony and Texas Instruments.

ECE Centers of Excellence were established to give faculty, staff and students the needed resources, so they can solve today's international engineering challenges.

Together, faculty, staff and students expand the boundaries of electrical and computer engineering education and research.

## CENTERS OF EXCELLENCE

▶ *Thin-Film Research and Surface Engineering (CETRASE)* researchers provide a broad-range of innovative ideas to improve efficiency and cost-function of sensors, electronics, electro-optics and energy systems. The team bridges the gap between materials researchers and product and system engineers. —Director, Dr. Guru Subramanyam.

▶ *Computer Vision and Wide-Area Surveillance Research (Vision Lab)* engineers and scientists create algorithms and architectures for real-time applications in the areas of signal processing, image processing, computer vision, pattern recognition, artificial neural networks and bio-mimetic recognition. —Director, Dr. Vijayan Asari.

▶ The *Distributed Sensing and Multistatic Radar* team at the Mumma Radar Lab focuses on the collection of radio frequency (RF) data using waveforms. Employing advanced architectures and signal processing algorithms in their Multi-Band RD Spectral and Spatial Diversity Dome, they support the rapid advancement of the Smart Grid, the Intelligent Transportation System, medical electronics, and the transformation of commerce, security, defense and education. —Director, Dr. Michael Wicks



*Guru Subramanyam, Ph.D.  
Chairperson, ECE  
Director, CETRASE*

## Centers of Excellence



*CETRASE*



*Vision Lab*



*Distributed Sensing*



////// ECE Embedded Data Processing Lab (EDPL)



Eric Balster, Ph.D.  
ECE assistant professor  
EDPL director

*"SWAP —  
reduction of size,  
weight and power  
— faster images,  
energy efficiency  
and cost reduction."*

**E**ric Balster, in 2007, was the lead software developer and flight test engineer for a large-scale project to deploy a fleet of persistent surveillance systems with electrical and computer image sensors. Capturing huge images of lower landscape, Balster created the software for processing. His prototype "made a difference" to our armed forces because of large-scale surveillance information that was processed in real-time. This new type of surveillance opened the DARPA initiatives.

Currently, Balster teaches and refines his research with graduate students, the University of Dayton Research Institute's Remote Sensing Group and the Air Force Research Lab team. Because of 'reduction to practice,' or in the military jargon, 'SWAP'—reduction of size, weight and power—his prototype continues to evolve. Balster's team advances the original project for faster images, energy efficiency and cost reduction.

The new-generation project combines five FPGAs with microprocessors that weigh 500 pounds, instead of the original 1500 pounds. And, today's engineer, in order to debug the system, remotes 20,000 feet in the air from a ground station with a satellite, instead of working in the aircraft as Balster did in 2007.

EDPL maintains the project for state-of-the-art tracking of moving objects in a wide-area and stitching the images together for real-time computation.

////// ECE Intelligent Signal Systems Lab (ISSL)



Keigo Hirakawa, Ph.D.  
ECE assistant professor  
ISSL director

*"ISSL — tool  
builders who  
resolve bottlenecks  
for multiple  
applications."*

**K**eigo Hirakawa describes ISSL researchers as "tool builders who resolve bottlenecks for multiple applications." Concentrating on image processing and computer vision, the ISSL team solves dynamic-range and noise problems. They partner with academic, government and industry agencies, such as the Air Force Research Lab and Sony Corporation, for multiple applications.

The group builds algorithms for "blur" extraction to understand image range, background and velocity. They produce rough 3D reconstructions varying the layout of RGB bands to obtain the highest resolution. They also create algorithms to process images at lower lights where light sensitivity counts, such as medical devices.

Recently, Hirakawa and Andrew Sarangan received a National Science Foundation (NSF) grant to facilitate critical scientific development of multispectral imaging. The hue is important, such as the capability of law enforcement to differentiate between the green of marijuana leaves and other green foliage, and also of importance is the development of a new lighter, handheld or single-shot device. The NSF funding will help Hirakawa and Sarangan engineer the possibilities. Larrell Walters, UDRI Sensor Systems, suggested other applications beyond law enforcement, such as for firefighters to find hazardous chemicals in smoke at a fire scene or for a medical application that would quickly discover skin cancer—from ISSL research, the applications are never ending.

////// ECE Motoman Robotics Lab and Controls Lab



Raúl Ordóñez, Ph.D.  
ECE associate professor  
Robotics Lab director  
Controls Lab director

*"Extremum-seeking optimizes a system allowing some autonomy for intelligent decision-making."*

Raúl Ordóñez co-authored *Extremum-Seeking Control and Applications* with Chunlei Zhang. Extremum-seeking determines the optimal maximum or minimum levels of a controls system performance aspect thus allowing some autonomy for intelligent decision-making, such as a car's smart algorithm that automatically minimizes fuel usage.

"Control systems are the brains," says Ordóñez. His theories converge with applications for real-world solutions. His team currently partners with GoHypersonic, Inc. (GHI) on the FIDO project, a hypersonic vehicle project, for Boeing and the Air Force Research Laboratory (AFRL). Investigating the subsonic to slow the hypersonic, the team's efforts are speeding toward a long-term, collaborative success story.

In addition to controls, Ordóñez began the University's robotics program, which has grown to include graduate and undergraduate student researchers. Motoman Robotics sponsors the lab and provides state-of-the-art robots and software. Their research is geared toward industrial robotics and robotic calibration. Commercial calibration costs over \$100K, so Ph.D. student, Tem Messay, created a simple, cost-effective algorithm for calibration that is now used by the UD and Motoman Robotics.

////// ECE Center for High Performance Computing and Neuromorphic Computing



Tarek Taha, Ph.D.  
ECE associate professor  
Center for High Performance  
Computing and Neuromorphic  
Computing director

*"A new computing model is necessary to process the speed and volume of our large inventories of digital data."*

Tarek Taha's group at the Center for High Performance Computing and Neuromorphic Computing develops models for a wide range of device structures and voltage inputs. New computing models are necessary to process the speed and volume of our large inventories of digital data—images, videos, language, symbols, structured, unstructured, etc.

Investigating parallel projects, Taha's team creates intelligent algorithms that sift through massive amounts of data to provide determinations that assist decision-making. At the same time, the team works toward cost and energy effectiveness on a new small chip design.

Cognitive computing with new chips and language could lead to computing models that mimic brain functionality. "Supercomputing clusters for massive brain-scale simulations," says Taha, "quickly generate useful information for the team." But, the human brain with its billions of interconnected neurons is difficult to simulate.

With funding from the National Science Foundation, the Air Force Office of Scientific Research and the Air Force Research Lab, the Center's research projects will be successful and eventually will result in multiple applications for everyday-use products, smarter robots as well as supercomputers with powerful problem-solving capabilities.

# Electrical and Computer Engineering

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**Asari, V.K.** 2012. Moving object detection and tracking in wide area motion imagery. *ISVC 2012: International Symposium on Visual Computing*, International Visual Computing Research Group, July 16, in Crete, Greece.

**Asari, V.K.** 2012. A self organized learning strategy for pattern association by an embedded line of attraction. *Seminar Series at Air Force Research Laboratory, AFRL/RYAT (Sensors Directorate)*, May 23, in Dayton, Ohio.

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Physics, July, in Irkutsk, Russia.

**Vorontsov, M.**, V.V. Kolosov, V.V. Dudorov, S.L. Lachinova, V.P. Paramonov. 2012. Generation of laser beams with controllable space-varying coherence with fiber-array systems. *Defense, Security, and Sensing Conference*, SPIE, April, in Baltimore, Maryland.

**Zhan, Q.** 2012. Plasmonic antennas as building blocks for spin optics and quantum optics applications. *SPIE Optics+Photonics*, SPIE, August, in San Diego, California.

**Zhan, Q.**, and W. Chen. 2012. Hybrid spiral plasmonic lens: Towards an efficient miniature circular polarization analyzer. *Frontiers in Optics*, OSA, October, in Rochester, New York.

### PRESENTATIONS

**Asari, V.K.** 2012. Gradient feature matching for expression invariant face recognition using single reference image. *SMC 2012: IEEE International Conference on Systems, Man, and Cybernetics*, IEEE Institute for Electrical and Electronic Engineers, October 14, in Seoul, Korea.

**Asari, V.K.** 2012. Local region statistical distance measure for tracking in wide area motion imagery. *SMC 2012: IEEE International Conference on Systems, Man, and Cybernetics*, IEEE Institute for Electrical and Electronic Engineers, October 14, in Seoul, Korea.

**Asari, V.K.** 2012. A new manifold learning technique for face recognition. *ICIP 2012: International Conference on Information Processing*, The Society of Information Processing, August 11, in Bangalore, India.

**Asari, V.K.** 2012. Analysis of blind source separation techniques for eye artifact removal. *ICIP 2012: International Conference on Information Processing*, The Society of Information Processing, August 11, in Bangalore, India.

**Asari, V.K.** 2012. A local histogram based descriptor for tracking in wide area imagery. *ICIP 2012: International Conference on Information Processing*, The Society of Information Processing, August 10, in Bangalore, India.

**Asari, V.K.** 2012. Local alignment of gradient features for face sketch recognition. *ISVC*



- 2012: International Symposium on Visual Computing, International Visual Computing Research Group, July 17, in Crete, Greece.
- Asari, V.K.** 2012. Neural network based methodology for automatic detection of whale blows in infrared video. ISVC 2012: International Symposium on Visual Computing, International Visual Computing Research Group, July 16, in Crete, Greece.
- Asari, V.K.** 2012. Single image super-resolution in frequency domain. SSIAl 2012: IEEE Southwest Symposium on Image Analysis and Interpretation, IEEE Institute for Electrical and Electronic Engineers, April 23, in Santa Fe, New Mexico.
- Asari, V.K.** 2012. Visibility improvement of aerial imagery by a locally tuned nonlinear enhancement technique. SSIAl 2012: IEEE Southwest Symposium on Image Analysis and Interpretation, IEEE Institute for Electrical and Electronic Engineers, April 22, in Santa Fe, New Mexico.
- Asari, V.K.** 2012. A phase space approach for detection and removal of rain in video. IS&T/SPIE Electronic Imaging 2012: IS&T/SPIE International Conference on Electronic Imaging, SPIE Society of Photo-Optical Instrumentation Engineers and Society of Imaging Science and Technology, January 23, in San Francisco, California.
- Arigela, S., and **V.K. Asari.** 2012. A fast and adaptive technique for hazy/foggy image enhancement. Stander Symposium Involvement, Brother Joseph W Stander Symposium 2012, University of Dayton, April 16, in Dayton, Ohio.
- Santhaseelan, V., **V.K. Asari.** 2012. Phase space analysis to detect and remove rain from video. Stander Symposium Involvement, Brother Joseph W Stander Symposium 2012, University of Dayton, April 16, in Dayton, Ohio.
- Asari, V.K.** 2012. Automatic detection of whale blows in infrared video. Research Review Meeting, National Oceanic and Atmospheric Administration (NOAA), February 28, in San Diego, California.
- Sarangan, A.M., **P.P. Banerjee,** R. Aylo, G. Nehmetallah, P.E. Powers, and H. Li. 2012. Binary nanoparticle dispersed metamaterial implementation and characterization. SPIE Photonics West Quantum Sensing and Nanophotonic Devices IX, January 23. (MAPR) technique. Photonics West, SPIE, January, in San Francisco, California.
- Velluet, M.T., **M. Vorontsov,** R.L. Espinola, G. Marchi, S. Nicolas, J. Riker, and P.B.W. Schwering. 2012. Turbulence characterization and image processing data sets from a NATO RTO SET 165 trial in Dayton, Ohio. Defense, Security, and Sensing Conference, SPIE, April, Baltimore, Maryland.
- Vorontsov, M.** 2012. Numerical techniques for 3D-turbulence effects analysis and piston phase retrieval. Advanced Maui Optical and Space Surveillance Technologies Conference, AMOS, Wailea, September, in Maui, Hawaii.
- Vorontsov, M.,** M. Aubailly, and A.M. Vorontsov. 2012. Scintillation resistant wavefront sensing based on multi-aperture phase reconstruction technique. Second Adaptive Optics Workshop, DEPS, May, in Monterey, California.
- Vorontsov, M.,** V.V. Dudorov, G.A. Filimonov, and V.V. Kolosov. 2012. Transmitter beam coherence degree influence on bit-error threshold for free-space optical communications through turbulent atmosphere. XVIII International Symposium Atmospheric and Ocean Optics. Atmospheric Physics, July, in Irkutsk, Russia.
- Vorontsov, M.,** V.V. Dudorov, V.V. Kolosov, and G.A. Filimonov. 2012. Bit error rate value for free-space optical communications systems with partially coherent beams. XVIII International Symposium Atmospheric and Ocean Optics. Atmospheric Physics, July, in Irkutsk, Russia.
- Vorontsov, M.,** T. Weyrauch, S.L. Lachinova, and M. Gatz. 2012. Speckle-metric optimization based adaptive optics: Laser beam projection and coherent beam combining at an extended target. Second Adaptive Optics Workshop, DEPS, May, in Monterey, California.
- Weyrauch, T., **M. Vorontsov,** G.W. Carhart, L.A. Beresnev, A.P. Rostov, and J.J. Liu. 2012. Experimental demonstration of target-in-the-loop coherent beam combining over a 7-km atmospheric propagation path. Photonics West, SPIE, January, in San Francisco, California.
- Zhan, Q.,** J. Fu, L. Zhou, and D.H. Ouyang. 2012. Mapping the optical field distribution of the focal point of a tightly focused vector beam by 3D optical trapping of colloidal nanoparticles. SPIE Optics + Photonics, SPIE, August, in San Diego, California.
- Chatterjee, M.R.,** and A. Kundur. 2012. Spectral analysis of encrypted chaotic signals using fast Fourier transforms and laboratory spectral analyzers. SPIE Annual Meeting, August 12, in San Diego, California.
- Chatterjee, M.R.,** and A. Kundur. 2012. Information encryption and retrieval in mid-RF range using acousto-optic chaos. SPIE Conference on Defense and Security, April 23, in Baltimore, Maryland.
- Ordóñez, R.E.** 2012. Cooperative sensing using reconfigurable sensor networks. Theoretical Layered Sensing Seminar, AFRL, WPAFB.
- Vorontsov, M., **E.E. Polnau,** M.D. Gatz, T. Weyrauch, S.L. Lachinova, and D. Marker. 2012. Target-in-the-loop adaptive laser beam projection on an extended target: Turbulence speckle effects mitigation. Photonics West, SPIE, January, in San Francisco, California.
- Vorontsov, M., T. Weyrauch, S.L. Lachinova, M. Gatz, and **E.E. Polnau.** 2012. Coherent beam combining on an extended target with randomly rough surface: Approach and experimental demonstration. Directed Energy Beam Control Conference, DEPS, Broomfield, in Colorado.
- Derenko, S., R. Wuchrer, T. Härtling, and **A.M. Sarangan.** 2012. Surface plasmon resonance gradients in gold nanoparticle arrays for multispectral applications. Near-field Optics, Nanophotonics and Related Techniques (NFO), September 3, in Spain.
- Sarangan, A.M.** 2012. Effect of cryogenic substrate temperature on the growth of Ag and Cu nanostructured optical metamaterials. 2012 Symposium on Photonics and Optoelectronics (SOPO), IEEE Photonics Society, May, in Shanghai, China.
- Aubailly, M.A., **M. Vorontsov,** and G.W. Carhart. 2012. On-the-fly turbulence effect mitigation in long-range surveillance applications based on lucky region fusion. SIAM Conference on Imaging Science, in Philadelphia, Pennsylvania.
- Aubailly, M., **M. Vorontsov,** G.W. Carhart, J.J. Liu, and R.L. Espinola. 2012. Content-dependent, on-the-fly visual information fusion for battlefield scenarios. Defense, Security, and Sensing Conference, SPIE, April, in Baltimore, Maryland.
- Aubailly, M., **M. Vorontsov,** and J.J. Liu. 2012. Scintillation-resistant wavefront sensing based on a multi-aperture phase reconstruction

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**POSTERS**

Powers, P.E., **J.W. Haus**, C. Ye, W. Shi, and A. Chavez-Pirson. 2012. Modeling parametric waveguide terahertz generation. SPIE Photonics West, Nonlinear frequency generation and conversion: Devices and applications XI, SPIE, January 24, in San Francisco, California

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**PATENTS AND  
PATENT DISCLOSURES**

**Subramanyam, G.** Resonant sensor capable of wireless interrogation. U.S. 7,922,975 B2 ed. USPTO.

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**CONTRACTS, GRANTS AND  
SPONSORED RESEARCH**

**Asari, V.K.** (Principal). Automatic pipeline threat detection by advanced image analysis. Pipeline Research Council International (PRCI), \$100,247.00. (December 17, 2012 - August 15, 2013).

**Asari, V.K.** (Supporting). Hot-melt adhesive feasibility study. Procter and Gamble, \$205,000.00. (June 2012).

**Asari, V.K.** (Co-Principal). Whale migration statistics. National Oceanic and Atmospheric Administration (NOAA), \$95,000.00. (August 16, 2011 - March 31, 2012).

**Asari, V.K.** (Co-Principal). Localization of human spatial processing using dense-array electroencephalography. Naval Medical Research Unit (NAMRU), \$50,000.00. (May 16, 2011 - March 31, 2012).

**Asari, V.K.** (Principal). Face recognition for human identification. Department of Defense (DOD) Telemedicine and Advanced Technology Research Center (TATRC), \$249,500.00. (August 2, 2010 - September 30, 2012).

**Asari, V.K.** (Supporting). Detection and tracking of moving objects in wide area motion imagery. (Under the program SCISSORS), Air Force Research Laboratory (AFRL), \$500,000.00. (May 2012 - August 2013).

**Asari, V.K.** (Supporting). Detection and tracking of moving objects in wide area motion imagery.

(Under the program SCISSORS), Air Force Research Laboratory (AFRL), \$450,000.00. (May 2011 - May 2012).

**Balster, E.** (Principal). Ohio Third Frontier sensor's program. Ohio Third Frontier, \$260,000.00. (July 1, 2010 - Present).

**Balster, E.** (Principal). Academic layered sensing program. Task 13, Research and Development of Sensor Processing Systems, AFRL, University of Dayton, \$950,000.00. (February 1, 2011 - January 31, 2013).

Pinnell, M.F. (Co-Principal), R.P. Blust (Co-Principal), **E. Balster** (Supporting), K.E. Bigelow (Supporting), K.M. Crosson (Supporting), S.J. Schneider (Supporting), and K.A. Kinnucan-Welsch (Supporting). EEC-1009607 - Engineering Innovation and Design for STEM Teachers, NSF, \$499,101.00. (July 12, 2010 - Present).

**Banerjee, P.P.** Optoelectronic image processing. AFRL, \$120,000.00. (November 2012 - December 2013).

**Banerjee, P.P.** (Principal). Metamaterials lens phase II. DARPA/DMS, \$350,000.00. (November 13, 2009 - February 29, 2012).

**Banerjee, P.P.** (Principal). Droplet characterization phase II. Army/DMS. \$330,000.00. (November 1, 2009 - February 29, 2012).

**Banerjee, P. P.**, and G. Nehmetallah. High speed surface measurement device phase II. Army/DMS, \$320,000.00. (March 1, 2011 - July 31, 2013).

**Duncan, B.D.** (Principal). Sub-aperture based EO imaging systems. RNET, Inc., \$50,000.00. (October 1, 2008 - Present).

**Hardie, R.C.** (Principal). AFRL/WPAFB, \$210,411.00. (2012 - 2014).

**Haus, J.W.** (Principal). Pan camera project. UtopiaCompression, \$90,000.00. (June 7, 2011 - October 1, 2013).

Powers, P.E. (Principal), and **J.W. Haus** (Co-Principal). Support for SAIC ALTAR program. SAIC (Subcontract to AFRL), \$67,646.00. (August 30, 2012 - August 31, 2013).

Powers, P.E. (Principal), and **J.W. Haus** (Co-Principal). Sub-task for thermal protection system, AFRL, \$105,000.00. (February 24, 2011 - June 30, 2012).

Sarangan, A.M. (Co-Principal), and **J.W. Haus**

(Co-Principal). Inorganic electrochromic glass R&D. CSG Holding Co, \$175,000.00. (October 2012 - September 2013).

**Haus, J.W.** (Principal). Sense and avoid lidar for unmanned aircraft systems (UAS). Utopia Compression (AFRL PHase II), \$90,000.00. (January 19, 2011 - October 19, 2013).

**Haus, J.W.** (Principal). LADAR and Optical Communications Institute, AFRL, \$5,015,000.00. (October 2006 - August 2012).

Sarangan, A.M. (Principal), **J.W. Haus** (Co-Principal), and J.G. Weber (Co-Principal). Collaborative research: Cross-institutional nano-technology education and workforce training project. National Science Foundation, \$99,995.00. (January 1, 2012 - December 31, 2013).

Sarangan, A.M. (Co-Principal), and **J.W. Haus** (Co-Principal). Medical imaging devices. FMI Medical Imaging, \$150,000.00.

Zhan, Q. (Co-Principal), **J.W. Haus** (Principal), M. Vorontsov. Imaging through deep turbulence. Collaborative Research, \$300,000.00. (January 1, 2010 - December 31, 2012).

**Hirakawa, K.** (Principal). Chromatic aberration correction. CISCO, \$45,000.00. (June 1, 2012 - May 15, 2013).

**Hirakawa, K.** (Principal). Low photon count imaging. Sony, \$73,765.00. (April 1, 2012 - March 31, 2013).

**Hirakawa, K.** (Principal). Signal-adaptive joint demosaicking-denoising. Sony, \$77,166.00. (April 1, 2011 - March 31, 2012).

**Ordóñez, R.E.** (Principal). Position-adaptive control of mobile radar networks - add on. AFRL, \$55,000.00. (January 2011 - May 2012).

**Ordóñez, R.E.** (Supporting). Small unmanned air vehicles navigation, AFRL, \$3,500,000.00. (December 15, 2010 - April 29, 2012).

**Sarangan, A.M.** (Principal). Infrared coatings for laser effects on materials, structures and sensors, AFRL (through UES), \$15,000.00. (April 1, 2012 - December 31, 2012).

**Sarangan, A.M.** (Supporting). Ohio academic research cluster for layered sensing. Ohio Third Frontier Project, \$24,348,718.00. (August 18, 2008 - November 18, 2013).

**Sarangan, A.M.** Development of metal vapor coating and blue enhanced medical imaging.

## UNIVERSITY OF DAYTON SCHOOL OF ENGINEERING SCHOLARSHIP 2012

FMI Medical Imaging, \$30,800.00. (September 1, 2012 - April 30, 2013).

**Sarangan, A.M. (Principal).** Midwave infrared sensing technology advancement (MISTA). AFRL, \$100,000.00. (October 2010 - September 2012).

**Sarangan, A.M. (Principal).** Collaborative research: Cross-institutional nano-technology education and workforce training project. National Science Foundation, \$100,000, Award #1138165. (January 2012 - December 2014).

**Sarangan, A.M. (Co-Principal).** Electrochromic glass research and development. China Southern Glass Holding Co., Ltd., \$175,000.

Subramanyam, G. (Principal), and **A.M. Sarangan** (Co-Principal). BioSense. AFRL Sensors Directorate and IDCAST, \$385,312.00. (October 1, 2010 - December 31, 2013).

**Subramanyam, G. (Principal).** HF excision, MaCauly Brown, Federal, \$240,000.00. (April 1,

2012 - December 24, 2014).

**Subramanyam, G. (Principal).** High power agile transmitter. AFOSR, \$300,000.00. (March 1, 2012 - September 30, 2014).

**Subramanyam, G.** BioSense2. AFRL Sensors Directorate, \$50,000.00. (September 1, 2011 - August 31, 2012).

**Taha, T. (Principal).** CAREER: Scalable computer architectures of hierarchical neocortex models and K-12 education enhancement. National Science Foundation, \$400,000.00. (March 15, 2007 - March 14, 2012).

**Vorontsov, M. (Principal).** FA95501210449. U.S. Air Force, \$1,639,778.00. (September 15, 2012 - September 14, 2017).

**Vorontsov, M. (Principal).** Cooperative agreement #W911NF-09-02-0040. ARL, \$1,416,975.00. (September 9, 2009 - September 8, 2013).

**Vorontsov, M. (Principal).** 120293BM. THALES Research and Technology, \$130,000.00. (March

1, 2012 - February 28, 2013).

**Zhan, Q. (Principal).** Metamaterials: conformal roadmap. AFRL, \$370,000.00. (April 1, 2012 - October 31, 2013).

**Zhan, Q. (Principal).** Modeling, fabrication and characterization of thermal metamaterials. AFRL, \$200,000.00. (October 1, 2011 - October 31, 2013).

**Zhan, Q. (Principal).** Metamaterials - design, fabrication, testing. AFRL, \$320,000.00. (January 1, 2009 - March 31, 2012).

**Zhan, Q. (Co-Principal), D. Ou-Yang (Principal), V. Dierolf, and I. Biaggio (Co-Principal).** MRI: Development of a spectroscopic imaging optical bottle for nanoparticle analysis. NSF, \$420,000.00. (October 1, 2009 - September 30, 2012).



*Center of Excellence for Computer Vision  
and Wide Area Surveillance Research (Vision Lab)*



**DEPARTMENT OF ENGINEERING MANAGEMENT AND SYSTEMS (EMS)**

////// *Advanced mathematical techniques for new systems-level analysis and optimization.*

John Doty, professor with the Department of Engineering Management and Systems, recently received \$600K from the Air Force Office of Scientific Research (AFOSR) for his work, "Advanced Mathematical Techniques for New Systems-Level Analysis and Optimization" that will be funded for three years.

In January 2012, Doty presented the following at the American Institute of Aeronautics and Astronautics (AIAA) Aerospace Sciences meeting:

- ▶ Approximate approach for direct calculation of unsteady entropy generation rate for engineering applications.
- ▶ Complete mission-integrated exergy analysis for hypersonic vehicles methodology and application.
- ▶ Data-driven stochastic model development for unknown data sources.
- ▶ Design of a temporally bifurcated dynamic electrical system for maximum metastable response with minimal thermal load.
- ▶ Development of surrogate models for an aircraft synchronous generator.
- ▶ Exergy analysis of a turbojet engine modeled as a lumped parameter system.
- ▶ Implementation of a non-equilibrium exergy analysis for an aircraft thermal management system.
- ▶ Initial development of a statistically based validation process for computational simulation.
- ▶ Quantification of the non-ideality of air for aerospace applications.
- ▶ Statistical sample size determination for uncertainty quantification and error control in validation of simulation experiments.
- ▶ Stochastic model development and forecasting for unsteady, dynamic systems.

Doty, passionate about research, conveys the same enthusiasm to his students at the University of Dayton. He teaches uncertain design for complex systems.

Uncertainty-based analysis works with pattern recognition by merging the correct data in the correct way to produce statistics for optimal solutions. Algorithms with filters and screens sift through "Big Data" for information relevant to decision-making.

Doty teaches engineers and scientists how to apply physics and dynamics with uncertainty, how to look at the system life cycle in a dynamically uncertain environment to minimize losses and maximize performance, as well as how to use analytical tools and management skills to plan, design, optimize and direct complex programs, processes and systems. *(continued)*



John Doty, Ph.D.  
Associate Professor

*"All uncertainty is dynamic. Uncertainty does not disappear but accumulates in systems."*

Doty has developed an advanced engineering design course and has written book chapters about exergy-based analysis of aerospace design. He states, "All uncertainty is dynamic. Uncertainty does not disappear but accumulates in systems."

Doty believes that a focal point should be established for mathematics, physics and engineering called a Modeling Simulation Center. And at the Center, scholars will emphasize optimization for a different way of predicting for effective analysis. According to Ed Mykytka, chairperson of the Department of Engineering Management and Systems, "This [Modeling Simulation Center] will be an interdisciplinary initiative to problem solve."

Doty earned his Ph.D. in mechanical engineering from Purdue University and his master's and bachelor's degrees in aeronautical engineering from the Air Force Institute of Technology. Prior to his mechanical and aerospace education, he completed a bachelor's degree in chemical engineering at Clarkson University. Doty recognizes the need for constant evaluation along with change, diversity and innovative thinking. He discovers what is not there—the uncertainty.

## Engineering Management and Systems

### PRESENTATIONS

**Doty, J.** 2012. Approximate approach for direct calculation of unsteady entropy generation rate for engineering applications. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Complete mission-integrated exergy analysis for hypersonic vehicles; methodology and application. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Data-driven stochastic model development for unknown data sources. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Design of a temporally-bifurcated dynamic electrical system for maximum metastable response with minimal thermal load. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Development of surrogate models for an aircraft synchronous generator. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Exergy analysis of a turbojet engine modeled as a lumped parameter system. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Implementation of a non-equilibrium exergy analysis for an aircraft thermal management system. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Initial development of a statistically-based validation process for computational simulation. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Quantification of the nonideality of air for aerospace applications. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Statistical sample size determination for uncertainty quantification and error control in validation of simulation experiments. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.

**Doty, J.** 2012. Stochastic model development and forecasting for unsteady, dynamic systems. 50th AIAA Aerospace Sciences meeting, January 9, in Nashville, Tennessee.



*Wright Patterson Air Force Base*

### NEWSLETTERS

**Deep, R.** 2012. Monthly column. MPULSE for the Dayton Area Mensa Complex.

### CONTRACTS, GRANTS AND SPONSORED RESEARCH

**Doty, J.** Advanced mathematical techniques for new systems-level analysis and optimization. Air Force Office of Scientific Research (AFOSR), \$600,000.00. (October 1, 2010 - September 30, 2013).

**DEPARTMENT OF ENGINEERING TECHNOLOGY**

////// *Active learning, outreach programs and technical innovation for learning.*

Scott Segalewitz, professor, Department of Engineering Technology, concentrates on active learning, outreach programs and technical innovation for learning. He explains that active learning and technology in the classroom actively engages students, and his outreach initiatives link him to an international classroom through programs such as the University of Dayton China Institute (UDCI) and the Shanghai Normal University (SHNU).



Scott Segalewitz  
Professor

**ACTIVE LEARNING**

In his Technical Computation (SET-153L) class, Segalewitz uses a flipped-classroom model where students gain their first exposure to new material via lecture videos and readings outside the classroom. Then, students use class time for the harder work of applying the knowledge. Active learning in a typically flipped-classroom involves:

- ▶ Lecture material with detailed presentations and examples, typically delivered in the classroom is available outside.
- ▶ Before class, students review lecture materials and complete example problems.
- ▶ Problem solving and integrating the reviewed material is reserved for class.
- ▶ Homework starts in classroom, and instructor guides students through concepts.

Because of extensive online assessments completed by his students, Segalewitz has quantitative and qualitative data that confirms their positive academic performance outcome when using an active learning model. He believes that this model can be used effectively for analytical courses in the School of Engineering.

*"Students complete extensive online assessments and provide quantitative and qualitative data for confirmation of the success of the flipped-classroom model."*

**OUTREACH**

In 2012, Segalewitz began working for UDCI after stepping down from a 12-year tenure as chairperson of the Department. His role as Director of Industrial and Technical Relations took him to China 3-4 times a year to develop relationships with industry.

His relationships resulted in many activities, such as offering professional development courses (we have over 50 in the catalog), joint research activities, student projects and internships, facility tours for students, recruiting talent for partner companies, and more.

During his 2012 administrative sabbatical, Segalewitz traveled to China to teach for four weeks at SHNU. The relationship between the University of Dayton and SHNU began in 2003, and the ninth cohort of students in the 3+1 program currently studies at UD. As part of this relationship, UD faculty teach courses for students who are enrolled in the engineering international program at SHNU. *(continued)*



Segalewitz extends his belief in active learning to other outreach activities including pre-college programs such as the UD Women in Engineering Summer Camp, UD Explore Engineering, and activities with the Dayton Summer Laureate program and the Miami Valley School. He has created projects for students to design and build as they explore exciting careers in engineering, such as electronic pulse detectors, paper towers, earthquake-resistant structures, and projectile launchers.

## TECHNICAL INNOVATION FOR STUDENT LEARNING

Segalewitz has always been involved in seeking new tools and applications of technology to aid in student learning. Shortly after joining the University of Dayton faculty in 2000, he developed a program to use two-way video-conference technology to deliver upper-level engineering technology courses to location-bound adult students. This technology was the first use of synchronous distance learning at UD's School of Engineering. This program later transitioned to synchronous webconference technology and served adult learners for many years.

In 2005, Segalewitz received grants to study the use of TabletPCs in the engineering classroom. The following year, Segalewitz and his team received another grant to study the use of TabletPCs in distance learning. The success of these projects led to the TabletPC requirement for UD School of Engineering students, which lasted for three years until UD students were permitted to select their computer.

Though involved in active learning for many years, his latest outreach and course development projects add a new dimension to his ongoing work at UD.



*Innovation Center*

# Engineering Technology

## PAPERS PUBLISHED IN CONFERENCE PROCEEDINGS

- Edmonson, C.P.** 2012. Integrating business process simulation software into a facilities layout course. ASEE, June, in San Antonio, Texas.
- Kozak, M.** 2012. A self-administered Gage analysis intervention and assessment. ASEE 2012 National Conference in San Antonio, Texas.
- Myszka, D.H.,** A.P. Murray, and C.W. Wampler. 2012. Mechanism branches, turning curves and critical points. ASME International Design Engineering Technical Conference in Chicago, Illinois.
- Schneider, S.J.** 2012. Utilizing a system-on-chip project as a capstone experience in a microprocessors course. American Society for Engineering Educators, in San Antonio, Texas.

## INVITED LECTURES

- Segalewitz, S.I.** (Presenter). 2012. Introducing UD to SHNU students, UD and SHNU partnership. Shanghai Normal University, October 27, in Shanghai, China.
- Segalewitz, S.I.** (Presenter). 2012. Cultivation of outstanding engineers in a global context. Shanghai Normal University, 10th anniversary celebration, Shanghai Normal University, October 26, in Shanghai, China.
- Segalewitz, S.I.** (Presenter). 2012. Using social media to market programs and events. Technofair, University of Dayton Learning Teaching Center (LTC), May 9, in Dayton, Ohio.

## PRESENTATIONS

- Blust, R.P.** 2012. You never know how far you can go unless you run. 5th Annual Conference for Female Teacher Leaders, Aspiring Leaders and Current Leaders in Education,

Miami Valley Women's Leadership Network, Montgomery County Education Service Center, in Dayton, Ohio.

- Blust, R.P.** 2012. National Science Foundation RET grant. Professional Development Day, Teacher Education, Kennedy Union Ballroom, University of Dayton, in Dayton, Ohio.
- Edmonson, C.P.** 2012. Integrating business process simulation software into a facilities layout course. ASEE, in San Antonio Texas.
- Kozak, M.** 2012. A self-administered Gage analysis intervention and assessment. American Society for Engineering Education National Conference, ASEE, June 12, in San Antonio.
- Schneider, S.J.** 2012. Shanghai Normal prospective student recruitment, Shanghai Normal University, The UD-SHNU Partnership, September 13, in Shanghai, China.
- Schneider, S.J.** 2012. Utilizing a system-on-chip project as a capstone experience in a microprocessors course. ASEE Annual Conference, American Society of Engineering Education, June 12, in San Antonio, Texas.
- Untener, J.** 2012. Wisdom from our founders applied today. Marianist Founders' Dinner, University of Dayton, Office of the Rector, in Dayton, Ohio.

## POSTERS

- Kozak, M.** 2012. The rubber band rule and other innovative techniques to teach introductory circuit analysis. American Society for Engineering Education National Conference, ASEE, in San Antonio, Texas.

## CONTRACTS, GRANTS AND SPONSORED RESEARCH

- Blust, R.P.** (Co-Principal). HHDN-Helping Hands Dense Network, Kern Family Foundation, \$1,195,000.00. (November 2011 - December 2014).
- Blust, R.P.** (Supporting). Promoting women through LEADER (Launching equity in the academy across the Dayton entrepreneurial region), National Science Foundation, \$2,860,000.00. (September 2008 - August

2013).

- Blust, R.P.** (Co-Principal). Engineering innovation and design for STEM teachers, National Science Foundation, University of Dayton, \$500,000.00. (June 2010 - June 2012).
- Blust, R.P.** (Supporting). Kern Entrepreneurship Education Network (KEEN), Kern Family Foundation, University of Dayton, \$150,000.00. (May 2010 - June 2012).
- Heitmann, J.A. (Supporting), **R.P. Blust** (Principal), M.F. Pinnell (Principal). Engineering innovation and design for STEM teachers, National Science Foundation, \$199,000.00. (June 2012).

**Edmonson, C.P.** (Principal). Simio Software, Simio LLC, \$79,200.00. (July 7, 2011 - Present).

**Falkowski, S.A.** (Co-Principal). Engineering innovation and design for STEM teachers, National Science Foundation, University of Dayton. (October 2009 - Present).

**Falkowski, S.A.** (Supporting). National Center for Manufacturing Education, National Science Foundation, \$1,600,000.00. (April 2011 - Present).

**Falkowski, S.A.** (Supporting). National Center for Manufacturing Education, National Science Foundation, \$1,600,000.00. (June 2007 - Present).

**Wolff, R.L.** (Co-Principal). Enhancing the resource center role of the National Center for Manufacturing Education. National Science Foundation, \$1,800,000.00. (2003 - Present).

## MAGAZINE/TRADE PUBLICATIONS

**Untener, J.** 2012. Flow Control. In *Run the numbers*, ed. Grand View Media Group, XVIII, no. 10: 26-28.

## OTHER

- Summers, D.C.** 2012. Lean and Black Belt Six Sigma. Pearson Education.
- Summers, D.C.** 2012. Six Sigma Green Belt website training. Pearson Education.

## DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING (MEE)

////// Over 200 graduate students, including three Fulbright scholars, engage in multiple areas of research.

**M**EE at the University of Dayton engages in multiple areas of research. About 100 graduate students perform research in acoustics, machine design, engineering mechanics, biomechanics and materials in the Mechanical Engineering graduate programs. About 50 graduate students do research in aerodynamics, propulsion, thermal management and computational fluid dynamics in the Aerospace Engineering graduate programs. And, about 50 students, including three Fulbright scholars, do research in energy-efficient buildings, energy-efficient manufacturing and solar energy in the Renewable and Clean Energy graduate program (RCL).



J. Kelly Kissock, Ph.D.  
Chairperson and Professor

### CENTERS OF ENERGY RESEARCH

*Industrial Assessment Center* conducts free, independent assessments for mid-sized industries and develops methods and software in industrial energy efficiency. –J. Kelly Kissock, Ph.D., director, and Jun-Ki Choi, Ph.D., assistant director

*Building Energy Center* conducts energy assessments of commercial and residential buildings and does research on energy informatics and energy efficient communities. –Kevin Hallinan, Ph.D., director

*Center for Strategic Energy and Environmental Informatics* is a state of Ohio Center of Excellence that builds upon its extensive capabilities and develops large-scale analysis tools for energy and environmental management. –J. Kelly Kissock, Ph.D., director

### MERLIN FLIGHT SIMULATION LABORATORY

Aerospace engineering students “try out” their designs without leaving the ground in the Merlin Flight Simulator. Working with real physics, students test their prototypes to determine aircraft capability. –Aaron Altman, Ph.D., director

### WIND TUNNEL LABORATORY

Aerospace engineering students use advanced lasers and metrics in a full-scale wind tunnel devoted to experimental aerodynamics. –Aaron Altman, Ph.D., director

### RENEWABLE AND CLEAN ENERGY LABORATORY

Renewable and Clean Energy students study infrared sensing, advanced heat transfer and solar photovoltaics in the Renewable and Clean Energy Laboratory. –J. Kelly Kissock, Ph.D., director

*"Three Fulbright scholars in our Renewable and Clean Energy graduate program do research in energy-efficient buildings, energy-efficient manufacturing and solar energy."*



## DESIGN OF INNOVATIVE MACHINES LABORATORY (DIM LAB)

The DIM Lab team creates, designs, builds, and tests novel machines and mechanisms for a variety of applications while generating the theory that supports these innovations: Shape-changing rigid body mechanisms, shape-changing extrusion dies, novel devices that utilize strain-energy in automobiles, statically equivalent serial chains, design of coupler-drivers, transition linkage identification, design of machines for energy reduction in controlled motions and part-orienting devices. –Andrew Murray, Ph.D., director, and Dave Myszka, Ph.D., director

## ACOUSTICS LABORATORY

Mechanical Engineering students perform research on active noise control and combustion acoustics. –Reza Kashani, Ph.D., director



*Engineering Wellness and Safety Lab*



*Building Energy Center*



*Industrial Assessment Center*

////// *Engineering Wellness and Safety Laboratory (EWSL)*



Kimberly Bigelow , Ph.D.  
MEE assistant professor  
EWSL director

*"Clinical  
biomechanics  
automates  
protocols for  
patients and  
doctors."*

**K**imberly Bigelow, assistant professor, Department of Mechanical and Aerospace Engineering, and director, University of Dayton Engineering Wellness and Safety Laboratory, evaluates human balance and movement — clinical biomechanics.

For people with neurological disorders such as multiple sclerosis, Parkinson's, stroke, brain injury, etc., the EWSL team objectively measures and validates therapy programs and assistive devices. Using sensors and balance plates for rates of improvement statistics, the team gathers performance data and collaborates with Dr. Kurt Jackson, associate professor and neurology coordinator with the Department of Physical Therapy. Bigelow's goal is to "automate protocols," so doctors and patients understand and employ EWSL technology for an optimal course of treatment.

Off-campus, Bigelow partners with the Kettering Health Network (KHN) NeuroRehab & Balance Center. KHN prescribes advanced treatment programs for complex neurological and balance disorders. With her EGR 103 and Capstone Senior Design students, Bigelow determines the optimal assistive device design solutions for KHN patients. The EGR 103 students work on the first iteration. Then, the senior students advance the project. One design for an iPad stand went through four iterations. The KHN partnership interweaves with EWSL, which leads to further collaborations, design projects and funding.

As an active mentor, Bigelow assists engineering students with research and funding. Recently, two of her students successfully applied and obtained funding through the prestigious National Science Foundation's graduate research fellowships: Senia Smoot studies assistive devices for autistic children. And, Renee Beach focuses on floor surfaces that pose fall risks. Bigelow's reward: Their research continues at EWSL.



*Engineering Wellness and Safety Laboratory (EWSL)*

////// Sustainable Design and Manufacturing Laboratory (SDML)



Jun-Ki Choi, Ph.D.  
MEE assistant professor  
SDML director

*"Making the sustainability connection from product inception to product end-of-life."*

Jun-ki Choi proactively integrates environmental consciousness with manufacturing processes through his sustainable product and process design research. His mantra is "reuse, remanufacture and recycle."

As assistant professor with the University of Dayton Department of Mechanical and Aerospace Engineering, assistant director with the UD's Industrial Assessment Center (UD-IAC) and director of the UD's Sustainable Design and Manufacturing Laboratory, Choi connects sustainability in academics with other agencies in the government, economic and industrial arenas.

Choi has been working on developing methodologies on interfacing engineering decisions with the broader implication of economic and environmental externalities through multi-scale systems modeling framework.

By employing a whole lifecycle assessment, Choi examines the environmental impact of products from their inception to their end-of-life. His studies reveal that logistics, transportation emissions, and fuel costs emerge as recycling infrastructure optimization challenges. He says, "Concept design is seventy-five percent of the cost, and it is important to get it right from the beginning. Systems design integration is a necessity."

At concept design, Choi proposes creating a connection between engineering and policymaking so sustainable decision-making will benefit from the collaborative efforts. In turn, innovative green products and processes as well as environmental impact awareness will result.

"The ease of assembly should be easy to disassemble," says Choi.



*Industrial Assessment*





Markus Rumpfkeil, Ph.D.  
MEE assistant professor

*"Devising solutions to help people is engineering at its best."*

Markus Rumpfkeil's path to the University of Dayton began at the Humboldt University of Berlin, Germany, where he received the equivalent of a Master and Bachelor in Physics with a Minor in Mathematics. He then obtained his Ph.D. in Aerospace Studies from the University of Toronto, Canada. "With a solid foundation in physics, science and mathematics, it was relatively easy to make the switch to aerospace engineering," says Rumpfkeil.

Wanting to be an educator all his life, he accepted a faculty position with UD's Department of Mechanical and Aerospace Engineering for three reasons: (1) "Teaching and caring about its students is a high priority at UD, (2) Dayton is the birthplace of aviation, and (3) Wright-Patterson Air Force Base (WPAFB) is within close proximity, where a lot of people are conducting world-class research."

Rumpfkeil's research interests include computational fluid dynamics (CFD), aerodynamic shape optimization, multidisciplinary design optimization and uncertainty quantification. He develops algorithms for next-generation analyses and optimization codes. By accessing the AFRL's DoD Supercomputing Resource Center (DSRC) for high-performance computing, he performs multiple analyses for cost, safety and environmental trade-off determinations.

Uncertainty quantification (UQ) presents a broad field; however, as Rumpfkeil explains, "Deterministically determined designs can be inefficient or even fail if variations in the environment are not accounted for, and the broad field of UQ tries to do just that."

Lastly, Rumpfkeil conducts simulations for airplane noise reduction. "Nowadays, people live closer and closer to airports, which have more and more air traffic. Many studies show that airplane noise adversely affects people's health. Devising solutions to help people is engineering at its best," says Rumpfkeil.



*Aerospace Propulsion - Wright Patterson Air Force Base Test Cell*

# Mechanical and Aerospace Engineering

## JOURNAL ARTICLES

- Kang, H., N. Genco, and **A. Altman**. 2012. Empirically derived biplane lift as a function of gap and stagger. *AIAA Journal of Aircraft*.
- Altman, A.**, R. Hurwitz, C. Dym, and J. Wesner. 2012. The key ideas of MDW VIII: A summary. *International Journal of Engineering Education* 282: 1-11.
- Bigelow, K.E.** 2012. Designing for success: Developing engineers who consider universal design principles. *Journal of Postsecondary Education and Disability Just, Usable, Sustainable, Transformational Design Special Issue* 253: 211-225.
- Bigelow, K.E.** 2012. Student perspective in an all-female first-year engineering innovation course. *International Journal of Engineering Education Special Issue - Mudd Design Workshop VIII: Design Education: Innovation and Entrepreneurship* 282: 286-292.
- Jackson, K., **K.E. Bigelow**, C. Bowshire, M. Weston, and E. Grant. 2012. Feasibility and effects of a group kickboxing program for individuals with multiple sclerosis: A pilot report. *Journal of Bodywork and Movement Therapies* 161. doi:10.1016/j.jbmt.2010.09.002
- Jackson, K., **K.E. Bigelow**, C. Cooper, and H. Merriman. 2012. A group kickboxing program for improving balance, mobility and quality of life in individuals with multiple sclerosis: A pilot study. *Journal of Neurological Physical Therapy* 36: 131-137.
- Briones, A.M., **J.S. Ervin**, L. Byrd, S. Putnam, and J. Jones. 2012. Evaporation characteristics of pinned water microdroplets. *AIAA Journal of Thermophysics and Heat Transfer* 26: 480-493.
- Hanchak, M., L. Byrd, A.M. Briones, **J.S. Ervin**, and P. Shawn. 2012. Model of droplet impingement based on least-squares solution of proper orthogonal decomposition basis matrices. *ASME Journal of Fluids Engineering*. <http://www.asme.org/products/journals/journal-of-fluids-engineering>
- Jiang, H., **J.S. Ervin**, S.S. Zabarnick, and Z.J. West. 2012. Effects of flow passage expansion or contraction on jet-fuel surface deposition. *AIAA Journal of Propulsion and Power* 30.
- Briones, A.M., **J.S. Ervin**, S.A. Putnam, L.W. Byrd, and J.G. Jones. 2012. A novel kinetically-controlled de-pinning model for evaporating water microdroplets. *International Communications in Heat and Mass Transfer* 39: 1311-1319.
- Jiang, H., **J.S. Ervin**, S.S. Zabarnick, and Z.J. West. 2012. Effects of flow passage expansion or contraction on jet-fuel surface deposition. *AIAA Journal of Propulsion and Power* 284: 694-706.
- Putnam, S.A., A.M. Briones, L.W. Byrd, **J.S. Ervin**, M.S. Hanchak, A. White, and J.G. Jones. 2012. Microdroplet evaporation on superheated surfaces. *Int. J. Heat Mass Transfer* 55: 5793-5807.
- Putnam, S.A., A.M. Briones, **J.S. Ervin**, M.S. Hanchak, L.W. Byrd, and J.G. Jones. 2012. Interfacial heat transfer during microdroplet evaporation on a laser heated surface. *Int. J. Heat Mass Transfer* 55: 6307-6320.
- Putnam, S., L. Byrd, A. Briones, M. Hanchak, **J.S. Ervin**, and J. Jones. 2012. Role of entrapped vapor bubbles during microdroplet evaporation. *Applied Physics Letters* 101: 071602 - 071602-4. <http://link.aip.org/link/doi/10.1063/1.4745009>.
- Hallinan, K.P.** 2012. Energy information augmented community-based energy reduction. *Sustainability Journal* 4: 1371-1396. [www.mdpi.com/2071-1050/4/7/1371](http://www.mdpi.com/2071-1050/4/7/1371).
- Kashani, A.R.** Forthcoming. Tuned damping of balcony vibration. *ASCE Journal of Performance of Construction Facilities*.
- Zhao, K., J.P. Schmiedeler, and **A.P. Murray**. 2012. Design of planar, shape-changing rigid-body mechanisms for morphing aircraft wings. *ASME Journal of Mechanisms and Robotics*.
- Perkins, D., and **A.P. Murray**. 2012. Singularity free revolute-prismatic-revolute and spherical-prismatic-spherical chains for actuating planar and spherical single degree of freedom mechanisms. *ASME Journal of Mechanisms and Robotics*.
- Petrykowski, J.C.**, and Y. Shi. 2012. Parametric modeling of electromagnetically induced vibrational processes occurring within induction melting systems. *Journal of Iron and Steel Research International* 191, no. 2: 709-712.
- Shi, Y., and **J.C. Petrykowski**. 2012. Quasi steady vibratory motion within an inductively-heated cylindrically-shaped liquid volume. *Journal of Iron and Steel Research International* 191, no. 2: 739-742.
- Rumpfkeil, M.** Accepted. Optimizations under uncertainty using gradients, Hessians, and surrogate models. *AIAA Journal* 51, no. 2: 444-451, 2013.

## PAPERS PUBLISHED IN CONFERENCE PROCEEDINGS

- Altman, A.** 2012. Eliminate final exams in intro to flight with portfolios? An update after 6 years of improvement. 50th AIAA Aerospace Sciences Meeting and Exhibit AIAA 2012-1076, January, in Nashville, Tennessee.
- Altman, A.** 2012. The aerospace design education implications from the eight Harvey Mudd design workshops. 50th AIAA Aerospace Sciences Meeting and Exhibit AIAA 2012-1221, January, in Nashville, Tennessee.
- Cranston, B., and **A. Altman**. 2012. Leading edge serrations on flat plates at low Reynolds number. 50th AIAA Aerospace Sciences Meeting and Exhibit AIAA 2012-0053, January, in Nashville, Tennessee.
- Ganci, G., **A. Altman**, and J. Rodewald. 2012. Identification of aircraft by their unique turbulent wake signature: Experimental validation. 50th AIAA Aerospace Sciences Meeting and Exhibit AIAA 2012-0066, January, in Nashville, Tennessee.
- Lego, Z., **A. Altman**, and S. Gunasekaran. 2012. Experimental and computational analysis of high angle of attack perching maneuvers. 30th AIAA Applied Aerodynamics Conference AIAA 2012-2666, June, in New Orleans, Louisiana.
- Hanchak, M.S., A.M. Briones, **J.S. Ervin**, and L.W. Byrd. 2012. Heat transfer coefficients and lifetimes of micro-droplet evaporation in the transition regime. ASME IMECE 2012, in Houston, Texas.
- Hallinan, K.P.**, Y. Tesfay, J. Monn, E. Krehnovi, P. Brodrick, and A. Rivera-Lopez. 2012. An improved method for predicting energy in variable occupancy academic buildings. 2nd

World Sustainability Forum.

Myszka, D.H., **A.P. Murray**, and C.W. Wampler. 2012. Mechanism branches, turning curves, and critical points. *Proceedings of the 2012 ASME International Design and Engineering Technical Conferences*, August 12-15, in Chicago, Illinois.

Zhao, K., J.P. Schmiedeler, and **A.P. Murray**. 2012. Kinematic synthesis of planar, shape-changing compliant mechanisms using pseudo-rigid-body models. *Proceedings of the 2012 ASME International Design and Engineering Technical Conferences*, August 12-15, in Chicago, Illinois.

**Myszka, D.H.**, A.P. Murray, and C.W. Wampler. 2012. Mechanism branches, turning curves, and critical points. *Proceedings of the 2012 ASME International Design and Engineering Technical Conferences*, August 12-15, in Chicago, Illinois.

**Petrykowski, J.C.** 2012. Analysis of fuel-coolant interaction potential in sodium cooled fast reactor safety experiments. ASME International Conference on Nuclear Engineering, in Anaheim, California.

**Rumpfkeil, M.** 2012. Optimization under uncertainty using derivatives and Kriging surrogate models. 50th AIAA Aerospace Meeting and Exhibit, January, in Nashville, Tennessee.

**Rumpfkeil, M.** 2012. Optimization under uncertainty using derivatives and Kriging surrogate models. Seventh International Conference on Computational Fluid Dynamics ICCFD6, July, in Hawaii.

## PRESENTATIONS

**Altman, A.** 2012. Identification of aircraft by their unique turbulent wake signature: Experimental validation. DCASS, AIAA, March, in Dayton, Ohio.

**Altman, A.** 2012. Eliminate final exams in intro to flight with portfolios? An update after 6 years of improvement. AIAA Aerospace Sciences Meeting, AIAA, January, in Nashville, Tennessee.

**Altman, A.** 2012. The aerospace design education implications from the eight Harvey Mudd Design Workshops. AIAA Aerospace Sciences Meeting, AIAA, January, in Nashville, Tennessee.

**Altman, A.**, and B. Cranston. 2012. Leading edge serrations on flat plates at low Reynolds number. AIAA Aerospace Sciences Meeting, AIAA,

January, in Nashville, Tennessee.

**Altman, A.**, G. Ganci, and J. Rodewald. 2012. Identification of aircraft by their unique turbulent wake signature: Experimental validation. AIAA Aerospace Sciences Meeting, AIAA, January, in Nashville, Tennessee.

Bani-Younes, A., and **A. Altman**. 2012. Experimental investigation of the flowfield surrounding a photodriven flapping wing. DCASS, AIAA, March, in Dayton, Ohio.

Geyman, M., and **A. Altman**. 2012. Wing/wall aerodynamic interactions in free flying, maneuvering MAVs. DCASS, AIAA, March, in Dayton, Ohio.

Gunasekaran, S., and **A. Altman**. 2012. Analysis of rapidly pitching wings using superposition of rotational circulation. AIAA Region III Regional Student Conference, AIAA, March, in Ann Arbor, Michigan.

Lego, Z., and **A. Altman**. 2012. Experimental and computational analysis of flat plates rapidly pitching to high angles. AIAA Region III Regional Student Conference, AIAA, March, in Ann Arbor, Michigan.

Lego, Z., **A. Altman**, and S. Gunasekaran. 2012. Experimental and computational analysis of high angle of attack perching maneuvers. AIAA Fluids/Applied Aero Conference, AIAA, June, in New Orleans, Louisiana.

Ross, I., and **A. Altman**. 2012. Investigating critical design aerodynamics of vertical-axis wind turbines to improve power efficiency. DCASS, AIAA, March, in Dayton, Ohio.

Byrd, L., A. Cole, S.M. Emo, **J.S. Ervin**, T. Michalak, and V. Tsao. 2012. In-situ charge determination for vapor cycle systems in aircraft. SAE 2012 Power Systems Conference, SAE, October.

Hanchak, M., A.M. Briones, **J.S. Ervin**, and L. Byrd. 2012. Heat transfer coefficients and lifetimes of micro-droplet evaporation in the transition regime. ASME IMECE 2012, November.

Johnson, D.J., S. Patnaik, and **J.S. Ervin**. 2012. An integrated chemical reactor-heat exchanger using ammonium carbamate. SAE Power Systems Conference, October.

**Kashani, A.R.**, and A. Mazdeh. 2012. The impact of perforation geometry on acoustic damping attributes of a perforated liner with bias flow. International Gas Turbine Institute Conference

and Exhibit, ASME/AIAA, June, in Copenhagen, Denmark.

**Petrykowski, J.C.** 2012. Analysis of fuel coolant interaction potential in sodium cooled fast reactor safety experiments. ASME 20th International Conference on Nuclear Engineering, ASME/International Atomic Energy Agency/Japanese Mechanical Engineering Society/Chinese Nuclear Society, August, in Anaheim, California.

**Petrykowski, J.C.**, and Y. Shi. 2012. Parametric modeling of electromagnetically induced vibrational processes occurring within induction melting systems. 7th International Conference on Electromagnetic Processing of Materials, Iron and Steel Institute of Japan/Chinese Society of Metals, October, in Beijing, China.

**Petrykowski, J.C.**, and Y. Shi, Y. 2012. Quasi steady vibratory motion within an inductively-heated cylindrically-shaped liquid volume. 7th International Conference on Electromagnetic Processing of Materials, Iron and Steel Institute of Japan/Chinese Society of Metals, October, in Beijing, China.

**Rumpfkeil, M.**, and D. Bryson. 2012. Oscillating wing aerodynamics and noise simulations using overflow. 11th Symposium on Overset Composite Grids and Solution Technology, on October 18, in Dayton, Ohio.

## INVITED LECTURES

**Altman, A.** 2012. Aerodynamic force estimation of photorestrictive flapping wings. AFRL Materials Directorate, AFRL, in Wright-Patterson AFB, Ohio.

Ervin, J.S., **A.D. Chiasson**, and M. Elsass. 2012. Update to Air Force Air Combat Command on Jet A freeze point studies. Air Force Air Combat Command HQ, March, in Langley AFB, Virginia.

Ervin, J.S., **A.D. Chiasson**, and M. Elsass. 2012. Update to Air Force Global Strike Command on Jet A conversion. Air Force, March, in Barksdale AFB, Louisiana.

Ervin, J.S., **A.D. Chiasson**, and M. Elsass. 2012. Update to Air Mobility Command on Jet A freeze point studies. Air Force Mobility Command HQ, March, in Scott AFB, Illinois.

Redford, C., J.S. Ervin, **A.D. Chiasson**, and M. Elsass. 2012. Update on Jet A research to Air Force Reserve Command, AFRC HQ, February, in



Warner Robbins AFB, Georgia.

Redford, C., J.S. Ervin, **A.D. Chiasson**, and M. Elsass, 2012. Jet A freeze point studies. Update to Air Force Special Operations Command, February, in AFSOC HQ, Hurlburt Field, Florida.

**Choi, J.-K.** 2012. Faculty research introduction for RCL graduate students. University of Dayton, in Dayton, Ohio.

**Choi, J.-K.** 2012. Integrated sustainable systems design. University of Dayton, November 17, in Dayton, Ohio.

**Hallinan, K.P.** 2012. Energy informatics. Society of Military Engineers, SAME, May 15, in Dayton, Ohio.

**Kashani, A.R.** 2012. Tuned damping of tall structures. Leo A. Daly Structural Engineering, November, in Omaha, Nebraska.

**Kashani, A.R.** 2012. Vibroacoustic modeling. Chrysler Corp, January, in Auburn Hill, Michigan.

**Kashani, A.R.** 2012. Earthquake mitigation via damping. International Earthquake Institute, December, in Tehran, Iran.

**Kashani, A.R.** 2012. Earthquake mitigation via damping. International Earthquake Institute, November, in Toledo, Ohio.

### INVITED PANELS

**Choi, J.-K.** 2012. Professional experience on job communication. English department, University of Dayton, in Dayton, Ohio.

### POSTERS

Jackson, K., and **K.E. Bigelow**. 2012. The influence of time of day and physical activity on symptomatic fatigue and clinical measures of dynamic balance in persons with multiple sclerosis. 2nd Annual International Symposium on Gait and Balance in Multiple Sclerosis, Oregon Health and Science University, October, in Portland, Oregon.

Petit, D.J., and **K.E. Bigelow**. 2012. The effect of different foams on posturography measures in healthy and impaired populations. American Society of Biomechanics, August 16, in Gainesville, Florida.

Rigsby, M.T., and **K.E. Bigelow**. 2012. Validation

of a commercial wearable sensor system for accurately measuring gait on uneven terrain. American Society of Biomechanics, August 17, in Gainesville, Florida.

### ABSTRACTS

**Petrykowski, J.C.**, and Y. Shi. 2012. Parametric modeling of electromagnetically induced vibrational processes occurring within induction melting systems. Proceedings of 7th International Conference on Electromagnetic Processing of Materials, in Beijing, China.

Shi, Y., **J.C. Petrykowski**. 2012. Quasi steady vibratory motion within an inductively-heated cylindrically-shaped liquid volume. Proceedings of 7th International Conference on Elec., in Beijing, China.

### CONTRACTS, GRANTS AND SPONSORED RESEARCH

**Altman, A.** (Co-Principal), and S.S. Altman (Co-Principal). Wind tunnel flow diagnostics and test support. AFRL/RQVX, Federal, \$185,000.00. (October 2012 - October 2013).

**Altman, A.** (Co-Principal), and S.S. Altman. (Co-Principal). Wind tunnel flow diagnostics and test support. AFRL/RBAX, Federal, \$180,000.00. (October 2011 - October 2012).

**Altman, A.** (Co-Principal), and G.J. Frank (Co-Principal). Perching/MAV aerodynamics, AFRL/RBSA, Federal, \$85,400.00. (September 2011 - November 2012).

**Altman, A.** (Supporting), and R. Scudder (Principal). Center for UAV exploitation wind tunnel upgrades, state of Ohio, State, \$190,000.00. (October 2009 - Present).

**Bigelow, K.E.** (Principal). Assistive device design - EGR 103 spring project. Kettering Health Network, Local, \$2,868.00. (December 2012 - Present).

**Bigelow, K.E.** (Principal). Assistive device design - kitchen devices for individuals with stroke. Kettering Health Network, Local, \$9,759.00. (September 2012 - Present).

**Bigelow, K.E.** (Principal). Assistive device design - vision therapy device. Kettering Health Network, Local, \$7,372.00. (August 2012 - Present).

**Bigelow, K.E.** (Principal). Assistive device design

- iPad accessories. Kettering Health Network, Local, \$2,705.00. (January 2012 - Present).

**Bigelow, K.E.** (Principal). Assistive device design - shower transfer seat. Kettering Health Network, Local, \$17,294.00. (January 2012 - September 2012).

**Bigelow, K.E.** (Principal). Assistive device design project - bathtub transfer seat. Kettering Health Network and Balance and NeuroRehab Center (through Kettering Foundation Grant), Local, \$17,294.00. (January 31, 2012 - May 31, 2012).

**Bigelow, K.E.** (Principal). Assistive device design project - iPad accessories, Kettering Health Network and Balance and NeuroRehab Center (through Kettering Foundation Grant), Local, \$2,705.00. (January 31, 2012 - May 31, 2012).

**Bigelow, K.E.** (Supporting), and L. Bistrek. (Principal). Improving student spatial visualization skills to increase retention and GPA. Procter and Gamble Fund's Higher Education Grant, Private, \$6,000.00. (December 2011 - Present).

**Bigelow, K.E.** (Principal), W.S. Diestelkamp, C.M. Krane, and M.F. Pinnell. Multi-disciplinary STEM grant preparation support in bioengineering, NSF Advance - LEADER Consortium Mini-Grant, Local, \$5,000.00. (December 2010 - August 2012).

**Bigelow, K.E.** (Co-Principal), M. Pinnell (Co-Principal), A. Ciric (Co-Principal), and L. Bistrek (Co-Principal). Engage: Engaging students in engineering, NSF-sponsored ENGAGE Mini-Grant, Federal, \$10,000.00. (August 2011 - January 2013).

Ervin, J.S. (Co-Principal), **A.D. Chiasson** (Supporting), M. Elsass (Supporting), and S.S. Zabarnick (Co-Principal). Simulations of aircraft fuel tank heat transfer, Air Force, Federal, \$1,200,000.00. (October 2010 - June 2013).

**Ervin, J.S.** (Principal). Student support for central states section of the Combustion Institute 2012 Technical Meeting, April 22-24, 2012, in Dayton, OH, NSF, Federal, \$5,000.00. (April 2012 - December 2012).

**Ervin, J.S.** (Principal). Aircraft thermal management research. Air Force Research Laboratory, Federal, \$5,500,000.00. (May 2008 - November 2013).

**Ervin, J.S.** (Principal). Fuel tank heat transfer for Jet A freeze point studies. Naval Air Command/ Defense Logistics Agency, Federal, \$600,000.00. (September 2012 - July 2013).

**Ervin, J.S.** (Co-Principal), D. Ballal (Principal),

## UNIVERSITY OF DAYTON SCHOOL OF ENGINEERING SCHOLARSHIP 2012

- M.J. DeWitt (Co-Principal), S.S. Zabarnick (Co-Principal), T.F. Williams (Co-Principal), and S.D. Stouffer (Co-Principal). FA8650-10-2-2934; Fuels and combustion technologies for aerospace propulsion. Air Force Research Laboratories, Federal, \$49,500,000.00 (December 2010 - December 2016).
- Ervin, J.S.** (Supporting), L. Byrd (Co-Principal), J. Jones (Co-Principal), A.M. Briones (Supporting), M. Hanchak (Supporting), and S. Putnam (Supporting). Understanding evaporation mechanisms, Air Force of Scientific Research, Federal, \$600,000.00. (September 2011 - October 2014).
- Hallinan, K.P.** (Principal). Utility energy audit program. Dayton Power and Light, Private, \$55,000.00. (March 15, 2012 - December 31, 2012).
- Hallinan, K.P.** (Principal). Effective R-value calculator development for high mass walls. Performance Concrete, Private, \$40,000.00. (January 2010 - December 2012).
- Hallinan, K.P.** (Principal), and R.J. Brecha (Co-Principal). Commercial building recommissioning program. Vectren, University of Dayton, \$175,000.00. (August 2009 - December 2013).
- Hallinan, K.P.** (Principal). Novel Carnot like Stirling solar engine. AFRL-Propulsion Directorate, Federal, \$25,000.00. (June 1, 2012 - May 15, 2013).
- Kashani, A.R.**, and J. Monfort. (Supporting). Acoustics of augmentor. Air Force (funding a graduate student, Jeff Monfort), Federal, \$50,000.00. (May 1, 2012 - May 1, 2013).
- Murray, A.P.** (Principal), and D.H. Myszka (Co-Principal). Variable geometry dies for polymer extrusion. National Science Foundation, Federal, \$313,830.00. (August 1, 2012 - July 31, 2015).
- Murray, A.P.**, and D.H. Myszka. Novel concepts for spring-based mechanical energy storage in motor vehicles. General Motors Global Research and Development, Private, \$140,000.00. (August 2010 - August 2012).
- Murray, A.P. (Principal), and **D.H. Myszka** (Co-Principal). Variable geometry dies for polymer extrusion. National Science Foundation, Federal, \$313,830.00. (August 1, 2012 - July 31, 2015).
- Murray, A.P., and **D.H. Myszka**. Novel concepts for spring-based mechanical energy storage in motor vehicles. General Motors Global Research and Development, Private, \$140,000.00. (August 2010 - August 2012).
- Pinnell, M.F.** (Principal), C.M. Krane (Principal), and W.S. Diestelkamp (Principal). Assessing the viscoelastic properties of porcine arteries: An integrated approach. Leader Consortium-NSF Advance Program, \$5,000.00. (January 1, 2010 - June 30, 2012).
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