

**Jarod Kelly**  
**Assistant Research Scientist**  
**School of Natural Resources and Environment**  
**University of Michigan**

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## Education

- PhD Mechanical Engineering, University of Michigan, August 2008.  
*Interactive genetic algorithms for shape preference assessment in engineering design*  
Chair: Panos Y. Papalambros  
Committee: Richard Gonzalez, Colleen M. Seifert, R. Brent Gillespie, Gregory H. Wakefield
- MSE Mechanical Engineering, University of Michigan, April 2005.
- BS Mechanical Engineering Magna Cum Laude, University of Oklahoma, May 2003.

## Areas of Interest

Energy generation and utilization  
Sustainability through design  
Multidisciplinary design and optimization  
Product design  
Preference analysis  
Genetic algorithms

## Honors, Awards & Grants

- 2012 National Science Foundation Environmental Sustainability Grant, *Advancing Offshore Wind Power Sitting through Multi-criteria Assessment Integration*, #1235671, (\$299,933 for 3 yrs), PI
- 2012 Clean Vehicle Research Center-Clean Vehicle Consortium Industrial Member Grant, *Electricity and material sourcing scenario analyses to guide vehicle technology strategies*, (\$345,530 for 3 yrs), PI
- 2012 Graham Environmental Sustainability Institute Integrated Assessment Planning Grant for Livable Communities, *Integrated Assessment of Infrastructure Greening within Detroit for Improved Sustainable Transportation, Water Quality, and Health*, (\$20,000 for 6 mo), PI
- 2011 Michigan Memorial Phoenix Energy Institute Faculty Fellow
- 2011 Michigan "Road Scholars" Program awardee
- 2010 Department of Energy: U.S.-China Clean Energy Research Center on Clean Vehicles
- 2010 Michigan Public Service Commission (Grant PSC-10-27), Offshore Wind Technology Michigan Energy Efficiency Grant
- 2008 Alcoa Conservation and Sustainability Fellow, University of Michigan

2008	AAAI Symposium Travel Grant
2007	Rackham Travel Grant
2007	Michigan Teaching Fellow
2006	Rackham Travel Grant
2006	University of Michigan Engineering Graduate Student Symposium, 2nd place poster
2004	National Science Foundation Graduate Research Fellow
2003	University of Michigan Benton Fellowship
2003	First Place Senior Design Capstone Project, University of Oklahoma
2002	University of Oklahoma AME Departmental Scholar
2001	Member Tau Beta Pi, Engineering Honors Society
2001	Member Pi Tau Sigma, Mechanical Engineering Honors Society
1998	National Merit Scholar
1998	Oklahoma Board of Regents Scholar
1998	Oklahoma Scholar
1998	Rooney Fund Scholar
1998	Kalamazoo Area Scholar

## Research Experience

9/2010-Present	<p>Assistant Research Scientist  University of Michigan, School of Natural Resources and Environment  Applying life cycle methodologies to transportation and electrical systems. Research efforts include: determining the environmental impacts of plug-in hybrid electric vehicles on regional electrical grids, especially fuel cycle impacts; assessing policy impacts on the environmental and electrical performance of offshore wind turbines in the Great Lakes; understanding vehicle travel patterns to inform vehicle design and transportation modalities. Mentoring and managing graduate students.</p>
9/2008-8/2010	<p>Research Fellow  University of Michigan, Center for Sustainable Systems.  Mentor: Gregory A. Keoleian  Researched the impacts of renewable electricity technologies on the characteristic CO<sub>2</sub> emissions of the electric grid. Developed several mathematical models of electricity dispatching thereby allowing detailed association of electricity demand with associated CO<sub>2</sub> emissions. Explored several scenarios in which electricity supply (renewable electricity) and demand (plugin hybrid electric vehicles) can change, and the resulting CO<sub>2</sub> impacts.</p>
8/2005-4/2008	<p>Graduate Research Assistant  University of Michigan, Optimal Design Laboratory.  Advisor: Panos Y. Papalambros  Conducted design research examining the impacts of shape on personal preference and design functionality. Developed interactive genetic algorithms (IGAs) and showed their capabilities in understanding shape preference. Applied psychological and marketing tools within an engineering design context for product design. Used IGAs to assess user associations between vehicle silhouette and fuel economy.</p>
9/2003-8/2005	<p>Graduate Research Assistant  University of Michigan, Smart Materials and Structures Design Laboratory.</p>

Advisor: Diann Brei  
Conducted experimental research on shape memory alloys (SMA). Projects included: cyclical loading impacts on SMA, distributed manipulation using SMA and compliant mechanisms, SMA embedded in matrix materials, SMA actuation for self locking mechanism.

9/2002-5/2003 Undergraduate Research Assistant  
University of Oklahoma.  
Advisor: Ajay K. Agrawal  
Conducted experimental research in natural gas combustion using various forms of flame stabilization (swirl, and porous media).

## Teaching

2008 Taught undergraduate Design and Manufacturing. Shanghai Jiao Tong University + University of Michigan Joint Institute Program in Shanghai. Instructed sophomore level mechanical engineering design course, including CAD software (Unigraphics), manufacturing processes and principles, material selection, Design for Assembly and other design considerations. Included course planning, lecture, laboratory instruction, and group project advising. [Summer 2008]

2006-2008 Assisted project groups in graduate Design Optimization course. University of Michigan. Served as project consultant for semester long team projects: included assisting in model development, optimization algorithm advice, and implementation of optimization software (LMS Optimus). [Winter 2006, 2007 & 2008]

2006-2007 Assisted teaching Analytical Product Design. University of Michigan. Lectured on rapid prototyping, reverse engineering, integrating marketing and engineering models. Served as consultant to project groups for semester long design projects. [Fall 2006 & 2007]

5/2007 Took Preparing Future Faculty course. University of Michigan. Studied pedagogical topics such as team learning, teaching with technology and fostering inclusive teaching environments. Course resulted in attainment of Michigan Teaching Fellow award.

11/2006 Guest lectured first-year architectural PhD course. University of Michigan. Introduced the Design Science program at UM, and presented research findings.

## Graduate Student Mentoring

3/2012-present Matthew Rife, Lauren Knapp, Yiting Li, Yufeng Ma. University of Michigan, SNRE. Analysis of offshore wind preferences and knowledge networks within Great Lakes communities. [Project advisor]

3/2012-Present Joe Collett. University of Michigan, SNRE. Impact of aluminum sourcing on vehicle lifecycle emissions. [Masters thesis co-advisor]

12/2011-Present Nolan Orfield. University of Michigan, SNRE. Algal biofuel, lifecycle assessment. [PhD dissertation committee member]

7/2011-Present Anne Marie Lewis. University of Michigan, SNRE. Examining the relationship between vehicle technology and policy and their role in reducing greenhouse gases. [PhD dissertation committee member]

1/2011-Present Brandon Marshall. University of Michigan, SNRE. Inclusion of naturalistic drive-cycle data into plug-in hybrid electric vehicle modeling for environmental impact assessment. [Masters thesis co-advisor]

1/2011-Present Nathan MacPherson. University of Michigan, SNRE. Clean Energy Research Center on Clean Vehicles. Biofuels project. [Masters thesis co-advisor]

- 1/2011-Present      Sonika Choudhary. University of Michigan, SNRE. Biomass electricity production in urban, suburban and rural areas: Case study with the University of Michigan. [Masters thesis co-advisor]
- 9/2008-Present      Dan Nathan-Roberts, University of Michigan, IOE. Automated Aesthetic Ergonomic Design of Mobile User Devices Using Genetic Algorithms. [PhD dissertation committee member]
- 1/2010-5/2011      Hunt Briggs, Timothy Haines, Bryan Hogle, Sarah Howie. University of Michigan, SNRE. Cisco Systems funded project to explore energy savings policies at UM campus buildings via IP managed devices. [Project advisor]
- 9/2010-12/2010      Sonika Choudhary, Andrew Fang, Nathan MacPherson, Ajay Varadharajan. University of Michigan, SNRE. Michigan Public Service Commission PHEV Pilot Project with DTE Energy. Studying impacts of plugin hybrid electric vehicles on electricity consumption and pollutant emissions (Project finalization). [Project advisor]
- 1/2009-12/2010      Aaron Camere, Caroline de Monasterio, Jason MacDonald, Allison Schafer. University of Michigan, SNRE. Michigan Public Service Commission PHEV Pilot Project with DTE Energy. Studying impacts of plugin hybrid electric vehicles on electricity consumption and pollutant emissions. [Project consultant]
- 9/2008-12/2009      Robert De Kleine. University of Michigan, SNRE. Masters thesis. "Life Cycle Optimization of Residential Air Conditioner Replacement". [Masters thesis co-advisor]
- 4/2006-9/2006      Pierre Maheut. University of Michigan. Visiting scholar from Ecole Centrale de Nantes, France. Project related to understanding shape preference.

**Undergraduate Student Mentoring**

- 10/2009-5/2010      Takeshi Hasegawa. University of Michigan. Undergraduate Research Opportunity Program. Modeling and analysis of CO2 emissions from electrical grid.
- 1/2009-4-2009      Ellen Chisa. University of Michigan. Visiting scholar from Olin College. Examination of interactive genetic algorithms for the enhancement of creativity.
- 10/2005-12/2005      Atiqur Rahman. University of Michigan. Understanding the current state of mass customization technologies.
- 11/2002-5/2003      Daniel Sequera. University of Oklahoma. Oversaw development and implementation of experiments in porous media combustion.

**Teaching Interests**

I am most interested in teaching courses that can explore the interaction between product design decisions and their impact on environment. These types of courses would cross boundaries between engineering, industrial design, and environmental impact assessment. I am interested in and capable of teaching fundamental undergraduate courses in an engineering curriculum, primarily design and manufacturing courses, but also courses in solid mechanics.

**Professional Experience**

- 5/2002-8/2002      Design Engineer (Intern), Eaton Corporation, Hybrid Powertrains Division. Galesburg, Michigan, USA. Designed and produced a prototype display system for new HEV project.
- 5/2001-8/2001      Reliability and Maintenance Engineer (Intern), Pharmacia & Upjohn (now Pfizer), Manufacturing Division. Kalamazoo, Michigan, USA. Conducted process evaluation, FMEA and part data-basing for drug production.

## Service & Leadership

10/2010	Invited speaker, City of Ann Arbor Energy Commission, Impacts of plug-in hybrid electric vehicles on regional pollutant emissions, Ann Arbor, Mi
9/2009-3/2010	Review coordinator, ASME's 2010 International Design Engineering Technical Conference, topic area <i>Sustainability in Design Optimization</i>
12/2008	Invited speaker, Portage North Middle School Environmental Club, Portage, Mi
9/2006-5/2008	Volunteer tutor for at-risk students at Peace Neighborhood Center, Ann Arbor, Mi
5/2006-11/2006	Session chair, University of Michigan Engineering Graduate Student Symposium
2/2006	Volunteer middle school science fair judge. Ann Arbor, Mi
2/2002-2/2003	Volunteer teacher for SEES (Sooner Elementary Engineering and Science Clubs). University of Oklahoma
4/2000-4/2003	Officer (Publicity Chair and Webmaster), University of Oklahoma American Society of Mechanical Engineers.
3/2001	Volunteer elementary school science fair judge. Norman, Ok

## Reviewing Service

Energy Policy

Environmental Science and Technology

Global Environmental Change

International Conference on Engineering Design

International Design Engineering Technical Conference

International Federation on Automatic Control

Journal of Computers and Structures

Journal of Computing And Information Science In Engineering

Journal of Engineering Design

Journal of Mechanical Design

## Peer-Reviewed Publications

**J.C. Kelly**, J.S. MacDonald, G.A. Keoleian Time-dependent plug-in hybrid electric vehicle charging based on national driving patterns and demographics *Applied Energy*. v. 94, Pages 395-405, June 2012.

**J.C. Kelly**, P.Y. Papalambros, G.H. Wakefield. Evidence for Using Interactive Genetic Algorithms in Shape Preference Assessment. *International Journal of Product Development*. v. 13, No. 2, pp. 168-184, 2011.

R. De Kleine, G.A. Keoleian, **J.C. Kelly**. Optimal Replacement of Residential Air Conditioning Equipment to Minimize Energy, Greenhouse Gas Emissions, and Consumer Cost in the US. *Energy Policy*. v. 39, pp. 31443153, 2011.

**J.C. Kelly**, P. Maheut, J.F. Petiot, P.Y. Papalambros. Incorporating user shape preference in engineering design optimization. *Journal of Engineering Design*. 2010.

B.M. Marshall **J.C. Kelly**, G.A. Keoleian. Environmental assessment of plug-in hybrid electric vehicles using naturalistic drive cycles and vehicle travel patterns. *Energy Policy*. In review.

N.D. MacPherson, **J.C. Kelly**, G.A. Keoleian. Fuel economy and greenhouse gas emissions labeling for plug-in hybrid vehicles from a life cycle perspective. *Journal of Industrial Ecology*. To appear.

B.M. Marshall **J.C. Kelly**, G.A. Keoleian. Physical and behavioral determinants of resilience in the transportation system: A case study of vehicle electrification and trip prioritization. *International Journal of Critical Infrastructure*. In review.

## Peer-Reviewed Conference Proceedings

R. Patil, **J.C. Kelly**, H.K. Fathy, Z. Filipi. A Framework for the Integrated Optimization of Charging and Power Management in Plug-In Hybrid Electric Vehicles. *2012 American Control Conference*. Montreal, Canada, June 27-29, 2012.

A.M. Lewis, **J. C. Kelly** G.A. Keoleian, Evaluating the Life Cycle Greenhouse Gas Emissions from a Lightweight Plug-in Hybrid Electric Vehicle in a Regional Context. *International Symposium on Sustainable Systems and Technology*. Boston, MA, U.S.A., May 16-18, 2012.

R. Patil, **J.C. Kelly**, H.K. Fathy, Z. Filipi. Plug-in HEV Charging for Maximum Impact of Wind Energy on Reduction of CO<sub>2</sub> Emissions in Propulsion. *2012 IEEE International Electric Vehicle Conference*. Greenville, SC, USA, March 4-8, 2012.

D. Nathan-Roberts, **J. C. Kelly**, Y. Liu. Determining the Effect of Ownership and Feature-Set on Consumer Product Design Preference via Interactive Genetic Algorithm. *55th Annual Meeting of the Human Factors and Ergonomics Society*. Las Vegas, Nevada, September 19-23 2011.

**J.C. Kelly**, D. Sivaraman, G.A. Keoleian. Analysis of Avoided Carbon-dioxide Due To Photovoltaic and Wind Turbine Technologies Displacing Electrical Peaking Facilities. *Proceedings of the ASME 2009 International Design Engineering Technical Conferences*. San Diego, California, August 30 - September 2, 2009.

**J. C. Kelly**, Colleen M. Seifert, P.Y. Papalambros. Interactive Genetic Algorithms for use as Creativity Enhancement Tools. In the *AAAI 2008 Spring Symposia*, Palo Alto, California, March 26-28, 2008.

<https://www.aaai.org/Papers/Symposia/Spring/2008/SS-08-03/SS08-03-006.pdf>

**J.C. Kelly**, P.Y. Papalambros. Use of Visual Aesthetic Preference Information in Product Design. In the *International Conference on Engineering Design*, Paris, France, August 2007.

<http://ode.engin.umich.edu/publications/PapalambrosPapers/2007/244.pdf>

## Working Papers

H.K. Fathy, **Jarod C. Kelly**, S. Bashash, G.A. Keoleian. Optimal Dispatch of Aggregate Plug-in Hybrid Electric Vehicle Load for Vehicle and Grid Carbon Dioxide Emissions. In preparation.

**J.C. Kelly**, G.A. Keoleian, I.A. Hiskens. Comparison of economic and capacity factor dispatch models to examine pollutant implications of electricity demand changes. In preparation.

B.M. Marshal, **J.C. Kelly**, K.M. Bolon, G.A. Keoleian. Adaptive capacity and distributed resources as means to build resilient systems that minimize environmental impacts. In preparation.

## Conference Proceedings

**J.C. Kelly**, G.A. Keoleian. Comparison of electricity allocation methods for plug-in hybrid

vehicles. *6th International Conference on Industrial Ecology*, Berkeley, California, June 8, 2011.

J.S. MacDonald, **J.C. Kelly**, G.A. Keoleian. Time-dependant PHEV Energy Consumption Estimation from National Travel Patterns. *6th International Conference on Industrial Ecology*, Berkeley, California, June 8, 2011.

H. Fathy, **J.C. Kelly**, S. Bashash, G.A. Keoleian Plug-in hybrid vehicle charging policy optimization using particle swarms. *6th International Conference on Industrial Ecology*, Berkeley, California, June 8, 2011.

B.M. Marshal, **J.C. Kelly**, G.A. Keoleian, T.K. Lee, Z. Filipi Environmental assessment of plug-in hybrid electric vehicles using naturalistic drive cycles and travel pattern information. *6th International Conference on Industrial Ecology*, Berkeley, California, June 8, 2011.

**J.C. Kelly**, G.A. Keoleian. Impacts of PHEV and renewable energy technologies on marginal displacement of CO<sub>2</sub> emissions. *In the 5th International Conference on Industrial Ecology*. Lisbon, Portugal, June 2009.

**J.C. Kelly**, G.H. Wakefield, P.Y. Papalambros. The Development of a Tool for the Preference Assessment of the Visual Aesthetics of an Object Using Interactive Genetic Algorithms. *In the Generative Art Conference*. Milan, Italy, December 13-15, 2006.  
<http://ode.engin.umich.edu/publications/PapalambrosPapers/2006/243.pdf>

**J.C. Kelly**, G.A. Keoleian. Impacts of PHEV and renewable energy technologies on marginal displacement of CO<sub>2</sub> emissions. *In the 5th International Conference on Industrial Ecology*. Lisbon, Portugal, June 2009.

**J.C. Kelly**, G.H. Wakefield, P.Y. Papalambros. The Development of a Tool for the Preference Assessment of the Visual Aesthetics of an Object Using Interactive Genetic Algorithms. *In the Generative Art Conference*. Milan, Italy, December 13-15, 2006.  
<http://ode.engin.umich.edu/publications/PapalambrosPapers/2006/243.pdf>

## Conference Posters, Workshops, and Selected Invited or Refereed Presentations

J.C. Kelly, G.A. Keoleian. Comparison of electricity allocation methods for plug-in hybrid vehicles. *6th International Conference on Industrial Ecology*. (Presentation). Berkeley, California, June 8, 2011.

J.S. MacDonald, J.C. Kelly, G.A. Keoleian. Time-dependant PHEV Energy Consumption Estimation from National Travel Patterns. *6th International Conference on Industrial Ecology*. (Presentation). Berkeley, California, June 8, 2011.

H. Fathy, J.C. Kelly, S. Bashash, G.A. Keoleian Plug-in hybrid vehicle charging policy optimization using particle swarms. *6th International Conference on Industrial Ecology*. (Presentation). Berkeley, California, June 8, 2011.

J.C. Kelly. Electrical grid dispatch modeling for use in environmental impact assessment. *University of Michigan, CSS Advisory Board Meeting*. (Presentation). Ann Arbor, Michigan, March 16 2011.

J.C. Kelly. Multiple Perspectives for Wind Turbine Deployment. *University of Michigan, Natural Resources and Environment 580*. (Presentation). Ann Arbor, Michigan, February 14, 2011.

J.C. Kelly. Impacts of plug-in hybrid electric vehicles on regional pollutant emissions. *City of Ann Arbor Energy Commission*. (Presentation). Ann Arbor, Mi, October 12, 2010.

J.C. Kelly Quantifying the impacts of sustainable energy technology through electrical grid modeling and emissions accounting. *University of Michigan*. (Presentation). Ann Arbor,

Michigan, February 23, 2010.

J.C. Kelly Quantifying the impacts of sustainable energy technology through electrical grid modeling and emissions accounting. *Iowa State University*. (Presentation). Ames, Iowa, February 11, 2010.

J.C. Kelly Modeling electricity dispatching: Methods and impacts. *University of Michigan, Design Science 790*. (Presentation). Ann Arbor, Michigan, November 5, 2009.

J.C. Kelly, D. Sivaraman, G.A. Keoleian. Analysis of Avoided Carbon-dioxide Due To Photovoltaic and Wind Turbine Technologies Displacing Electrical Peaking Facilities. *Proceedings of the ASME 2009 International Design Engineering Technical Conferences*. (Presentation). San Diego, California, September 2009.

J.C. Kelly, G.A. Keoleian. Impacts of PHEV and renewable energy technologies on marginal displacement of CO<sub>2</sub> emissions. *In the 5th International Conference on Industrial Ecology*. (Presentation). Lisbon, Portugal, June 2009.

J.C. Kelly, G.A. Keoleian. Regionally Based Renewable Energy Analysis. *University of Michigan, CSS Advisory Board Meeting*. (Presentation). Ann Arbor, Michigan, May 2008.

J.C. Kelly Optimal deployment of technology to capture renewable energy subject to regional demand. *University of Michigan, CSS Advisory Board Meeting*. (Presentation). Ann Arbor, Michigan, October 2008.

J.C. Kelly, G.A. Keoleian. Optimal deployment of technology to capture renewable energy subject to regional demand. *In the 2nd Alcoa Worldwide Convening*. (Presentation). Barcelona, Spain, October 2008.

J. C. Kelly, Colleen M. Seifert, P.Y. Papalambros. Interactive Genetic Algorithms for use as Creativity Enhancement Tools. *In the AAAI 2008 Spring Symposia*. (Presentation). Palo Alto, California, March 26-28, 2008.

J. C. Kelly, Colleen M. Seifert, P.Y. Papalambros. Interactive Genetic Algorithms for use as Creativity Enhancement Tools. *In the AAAI 2008 Spring Symposia*. (Poster). Palo Alto, California, March 26-28, 2008.

J.C. Kelly, P.Y. Papalambros. Preference Information Within Design. *University of Michigan, Engineering Graduate Symposium*. (Poster). Ann Arbor, Michigan, November 2, 2007.

J.C. Kelly, P.Y. Papalambros. Preference Information Within Design. *University of Michigan, Engineering Graduate Symposium*. (Presentation). Ann Arbor, Michigan, November 2, 2007.

J.C. Kelly, P.Y. Papalambros. Use of Visual Aesthetic Preference Information in Product Design. *In the International Conference on Engineering Design*. (Presentation). Paris, France, August 2007.

J.C. Kelly, G.H. Wakefield, P.Y. Papalambros. The Development of a Tool for the Preference Assessment of the Visual Aesthetics of an Object Using Interactive Genetic Algorithms. *In the Generative Art Conference*. (Presentation). Milan, Italy, December 13-15, 2006.

J.C. Kelly, P.Y. Papalambros. Assessing Shape Preference Using Interactive Genetic Algorithms for Use in Design. *University of Michigan, Engineering Graduate Symposium*. (Poster). Ann Arbor, Michigan, November 3, 2006.

J.C. Kelly, P.Y. Papalambros. Assessing Shape Preference Using Interactive Genetic Algorithms for Use in Design. *University of Michigan, Engineering Graduate Symposium*. (Presentation). Ann Arbor, Michigan, November 3, 2006.



J.C. Kelly, A.K. Agrawal. Comparison of Flame Stabilization Techniques for Lean Premixed Combustion of Natural Gas. *23rd Oklahoma AIAA/ASME Symposium*. (Presentation). Norman, OK, April, 2003.

### **Professional Membership**

American Society of Mechanical Engineers

International Society for Industrial Ecology

Tau Beta Pi

Pi Tau Sigma

### **References**

Panos Y. Papalambros, University of Michigan, Mechanical Engineering

Gregory A. Keoleian, University of Michigan, School of Natural Resources and Environment

Jeffery L. Stein, University of Michigan, Mechanical Engineering

Colleen M. Siefert, University of Michigan, Department of Psychology

Jean François Petiot, Ecole Centrale de Nantes

Ann Arbor, Michigan, July 31, 2012