CHRISTOPHER A. MATTSON

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Research Interests

Product Development
Engineering for Global Development
Engineering Design Theory and Methodology
Multiobjective and Multidisciplinary Design Optimization

Education

Ph.D., Rensselaer Polytechnic Institute, *Mechanical Engineering*, 2003.
Dissertation: *A New Paradigm for Concept Selection in Engineering Design Using Multi-objective Optimization.*
Advisor: Prof. Achille Messac

M.S., Brigham Young University, *Mechanical Engineering*, 2001.
Thesis: *Principles for the Design and Development of Modular Consumer Products.*
Advisor: Prof. Spencer P. Magleby

B.S., Brigham Young University, *Mechanical Engineering*, 1999.

Professional Experience

Associate Professor, Aug. 2012–Present
Brigham Young University, Provo, UT
Teaching, research, and service in the Mechanical Engineering Department. Research focused on design and optimization.

Fulbright Scholar (sabbatical), July 2014–July 2015
Loughborough University, Loughborough, England
Research in the Loughborough Design School. Research focused on sustainable design.

Assistant Professor, Jul. 2006–Jul. 2012
Brigham Young University, Provo, UT
Teaching and research in the Mechanical Engineering Department. Research focused on design and optimization.

Global Director of Engineering Design and Research, Mar. 2004–Jun. 2006
ATL Technology, Springville, UT
Managed 25 engineers and oversaw numerous product development projects. Conducted research in design automation of electrical contacts. Lived in Guangzhou, China for 1.5 years establishing an engineering design center.

Postdoctoral Fellow, Nov. 2003–Mar. 2004
Rensselaer Polytechnic Institute, Troy, NY
Research in multi-objective optimization and response surface modeling.

Research Assistant, Apr. 2001–Nov. 2003
Rensselaer Polytechnic Institute, Troy, NY
Research in multi-objective and multidisciplinary optimization, with focus on development of Pareto frontier generators and their integration into conceptual engineering design practice.

Research Assistant, Apr. 2000–Apr. 2001
Brigham Young University, Provo, UT
Research in design theories for the development of modular consumer products.

Mechanical Engineer, Apr. 1999–Apr. 2000
ATL Technology, San Jose, CA
Designed numerous devices for Personal Digital Assistants (PDAs) with weekly interaction with multiple large clients including Palm Computing, Handspring, and IDEO.

Engineering Assistant, Aug. 1996–Apr. 1999
ATL Technology, Orem, UT
Developed functional specifications, test procedures, and documentation for docking stations, connector systems, and cable assemblies for numerous part numbers. Assisted in the mechanical and electrical design of products.

Honors and Awards

Presidential Early Career Award for Scientists and Engineers (PECASE), United States Government, Executive Office of the President. PECASE is the highest honor bestowed by the United States Government on engineers in the early stages of their independent research careers. Dr. Mattson was nominated by the National Science Foundation for "innovative research to enable product design for sustainable poverty alleviation, and for dedication towards establishing third-world outreach and learning experiences for engineering students." July 2012

Ben C. Sparks Medal (joint recipient with Prof. Carl Sorensen), American Society of Mechanical Engineers (ASME), Citation: "For outstanding contributions through BYU Capstone, an industry-sponsored design/build program for Brigham Young University undergraduate students, which has helped provide a new generation of Renaissance engineers with a global perspective to solve economic, environmental, cultural and societal challenges." March 2015

National Science Foundation (NSF) CAREER Award, "Design Strategies to Benefit from the Profit-by-Poverty-Alleviation Paradigm," Mattson, C. A., 2010.

Fulbright Scholar Award, Fulbright-Loughborough University Scholar Award, July 2014.

Class of '49 Endowed Young Scholar Award, Brigham Young University, August 2013.

Outstanding Faculty Award, Ira A. Fulton College of Engineering, Brigham Young University, 2011.

Outstanding Service Award, AIAA, Multidisciplinary Design Optimization Technical Committee, Abbreviated citation: "The Multidisciplinary Design Optimization Technical Committee (MDO TC) of the American Institute of Aeronautics and Astronautics recognizes Prof. Christopher Mattson for his commitment, dedication, and service to the MDO TC...", April 2010.

Technical Committee Service Award, AIAA, Multidisciplinary Design Optimization Technical Committee, Abbreviated Citation: "Chris Mattson's dedicated service leaves MDO as one of the most vibrant and active TC's in AIAA today", Sept. 2004.

Scientist of the Week, *Laboratory Equipment*, Advantage Business Media. Every week Laboratory Equipment features a Scientist of the Week, chosen from the science industry's latest headlines. Christopher Mattson was featured because he and his engineering students at BYU built an inexpensive, easy to operate and move human-powered water drill for people living in Tanzania. Featured Aug. 11-18, 2011.

Best Paper Award, S. K. Curtis, B. J. Hancock, and C. A. Mattson, "Use Scenarios for Design Space Exploration with a Dynamic Multiobjective Optimization Formulation," ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Chicago, Illinois, DETC2012-71039, August 12-15, 2012.

The Jack Spergel Memorial Award for Outstanding Technical Paper, 57th International Wire & Cable Symposium and Conference, Invited Paper "Recent Developments in the Design and Optimization of Constant Force Electrical Contacts," by Meaders, J. C., Harston, S. P., and Mattson, C. A., Charlotte, NC, Nov 9, 2009.

Best Paper Award, 37th International Institute of Connector and Interconnection Technology (IICIT) Connector and Interconnection Symposium, "Recent Developments in the Design and Optimization of Constant Force Electrical Contacts," by Meaders, J. C., Harston, S. P., and Mattson, C. A., Naperville, Il, May 12-13, 2008.

Best Student Paper Award, (Third Place) Lewis, P. K., Murray, V., and Mattson, C. A., "Accounting for Changing Customer Needs With s-Pareto Frontiers," AIAA-2010-9039, 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth TX, Sep. 13-15, 2010.

Mechanisms Award, ASME Graduate Mechanism Design Contest: Weight, B. A. and Mattson, C. A., "Near Constant Force Electrical Connector," American Society of Mechanical Engineers, IDETC Robotics and Mechanisms Conference, September 29 - October 02, 2002, Third Place.

International Experience

Study Abroad Director, (Co-directed with Prof. Spencer Magleby, College of Engineering and Technology, BYU), Global Product Development (Me En 579), USA, The Netherlands, Hungary, Austria, and Czech Republic, April-May 2016.

Fulbright Scholar (sabbatical), Loughborough University, Loughborough, England, July 2014–July 2015 (continuous).

Study Abroad Director, (Co-directed with Prof. Spencer Magleby, College of Engineering and Technology, BYU), Global Product Development (Me En 579), USA, Spain, Italy, Romania, Greece, April-May 2014.

Research Director, Production Ramp up Research Field Trip, Brazil, March 2014.

Research Director, Mid-Product Development Research Field Trip, Brazil, November 2013.

Research Director, Ethnographic Research Field Trip, Brazil, June 2013.

Research Director, Ethnographic Research Field Trip, Peru, May 2013.

Research Director, Product Testing Field Trip, Peru, June 2012.

Study Abroad Director, (Co-directed with Prof. Spencer Magleby, College of Engineering and Technology, BYU), Global Product Development (Me En 579), USA, Denmark, Sweden, Lithuania, Latvia, Estonia, Finland, and Russia, April-May 2012.

Study Abroad Director, Human Powered Water Well Drill Field Testing (Part of BYU Capstone), Tanzania, May 2011.

Study Abroad Co-Director (with Prof. Randy Lewis, Chemical Engineering, BYU), Global Engineering Outreach (GEO), Peru, April-May 2011.

Study Abroad Director, Global Product Development (Me En 579), USA, England, Luxembourg, France, Czech Republic, Hungary, May 2010.

Study Abroad Co-Director (with Prof. Robert H. Todd, Mechanical Engineering, BYU), Global Product Development (Me En 579), USA, England, France, Luxembourg, Germany, Czech Republic, Poland, Slovakia, Hungary, May 2008.

Global Director of Engineering and Research (ATL Technology), Established and managed engineering design center, China 2004-2005 (continuous).

Mormon Missionary, Lived among and served people in Amazon region, Brazil 1994-1996 (continuous).

Publications

Books

1. Mattson, C. A. and Sorensen, C. D., *Product Development – Principles and Tools for Creating Desirable and Transferable Designs*, Springer, In Press.

Book Chapters

1. Mattson, C. A., "Synthesis Through Rigid-Body Replacement," in *Handbook of Compliant Mechanisms* edited by Howell, L.L., Magleby, S.P., and Olsen, B.M., Chapter 8, Wiley, 2013.

Editorials

1. Mattson, C. A. and Winter, A. G. "Why the Developing World Needs Mechanical Design," *Journal of Mechanical Design*, Vol. 138, 2016, pp. 070301-3, DOI:10.1115/1.4033549.

Journals Articles

1. Allen, J. D., Mattson, C. A., and Ferguson, S. M., "Evaluation of System Evolvability Based on Usable Excess," *Journal of Mechanical Design*, 2016, Vol. 138, No. 9, pp 091101 (9 pages), DOI: 10.1115/1.4033989.

2. Thacker, K. S., Barger, K. M., and Mattson, C. A., "Balancing Technical and User Objectives in the Redesign of a Peruvian Cookstove," *Development Engineering*, 2016, In Press, DOI: 10.1016/j.deveng.2016.05.001.

3. Cansler, E., White, S., Ferguson, S., and Mattson, C. A., "Identifying and Mapping Excess Relationships in Engineered Systems," *Journal of Mechanical Design*, 2016, Vol. 138, No. 8, pp 081103 (11 pages), DOI: 10.1115/1.4033884.

4. Wood, A. E. and Mattson, C. A. "Design for the Developing World: Common Pitfalls and How to Avoid Them," *Journal of Mechanical Design*, 2016, Vol. 138, No. 3, pp 031101, 11 pages, DOI: 10.1115/1.4032195.

5. Watson, J. D., Allen, J. D, Mattson, C. A., and Ferguson, S. M., "Optimization of Excess System Capability for Increased Evolvability," *Structural and Multidisciplinary Optimization*, 2016, Vol. 53., No. 6, pp 1277-1294, DOI:10.1007/s00158-015-1378-x.

6. Hancock, B. J., Nysetvold, T., Mattson, C. A., "L-Dominance: An Approximate-Domination Mechanism for Adaptive Resolution of Pareto Frontiers," *Structural and Multidisciplinary Optimization*, 2015, Vol. 52, No. 2, pp 269-279, DOI: 10.1007/s00158-015-1237-9.

7. Takahashi, R., Fullwood, D. T., Rampton, T. M., Skousen, D. J., Adams, B. L., and Mattson, C. A., "Hybrid Bishop-Hill Model Combined Finite Element Analysis for Elastic-Yield Limited Design," *Engineering Computations*, 2015, Vol. 32, No. 6, pp.1814 - 1836, DOI: 10.1108/EC-06-2014-0130.

8. Lewis, P. K., Mattson C. A., and Wood, C. D., "Modular Product Optimization to Alleviate Poverty: An Irrigation Pump Case Study", *International Journal of Product Development*, 2015, Vol. 20, No. 1, pp. 49 - 73, DOI:10.1504/IJPD.2015.067277.

9. Mattson C. A., and Wood, A. E., "Nine Principles for Design for the Developing World as Derived from the Engineering Literature", *Journal of Mechanical Design*, 2014, Vol. 136, No. 12, pp. 121403, 15 pages, DOI 10.1115/1.4027984.

10. Tackett, M. W. P., Mattson, C. A., and Ferguson, S. M., "A Model for Quantifying System Evolvability Based on Excess and Capacity," *Journal of Mechanical Design*, 2014, Vol. 136, No. 5, pp. 051002, 11 pages, DOI 10.1115/1.4026648.

11. D. D. LeBaron and C. A. Mattson, "Using Topology Optimization to Numerically Improve Barriers to Reverse Engineering," *Journal of Mechanical Design*, 2014, Vol. 136, No. 2, page 021007, 8 pages, DOI 10.1115/1.4025962.

12. Lewis, P. K., Tackett, M.W.P., and Mattson, C. A., "Considering Dynamic Pareto Frontiers in Decision Making," *Optimization and Engineering*, 2014, Vol. 15, No. 4, pp. 837-854, DOI 10.1007/s11081-013-9238-2.

13. Hancock, B. J., Mattson, C. A., "The Smart Normal Constraint Method for Directly Generating a Smart Pareto Set," *Structural and Multidisciplinary Optimization*, 2013, Vol. 48, No. 4, pp 763-775, 2013, DOI 10.1007/s00158-013-0925-6.

14. Curtis, S. K., Hancock, B. J., and Mattson, C. A., "Usage Scenarios for Design Space Exploration with a Dynamic Multiobjective Optimization Formulation," *Research in Engineering Design*, 2013, Vol. 24, No. 4, pp 395-409, DOI 10.1007/s00163-013-0158-0.

15. Lewis, P. K. and Mattson, C. A., "An Optimization-Based Method for Designing Modular Systems that Traverse Dynamic s-Pareto Frontiers," *Structural and Multidisciplinary Optimization*, 2013, Vol. 48, No. 5, pp 747-762, DOI 10.1007/s00158-013-0924-7.

16. Curtis, S. K., Mattson, C. A., Hancock, B. J., and Lewis, P. K., Divergent Exploration in Design with a Dynamic Multiobjective Optimization Formulation, *Structural and Multidisciplinary Optimization*, Vol. 47, No. 5, pp 645-657, 2013, DOI 10.1007/s00158-012-0855-8

17. Curtis, S. K., Harston, S. P., and Mattson, C. A., "Characterizing the Effects of Learning when Reverse Engineering Multiple Samples of the Same Product," *Journal of Mechanical Design*, Vol. 135, No. 1, 2013, pp. 011002, 8 pages.

18. Anderson, T. V. and Mattson, C. A., "Propagating Skewness and Kurtosis Through Engineering Models for Low-Cost, Meaningful, Non-Deterministic Design," *Journal of Mechanical Design*, Special Issue on Design Under Uncertainty, Vol. 134, No. 10, 2012, pp 100911, 9 pages.

19. George, R. B., Colton, M. B., Mattson, C. A., Thomson, S. L., "A Differentially Driven Flapping Wing Mechanism for Force Analysis and Trajectory Optimization," *International Journal of Micro Air Vehicles*, Vol. 4, No. 1, 2012, pp. 31-49.

20. Larson, B. H., and Mattson, C. A., "Design Space Exploration for Quantifying and Improving System Model Execution Reliability," *Journal of Mechanical Design*, Vol. 134, No. 4, 2012, pp 041010;

21. Lewis, P. K., and Mattson, C. A., "A Method for Developing Systems that Traverse the Pareto Frontiers of Multiple System Concepts Over Time," *Structural and Multidisciplinary Optimization*, 45(4), April, 2012, pp. 467–478.

22. Anderson, T. V., Mattson, C. A., Larson, B. H., and Fullwood, D. T., "Efficient Propagation of Error through System Models for Functions Common in Engineering," *Journal of Mechanical Design*, Vol. 134, 2012, pp 014501

23. Takahashi, R., Prasai, D, Adams, B. L., and Mattson, C. A., "Hybrid Bishop-Hill Model for Elastic-Yield Limited Design With Non-Orthorhombic Polycrystalline Metals," *Journal of Engineering Materials and Technology*, 134.1, 2011, pp. 011003 (12 pages).

24. Curtis, S. K., Harston, S. P., and Mattson, C. A., "The Fundamentals of Barriers to Reverse Engineering and their Implementation into Mechanical Components," *Research in Engineering Design*, Vol 22, 2011, pp. 245-261.

25. Lewis, P. K., Murray, V. R., and Mattson, C. A., "A Design Optimization Strategy for Creating Devices that Traverse the Pareto Frontier Over Time," *Structural and Multidisciplinary Optimization*, Vol. 43, No. 2, 2011, pp 191-204.

26. Barnum, G. J. and Mattson, C. A.,"A Computationally-Assisted Methodology for Preference-Guided Conceptual Design," *Journal of Mechanical Design*, Vol. 132, No. 12, 2010, pp 121003 (9 pages).

27. Harston, S. P., Mattson, C. A., and Adams, B. L., "Capitalizing on Heterogeneity and Anisotropy to Design Desirable Hardware that is Difficult to Reverse Engineer," *Journal of Mechanical Design*, Vol. 132, 2010, pp 081001 (11 pages).

28. Harston, S. P., and Mattson, C. A., "Metrics for Evaluating the Barrier and Time to Reverse Engineer a Product," *Journal of Mechanical Design*, Vol. 132, 2010, pp 041009 (9 pages).

29. Meaders, J. C., and Mattson, C. A., "Optimization of Near-constant Force Springs Subject to Mating Uncertainty," *Structural and Multidisciplinary Optimization*, Vol. 41, No. 1, 2010, pp. 1-15.

30. Mattson, C. A., Mullur, A. A., and Messac, A., "Case Studies in Concept Exploration and Selection with s-Pareto Frontiers," *International Journal of Product Development*, Special Issue on Space Exploration and Design Optimization, Vol. 9, No.1/2/3, 2009, pp. 32–59.

31. Weight, B. L., Mattson, C. A., Magleby, S. P., and Howell, L. L., "Configuration Selection, Modeling, and Preliminary Testing in Support of Constant Force Electrical Connectors," *ASME Journal of Electronic Packaging*, Vol. 129, No. 3, 2007, pp 236-255.

32. Mattson, C. A., and Messac, A., "Pareto Frontier Based Concept Selection under Uncertainty, with Visualization," *Optimization and Engineering*, Kluwer Publishers - Special Issue on Multidisciplinary Design Optimization, Invited Paper, Vol. 6, No. 1, 2005, pp. 85-115.

33. Mattson, C. A., Mullur, A. A., and Messac, A., "Smart Pareto Filter: Obtaining a Minimal Representation of Multiobjective Design Space," *Engineering Optimization*, Vol. 36, No. 4, 2004, pp. 721-740.

34. Messac, A. and Mattson, C. A., "Normal Constraint Method with Guarantee of Even Representation of Complete Pareto Frontier," *AIAA Journal*, Vol. 42, No. 10, 2004, pp. 2101-2111.

35. Mattson, C. A., Howell, L. L. and Magleby, S. P., "Development of Commercially Viable Compliant Mechanisms Using the Pseudo-Rigid-Body Model: Case Studies of Parallel Mechanisms," *Journal of Intelligent Material Systems and Structures*, Vol. 15, No. 3, 2004, pp. 195-202.

36. Messac, A., Ismail-Yahaya, A., and Mattson, C. A., "The Normalized Normal Constraint Method for Generating the Pareto Frontier," *Structural and Multidisciplinary Optimization*, Vol. 25, No. 2, 2003, pp. 86-98.

37. Mattson, C. A. and Messac, A., "Concept Selection Using s-Pareto Frontiers," *AIAA Journal*, Vol. 41, No. 6, 2003, pp. 1190-1198.

38. Maria, A., Mattson, C. A., Ismail-Yahaya, A., and Messac, A., "Linear Physical Programming for Production Planning Optimization," *Engineering Optimization*, Taylor and Francis Publisher, Vol. 35(1), 2003, pp. 19-37.

39. Messac, A., and Mattson, C. A., "Generating Well-Distributed Sets of Pareto Points for Engineering Design Using Physical Programming," *Optimization and Engineering*, Kluwer Publishers, Vol. 3, Issue 4, 2002, pp. 431-450.

Commissioned Articles

The following articles were commissioned by the "Multidisciplinary Design Optimization (MDO) Technical Committee" of the American Institute of Aeronautics and Astronautics (AIAA). These articles succinctly highlight the notable international developments in the MDO field for the specified year.

1. Mattson, C. A., "Year-In-Review, Multidisciplinary Design Optimization," *Aerospace America*, Vol. 47, No. 11, Dec. 2009, pp. 26.

2. Mattson, C. A., "Year-In-Review, Multidisciplinary Design Optimization," *Aerospace America*, Vol. 46, No. 12, Dec. 2008, pp. 40.

Conference Papers

1. K. M. Barger and C. A. Mattson, "Renewable Energy Needs in Developing Countries: Engineering Solutions to Existing Barriers," ASME 2016 International Mechanical Engineering Congress & Exposition, Phoenix, AZ, IMECE2016-65647, Nov. 11-17, 2016.

2. C. A. Mattson, A. E. Wood, and J. Renouard, "Village Drill: A case study in engineering for global development with five years of data post market-introduction," ASME 2016 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Charlotte, NC, DETC2016-60141, Aug. 21-24, 2016.

3. J. D. Allen, C. A. Mattson, K. S. Thacker, and S. M. Ferguson, "Design in excess capability to handle uncertain product requirements in a developing world setting," ASME 2016 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Charlotte, NC, DETC2016-59181, Aug. 21-24, 2016.

4. Wood, A. E. and Mattson, C. A., "An Experiment in Engineering Ethnography in the Developing World," ASME 2016 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Charlotte, NC, DETC2016-60177, Aug. 21-24, 2016.

5. C. A. Mattson, V. Lofthouse, and T. Bhamra, "Exploring Decision Tradeoffs in Sustainable Design," ASME 2015 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Boston, MA, DETC2015-47295, Aug. 2-5, 2015.

6. E. Cansler, S. M. Ferguson, and C. A. Mattson, "Exploring the Relationship between Excess and System Evolutions using a Stress-test," ASME 2015 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, DTM, Boston, MA, DETC2015-47603, Aug. 2-5, 2015.

7. K. S. Thacker, K. M. Barger, and C. A. Mattson, "Preserving the Usability of a Peruvian Cookstove: A More Balanced Approach to Improved Cookstove Design," ASME 2015 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Boston, MA, DETC2015-47270, Aug. 2-5, 2015.

8. J. D. Watson, J. D. Allen, C. A. Mattson, and S. M. Ferguson, "Optimization of System Evolvability Under Uncertainty," AIAA Aviation 2015, 2151511, Dallas Texas, June 22-26, 2015.

9. B. J. Hancock, T. Nysetvold, C. A. Mattson, "L-Dominance: A New Mechanism Combining Epsilon-Dominance and Pareto Knee Exploitation in Evolutionary Multiobjective Optimization," AIAA 53rd Aerospace Sciences Meeting, AIAA-2015-0381, Jan. 2015.

10. A. E. Wood, C. D. Wood, and C. A. Mattson, "Application and Modification of Design for Manufacture and Assembly Principles for the Developing World," IEEE 2014 Global Humanitarian Technology Conference, San Jose, California, Oct. 10-13, 2014.

11. K. S. Thacker, M. Barger, and C. A. Mattson, "A Global Review of End User Needs: Establishing the Need for Adaptable Cookstoves," IEEE 2014 Global Humanitarian Technology Conference, San Jose, California, Oct. 10-13, 2014.

12. E. Cansler, S. M. Ferguson, and C. A. Mattson, "Identifying and Mapping Excess Relationships in Complex Engineered Systems." ASME 2014 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Buffalo, New York, DETC2014-34971, Aug. 17-20, 2014.

13. J. D. Allen, J. D. Watson, C. A. Mattson, and S. M. Ferguson, "Evaluation of System Reconfigurability Based on Usable Excess," ASME 2014 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Buffalo, New York, DETC2014-34298, Aug. 17-20, 2014.

14. J. D. Watson, J. D. Allen, C. A. Mattson, and S. M. Ferguson, Optimization of Excess System Capability for Increased Reconfigurability," 15th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Atlanta, Georgia, AIAA Paper 2014-1890749, June 16-20, 2014.

15. B. J. Hancock, T. B. Nysetvold, and C. A. Mattson, "L-Dominance: An Approximate-Domination Mechanism for Adaptive Resolution of Pareto Frontiers," 15th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Atlanta, Georgia, AIAA Paper 2014-1890284, Jun. 16-20, 2014.

16. C. A. Mattson and A. E. Wood, "Eight principles derived from the engineering literature for effective design for the developing world," ASME 2013 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Portland, Oregon, DETC2013-13108, Aug. 4-7, 2013.

17. B. J. Hancock, and C. A. Mattson, "The Smart Normal Constraint Method for Directly Generating a Smart Pareto Set," 9th AIAA Multidisciplinary Design Optimization Specialist Conference, Boston, Massachusetts, AIAA Paper 2013-1748, Apr. 8-11, 2013.

18. M. W. Tackett, C. A. Mattson, S. M. Ferguson, "A Model for Quantifying System Evolvability Based on Excess and Modularity," 9th AIAA Multidisciplinary Design Optimization Specialist Conference, Boston, Massachusetts, AIAA Paper 2013-1752, Apr. 8-11, 2013.

19. M. L. Duffield, C. A. Mattson, and M. Colton, "Towards Variable Fidelity Optimization with Hardware in the Loop for Flapping Flight," 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Indianapolis, Indiana, AIAA Paper 2012-5692, Sep. 17-19, 2012.

20. P. K. Lewis and C. A. Mattson, "Multiobjective Optimization of Modular Systems that Traverse Dynamic s-Pareto Frontiers," 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Indianapolis, Indiana, AIAA Paper 2012-5441, Sep. 17-19, 2012.

21. D. D. LeBaron, K. C. Francis, and C. A. Mattson, "Creating Barriers to Reverse Engineering Using Topology Optimization," 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Indianapolis, Indiana, AIAA Paper 2012-5428, Sep. 17-19, 2012.

22. S. K. Curtis, B. J. Hancock, and C. A. Mattson, "Use Scenarios for Design Space Exploration with a Dynamic Multiobjective Optimization Formulation," ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Chicago, Illinois, DETC2012-71039, Aug. 12-15, 2012.

23. C. D. Wood, P. K. Lewis, and C. A. Mattson, "Modular Product Optimization to Alleviate Poverty: An Irrigation Pump Case Study," ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Chicago, Illinois, DETC2012-71171, August 12-15, 2012.

24. N. S. Wasley, P. K. Lewis, and C. A. Mattson, "Designing Products for Optimal Collaborative Performance with Application to Engineering-Based Poverty Alleviation," ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Chicago, Illinois, DETC2012-71209, August 12-15, 2012.

25. S. K. Curtis, C. A. Mattson, and P. K. Lewis, "Dynamic Multiobjective Optimization Formulation," 8th AIAA Multidisciplinary Design Optimization Specialist Conference, Honolulu, Hawaii, AIAA-2012-1848, April 23-26, 2012.

26. P. K. Lewis , M. Tackett, and C. A. Mattson, "Considering Dynamic Pareto Frontiers in Decision Making," 8th AIAA Multidisciplinary Design Optimization Specialist Conference, Honolulu, Hawaii, AIAA-2012-1849, April 23-26, 2012.

27. Campbell, R., Lewis, P. K., and Mattson, C. A., "A Method for Identifying Design Principles for the Developing World," ASME 2011 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Washington DC, DETC2011-48584, August 2011.

28. Morrise, J., Mattson, C. A., Lewis, P. K., and Magleby, S. P., "A Method for Designing Collaborative Products for Poverty Alleviation," ASME 2011 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Washington DC, DETC2011-47409, August 2011.

29. Knight, D. K., and Mattson, C. A., "Return on Investment Analysis for Implementing Barriers to Reverse Engineering," ASME 2011 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Washington DC, DETC2011-47094, August 2011.

30. Halverson, T., Todd, R. H., Mattson, C. A., and Warnick G., "Industry Experience and Perspective A Survey of Advice Brigham Young University Capstone Alumni Share with Incoming Students, *Proceedings of 2011 American Society of Engineering Education Annual Conference & Exposition*, ASEE Paper Number 1822, June 2011.

31. Lewis, P. K., Mattson, C. A., and Morrise, J., "Effect of Alternate Aggregate Objective Functions on Selecting Target s-Pareto Designs for Modular Products," 7th AIAA Multidisciplinary Design Optimization Specialists Conference, Denver, Colorado, AIAA Paper 2011-1900, Apr. 4-7, 2011.

32. Larson, B. H., and Mattson, C. A., "Design Space Exploration for Quantifying and Improving the Reliability of System Models," 7th AIAA Multidisciplinary Design Optimization Specialists Conference, Denver, Colorado, AIAA Paper 2011-2151, Apr. 4-7, 2011.

33. Mattson, C. A. and Lewis, P. K., "Modular Product Design in Engineering-Based Poverty Alleviation," Proceedings of the NSF Civil, Mechanical, and Manufacturing Innovation Grantees and Research Conference, Grant Number CMMI-0954580, Atlanta, Georgia, Jan 3-7, 2011.

34. Mattson, C. A., Adams, B. L., and Harston, S. P., "Toward Strategically Designing Products that are Difficult to Reverse Engineer," Proceedings of the NSF Civil, Mechanical, and Manufacturing Innovation Grantees and Research Conference, Grant Number CMMI-0800904, Atlanta, Georgia, Jan 3-7, 2011.

35. Lewis, P. K., and Mattson, C. A., "Accounting for Changing Customer Needs With s-Pareto Frontiers," 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, Texas, AIAA Paper 2010-9039, Sep. 13-15, 2010.

36. Larson, B. H., and Mattson, C. A., "System Behavioral Model Accuracy for Concurrent Design and Modeling," 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, Texas, AIAA Paper 2010-9104, Sep. 13-15, 2010.

37. Barnum, G. J., and Mattson, C. A., "A Computationally-assisted Methodology for Preference-guided Conceptual Design," 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, Texas, AIAA Paper 2010-9175, Sep. 13-15, 2010.

38. Harston, S. P., Mattson, C. A., and Koecher, M., "A Topology Optimization Method with Anisotropic Materials," 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, Texas, AIAA Paper 2010-9176, Sep. 13-15, 2010.

39. Lewis, P. K., Murray, V. R., and Mattson, C. A., "An Engineering Design Strategy for Reconfigurable Products that Support Poverty Alleviation," ASME 2010 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Montreal, Quebec, Canada, DETC2010-28739, August 2010.

40. Curtis, S. K., Harston, S. P., and Mattson, C. A., "On Barriers to Reverse Engineering Mechanical Components," ASME 2010 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference, Montreal, Quebec, Canada, DETC2010-28610, August 2010.

41. Lewis, P. K., and Mattson, C. A., "Identification of Modular Product Platforms and Modules that Account for Changing Consumer Needs," 6th AIAA MDO Specialists Conference, Orlando, Florida, AIAA Paper 2010-2836, April 12-15, 2010.

42. Larson, B. H., and Mattson, C. A., "Requirements for Developing System Behavioral Models by Composition of Available Discipline Specific Models," 6th AIAA MDO Specialists Conference, Orlando, Florida, AIAA Paper 2010-2913, April 12-15, 2010.

43. Haddock, N. D., and Mattson, C. A., "Characterizing the Material Property Tradeoffs of Polycrystalline Diamond for Design Evaluation and Selection," 6th AIAA MDO Specialists Conference, Orlando, Florida, AIAA Paper 2010-3076, April 12-15, 2010.

44. Curtis, S. K., Harston, S. P., and Mattson, C. A., "A Generic Formulaic Characterization of the Time to Reverse Engineer the Tolerances of a Product," 2009 ASME International Mechanical Engineering Congress and Exposition, Lake Buena Vista, Florida, IMECE2009-13123, Nov 13-19, 2009.

45. Harston, S. P., and Mattson, C. A., "Metrics for Evaluating and Optimizing the Barrier and Time to Reverse Engineer a Product," 2009 Design Engineering Technical Conference, & Computers and Information in Engineering Conference, San Diego, California, DETC2009-86781, Aug 30 – Sep 2, 2009.

46. Mattson, C. A. and Adams, B. L. "Toward Barriers to Reverse Engineering," Proceedings of the NSF Civil, Mechanical, and Manufacturing Innovation Grantees and Research Conference, Grant Number CMMI-0800904, Honolulu, Hawaii, Jun 25-29, 2009.

47. Todd, R. H., Mattson, C. A., Warnick, G. and Dymock R., "A Student Bidding Process Applied to Industrially-Sponsored Senior Capstone Design Projects," ASEE 2009 Annual Conference and Exposition, Austin, Texas, AC 2009-2243, Jun 14-17, 2009.

48. Knight, D. C., Mattson, C. A., and Adams, B. L., "Maximizing Return on Investment by Constructing Optimal Barriers Against Competitors' Market Entry," 5th AIAA MDO Specialists Conference, Palm Springs, California, AIAA Paper 2009-2190, May 4-7, 2009.

49. Barnum, G. J., and Mattson, C. A., "A Numerical Optimization Search Strategy for Exploring Morphological Charts," 5th AIAA MDO Specialists Conference, Palm Springs, California, AIAA Paper 2009-2224, May 4-7, 2009.

50. Thomson, S. L., Mattson, C. A., Colton, M. B., Harston, S. P., Carlson, D. C., and Cutler, M., "Experiment-Based Optimization of Flapping Wing Kinematics," 47th AIAA Aerospace Sciences Meeting and Exhibit, Orlando, Florida, AIAA Paper 2009-0874, January 5-8 2009.

51. Meaders, J. C., Harston, S. P., and Mattson, C. A., "Recent Developments in the Design and Optimization of Constant Force Electrical Contacts," International Wire & Cable Symposium, Providence, Rhode Island, 2008, Invited Paper.

52. Haddock, N. D., Mattson, C. A., and Knight, D. C., "Exploring Direct Generation of Smart Pareto Sets," 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, AIAA-2008-5984, September 10-12 2008.

53. Boyce, N. O. and Mattson, C. A., "Reducing Computational Time of the Normal Constraint Method by Eliminating Redundant Optimization Runs," 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, AIAA-2008-5856, September 10-12 2008.

54. Yearsley, J. D. and Mattson, C. A., "Interactive Design of Combined Scale-based and Module-based Product Platforms," 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, AIAA-2008-5819, September 10-12 2008.

55. Harston, S. P., Mattson, C. A., Adams, B. L., and Ahmadi, S., "Capitalizing on Heterogeneity and Anisotropy to Find Designs with Unexpected Performance," 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, AIAA-2008-6015, September 10-12 2008.

56. Meaders, J. C., Harston, S. P., and Mattson, C. A., "Recent Developments in the Design and Optimization of Constant Force Electrical Contacts," Proceedings of the International Institute of Connector and Interconnection Technology (IICIT) 37th Connector and Interconnection Symposium, Naperville, Il, May 12-13, 2008.

57. Yearsley, J. D. and Mattson, C. A., "Product Family Member and Platform Identification with Concurrent Variable and Objective Space Smart Pareto Filtering," 49th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Schaumburg, Illinois, AIAA-2008-2220, April 7-10 2008.

58. Meaders, J. C. and Mattson, C. A., "Minimization of Frictional Effects in Simulated Pin Joints of Constant-Force Compliant Mechanisms," 49th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Schaumburg, Illinois, AIAA-2008-2063, April 7-10 2008.

59. Meaders, J. C. and Mattson, C. A., "Robust Design Optimization of a Constant Force Mechanism using a Surrogate Modeling Approach," 46th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, AIAA Paper 2008-0900, January 7-10 2008.

60. Yearsley, J. D. and Mattson, C. A., "Product Family Design using a Smart Pareto Filter," 46th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, AIAA Paper 2008-0909, January 7-10 2008.

61. Bowman, E., and Mattson, C. A., "Handling Frequent Design Changes by Automatic Optimization-Constrained Updates of Parametric CAD Models," ASME International Mechanical Engineering Congress and Exposition, Technical Publication, IMECE2007-42379, Seattle, Washington, Nov. 11-15, 2007.

62. Meaders, J. C., and Mattson, C. A., "Robust Design Optimization of Compliant Constant Force Contacts with Simulated Pin Joints," 47th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, AIAA Paper 2007-1911, Honolulu, Hawaii, April, 23-26, 2007.

63. Mattson, C. A. and Bowman, K. E., "Feasible-Configuration Generator for Multiple Bend Springs," 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, AIAA - 2006-7094, Portsmouth, Virginia, Sep. 6-8, 2006.

64. Mattson, C. A., "Rapid Optimization-based Conceptualization of Multiple-bend Spring Concepts," 47th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Paper No. AIAA-2006-2049, Newport, Rhode Island, May, 1-4, 2006

65. Messac. A., Mattson, C. A., "Normal Constraint Method with Guarantee of Even Representation of Complete Pareto Frontier," 45th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Paper No. AIAA-2004-1679, Palm Springs, California, Apr, 19-22, 2004.

66. Mattson, C. A. and Messac, A., "Case Studies in Concept Selection using s-Pareto Frontiers," 1st Inverse Problems, Design and Optimization Symposium, Paper No. IPDO-143, Rio de Janeiro, Brazil, March 17 - 19, 2004.

67. Mattson, C. A., Mullur, A. A., and Messac, A., "Applications of s-Pareto Frontiers in Engineering Design," AIAA 42nd Aerospace Sciences Meeting and Exhibit, Paper No. AIAA-2004-0279, Reno, Nevada, January 5 - 8, 2004.

68. Mattson, C. A., and Messac, A., "Handling Equality Constraints in Robust Design Optimization," 44th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Paper No. AIAA-2003-1780, Norfolk, Virginia, April 7 - 10, 2003.

69. Mullur, A. A., Mattson, C. A., and Messac, A., "New Decision Matrix Based Approach to Concept Selection using Linear Physical Programming," 44th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Paper No. AIAA-2003-1446, Norfolk, Virginia, April 7 - 10, 2003.

70. Maria, A., Mattson, C. A., and Messac, A., "Multicriteria Decision Making for Production System Conceptual Design using s-Pareto Frontiers," 44th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Paper No. AIAA-2003-1442, Norfolk, Virginia, April 7 - 10, 2003.

71. Mullur, A., Mattson, C. A., and Messac, A., "Pitfalls of the Typical Construction of Decision Matrices for Concept Selection," AIAA 41st Aerospace Sciences Meeting and Exhibit, AIAA-2003-0466, 2003.

72. Mattson, C. A., Mullur, A. A., and Messac, A., "Minimal Representation of Multiobjective Design Space Using a Smart Pareto Filter," 9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization, AIAA-2002-5458, 2002.

73. Mattson, C. A., and Messac, A., "Concept Selection in n-dimension Using s-Pareto Frontiers and Visualization," 9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization, AIAA-2002-5418, 2002.

74. Mattson, C. A., and Messac, A., "A Non-Deterministic Approach to Concept Selection using s-Pareto Frontiers," Proceedings of the ASME Design Automation Conference, DETC2002/DAC-34125, 2002.

75. Maria, A., Mattson, C. A., Ismail-Yahaya, A., and Messac, A., "Multiobjective Production Planning and Optimization Using Linear Physical Programming," 2002 Japan-USA Symposium on Flexible Automation (2002JUSFA) International Conference on New Technological Innovation for the 21st Century Hiroshima, Japan, July 15-17, 2002.

76. Messac, A., and Mattson, C. A., "Physical Programming and its Integration into the Engineering Design Community," Proceedings of the NSF Design, Service and Manufacturing Grantees and Research Conference, 2002.

77. Mattson, C. A., and Messac, A., "Development of a Pareto-based Concept Selection Method," 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Paper No. AIAA 2002-1231, Denver, CO, April 22-25, 2002.

78. Messac, A. and Mattson, C. A., "Physical Programming: Effective and Friendly Optimization for Engineering and Business Applications," Proceedings of the AIAA Aircraft Technology, Integration, and Operations Forum: Solution-Oriented Technological Applications and Operational Methodologies, AIAA Paper 2001-5213, 2001.

79. Mattson, C. A., Howell, L. L. and Magleby, S. P., "Development of Commercially Viable Compliant Mechanisms Using the Pseudo-Rigid Body Model: Case Studies of Parallel Mechanisms," Proceedings of the 2001 ASME International Mechanical Engineering Congress and Exposition, 2001.

80. Mattson, C. A. and Magleby, S. P., "The Influence of Product Modularity During Concept Selection of Consumer Products," Proceedings of the ASME Design Theory and Methodology Conference, DETC2001/DTM-2052, 2001.

Patents

Patents Granted

1. "Hand Tool Impacting Device with Floating Pin Mechanism," Mattson, C. A., Allred, J., Alsup, J., Anderson, T., Christensen, D., Morrise, J., and Ward, J., Patent Number US 9,102,046 B2, issued August 11, 2015.

2. "Tension Locking Tool (continuation)," Mattson, C. A., Winder, B. G., Mackay, A. B., Jacobsen, J. O., Halverson, P. A., Frazer, S., Patent Number US 9,085,066 B2, issued July 21, 2015.

3. "Hand Power Tool and Drive Train," Mattson, C. A., Campbell, R., Davis, C., Olligschlager, D., Solomon, B., and Wilding, S., Patent Number US 9,038,745 B2, issued May 26, 2015.

4. "Tension Locking Tool," Mattson, C. A., Winder, B. G., Mackay, A. B., Jacobsen, J. O., Halverson, P. A., Frazer, S., Patent Number US 7,793,570 B2, issued September 14, 2010.

5. "Constant Force Apparatus and Method," Weight, B. A., Mattson, C. A., Magleby, S. P., and Howell, L. L., Patent Number US 6,945,800 B2, issued September 20, 2005.

6. "Tracked Bicycle," Cheney, D., Magleby, S. P., Moulton, A., Mattson, C. A., Lasson, C., Larsen, R., Larson, K., Bennion, R., Norby, E., and Evans G., Patent Number US 6,663,117 B2, issued December 16, 2003.

Patents Pending

"Asset Sharing System," Mattson, C. A., Pack, A., Taylor, A., Kincaid, C., Townsend, E., Pherson, N., and Brower, M., U.S. Utility Patent (provisional), Filed 8 Dec 2015.

Licensing Agreements

"Tension Locking Tool," Mattson, C. A., Winder, B. G., Mackay, A. B., Jacobsen, J. O., Halverson, P. A., Frazer, S., Patent Number 7,793,570, licensed to SOG Speciality Knives and Tools, LLC.

"Constant Force Apparatus and Method," Weight, B. A., Mattson, C. A., Magleby, S. P., and Howell, L. L., Patent Number 6,945,800, licensed to ATL Technology, LLC.

External Research Grants and Contracts

Current Grants

National Science Foundation (NSF), $199,991, 5/2016 to 4/2018, "EAGER: Social Impact Modeling for Engineered Products," Mattson, C. A., (PI) and Dahlin, E., (co-PI).

National Science Foundation (NSF), $409,923, 5/2013 to 4/2017, "Collaborative Research: Mitigating Emergent System Behavior through System Evolvability," Ferguson, S. (PI), Mattson, C. A., (Co-PI).

Completed Grants

Air Force Office of Scientific Research (AFOSR), $60,000, 9/2011 to 4/2014, "University Engineering Design Challenge," Mattson, C. A., (PI), and McLain T. W., (Co-PI).

Air Force Office of Scientific Research (AFOSR), $309,445, 9/2010 to 8/2013, "Experimental and Computational Analysis of Intermittent Flapping Flight," Thomson, S.T. (PI), Colton, M. B., (Co-PI), and Mattson, C. A., (Co-PI).

National Science Foundation (NSF), $412,000, 1/2010 to 12/2014, "CAREER: Design Strategies to Benefit from the Profit-by-Poverty-Alleviation Paradigm," Mattson, C. A., (PI).

FEI Company, $120,000, 10/2008 to 9/2011, "Focused Ion Beam Subsystem Multidisciplinary Modeling and Optimization," Mattson, C. A., (PI).

National Science Foundation (NSF), $389,076, 7/2008 to 6/2011, "A Framework for Maintaining Product Superiority by Designing Hardware that Protects Itself from Reverse Engineering," Mattson, C. A., (PI), Adams, B. L., (Co-PI).

National Science Foundation (NSF), $24,000, 7/2008 to 6/2011, "Supplement for Undergraduate Research Opportunity: A Framework for Maintaining Product Superiority by Designing Hardware that Protects Itself from Reverse Engineering," Mattson, C. A., (PI), Adams, B. L., (Co-PI).

Invited Lectures and Presentations

Invited Lecture,"Village Drill: A Case Study in Engineering for Global Development," Graduate Seminar, University of Toronto, Toronto, Ontario, Canada, February 24, 2017.

Invited Lecture, "Village Drill: A Case Study in Engineering for Global Development, With Five Years of Data Post Market-Introduction," ASU LightWorks Event Series on Engineering for Global Development: Use-Inspired Solutions to Water-Energy Nexus Challenges, Arizona State University, Tempe, Arizona, November 15, 2016.

Invited Lecture, "Design Exploration," Graduate Seminar, Zhejiang University of Technology, Hangzhou, People's Republic of China, November 2, 2016.

Invited Lecture, "Teaching Students to Create Desirable and Transferable Designs in Engineering," Faculty Development Seminar, Zhejiang University of Technology, Hangzhou, People's Republic of China, November 2, 2016.

Invited Lecture, "Elusive Impact: Lessons in Engineering for Global Development and Design for the Developing World," Graduate Seminar, Portland State University, Portland, Oregon, October 28, 2016.

Invited Lecture, "Why Design Simultaneously Unites and Divides Us," BYU Creativity, Innovation, and Design Lecture Series, Brigham Young University, Provo, Utah, September 22, 2016.

Invited Lecture, "Failing to Succeed: Lessons in Engineering for Global Development," Tata Proseminar, Massachusetts Institute of Technology, Cambridge, Massachusetts, November 19, 2015.

Invited Lecture, "A Different Perspective on Engineering for Global Development," Global Engineering Guest Lecturer, Massachusetts Institute of Technology, Cambridge, Massachusetts, November 18, 2015.

Invited Lecture, "Why Design Simultaneously Unites and Divides Us," Public Lecture, Loughborough University, Loughborough, England, UK, June 24, 2015.

Invited Presentation, "Interdisciplinary Education," School of Business and Economics, Loughborough University, Loughborough, England, UK, June 24, 2015.

Invited Lecture, "A Unique Design Process Taught to Engineering Students in the United States," Wolfson School of Mechanical and Manufacturing Engineering, Loughborough University, Loughborough, England, UK, June 17, 2015.

Invited Lecture, "Living and Working Abroad," Global Leadership Seminar, Brigham Young University Study Abroad Program for Engineers, London, England, UK, May 14, 2015.

Invited Lecture, "Handling Trade-offs in Engineering Design," School of Engineering Research Seminar, Queen Mary University of London, London, England, UK, April 29, 2015.

Invited Lecture, "Beyond the Build," Ben C. Sparks Award Lecture (given with Prof. Carl Sorensen), ASME International Mechanical Engineering Education Leadership Summit, Newport Beach, California, March 13, 2015.

Invited Lecture, "Towards Multi-criteria Tradeoff Exploration in Sustainable Design," Department Seminar, Department of Mechanical Engineering, University of Bath, Bath, England, UK, February 17, 2015.

Invited Lecture, "Lessons in Designing for Emerging Markets," Sustainable Design Module, Loughborough Design School, Loughborough, England, UK, December 2, 2014.

Invited Lecture, "What Doesn't Work: Lessons in Trying to Design for the Developing World," Engineering for Global Development Impact Forum, ASME Advanced Design and Manufacturing Impact Forum, Buffalo, NY, August 20, 2014.

Invited Lecture, "Design Exploration," Stanford University, Stanford, California, January 15, 2014.

Invited Lecture, "9 Principles for Design for the Developing World," Intellectual Ventures (invited by the *Global Good* division), Bellevue, Washington, September 25, 2013.

Invited Lecture, "Inclusion Social: Ingeniera en un Mundo Globalizado" (Social Inclusion: Engineering in a Globalized World), Universidad Nacional de Piura, Piura, Peru, May 24, 2013.

Invited Lecture, "Inclusion Social: Ingeniera en un Mundo Globalizado" (Social Inclusion: Engineering in a Globalized World), Universidad Privada Juan Meja Baca, Chiclayo, Peru, May 28, 2013.

Invited Lecture, "Design for the Developing World," TEDx, Provo, Utah, March 22, 2012. www.youtube.com/watch?v=6wbuvdAe6Yg

Invited Lecture, "Design Thinking," Graduate Seminar, Brigham Young University, Provo, Utah, Nov. 2011.

Invited Lecture, "Characteristics of Innovators," Invented In Utah Symposium, South Jordan, Utah, October 14, 2010.

Invited Lecture, "Characteristics of Innovators," Rocketship Design, Provo, Utah, December 22, 2009.

Invited Lecture, "Multi-objective Optimization using the Normal Constraint Method," Operations Research Colloquium at The Pennsylvania State University, March 18, 2008.

Invited Lecture, "Multi-objective Optimization Based Concept Selection Using s-Pareto Frontiers," Brigham Young University, Provo, Utah, Mar. 23, 2006.

Invited Lecture, "Product Development: Methods for Concept Selection," South China University of Technology, Guangzhou, Guangdong, China, Nov. 25, 2005.

Invited Lecture, "Decision Making in Engineering Design & Product Development," South China University of Technology, Guangzhou, Guangdong, China, Feb. 25, 2005.

Invited Lecture, "Applications of s-Pareto Frontiers in Engineering Design," Xian University of Technology, Xian, Shaanxi, China, Nov. 25, 2004.

Invited Lecture, "Multidisciplinary Design and Optimization," ATL Technology LTD., May 2003.

Invited Lecture, "Pareto Based Concept Selection," ATL Technology LTD., May 2002.

Professional Activities

Journal Editorships

Associate Editor, Journal of Mechanical Design, ASME, 2014 – present

Associate Editor, Structural and Multidisciplinary Optimization Journal, Springer, 2006 – 2014.

Professional Committee Memberships

Executive Committee Member, ASME Design Automation Committee (DAC), 2015 - 2020

Member, AIAA Multidisciplinary Design Optimization Technical Committee (MDO TC), 2003 - 2015.

Member, ASME/IEEE Engineering for Change (E4C), EGD101 Steering Committee, 2015 - Present.

Member, ASME Engineering for Global Development (EGD), Conference Planning Committee, 2015 - Present.

Member, Fulbright Scholar Peer Review Discipline Committee, Mechanical Engineering, Council for International Exchange of Scholars, Institute of International Education, 2016 - 2019

Member, Conferences Subcommittee for the AIAA Multidisciplinary Design Optimization Technical Committee, 2011 - 2015.

Member, Design Automation Committee, Design Engineering Division of the American Society of Mechanical Engineers, 2010 - 2015.

Chair, Awards Subcommittee for the AIAA Multidisciplinary Design Optimization Technical Committee, 2010 - 2011.

Member, Publications Subcommittee for the AIAA Multidisciplinary Design Optimization Technical Committee, 2008 - 2010.

Chair, Education Subcommittee for the AIAA Multidisciplinary Design Optimization Technical Committee, 2005 - 2008.

External Advisory Board Memberships

External Advisor, Rocketship, Provo, Utah, 2009 - present.

External Advisor, ATL Technology, Springville, Utah, 2006 - present.

Professional Affiliations

Senior Member, American Institute of Aeronautics and Astronautics (AIAA), 2011 - Present.

Member, American Institute of Aeronautics and Astronautics (AIAA), 2001 - Present.

Member, American Society of Mechanical Engineering (ASME), 1996 - Present.

Member, Sigma Xi, Scientific Research Honor Society, 2001 - Present.

Member, American Society of Engineering Education (ASEE), 2007 - 2009.

Conference Organization

General Chair, 7th AIAA MDO Specialists Conference, Denver, Colorado, Apr. 4-7, 2011.

Technical Program Chair, 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, 2012.

Technical Program Chair, 6th AIAA MDO Specialists Conference, Orlando, Florida, Apr. 12-15, 2010.

Co-Organizer, Special Session on Design for the Developing World, ASME 2015 International Design Engineering Technical Conferences, Boston, MA, Aug. 2-5, 2015.

Co-Organizer, Special Session on Design for the Developing World, ASME 2014 International Design Engineering Technical Conferences, Buffalo, NY, Aug. 18-20, 2014.

Co-Organizer, Special Session on Design for the Developing World, ASME 2013 International Design Engineering Technical Conferences, Portland, OR, Aug. 5-7, 2013.

Co-Organizer, Special Session on Design for the Developing World, ASME 2012 International Design Engineering Technical Conferences, Chicago, Il, Aug. 13-15, 2012.

Co-Organizer, Special Session on Design for the Developing World, ASME 2011 International Design Engineering Technical Conferences, Washington, D.C., Aug. 28-31, 2011.

Chair of Student Paper Competition and Organizing Committee Member, 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, Sep. 10-12, 2008.

Chair of Student Paper Competition and Organizing Committee Member, 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Portsmouth, Virginia, Sep. 6-8, 2006.

Webmaster and Organizing Committee Member, 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, 2004, Albany, NY, Aug. 30 - Sep. 2, 2004.

Co-organizer, Multidisciplinary Design Optimization, AIAA 42nd Aerospace Sciences Meeting and Exhibit, 5-8 January 2004, Reno, NV.

Technical Program Co-Chair, Aircraft Design, AIAA 4th Annual Aviation Technology, Integration, and Operations (ATIO) Technical Forum, 20 - 22 September 2004, Chicago, Il.

Co-organizer, Multidisciplinary Design Optimization, AIAA 41st Aerospace Sciences Meeting and Exhibit, 6-9 January 2003, Reno, NV.

Technical Program Co-Chair, Multidisciplinary Design Optimization, AIAA 3rd Annual Aviation Technology, Integration, and Operations (ATIO) Technical Forum, 17 - 19 November 2003, Denver, Co.

Technical Program Co-Chair, Multidisciplinary Design Optimization, 2002 AIAA Aircraft Technology, Integration, and Operations Forum, 1-3 October 2002, Los Angeles, CA.

Other Conference Related Service

Panel Moderator (Co-Moderated with Prof. Amos Winter), "Engineering for Global Development," DAC Keynote Address and Panel, ASME 2015 International Design Engineering Conferences & Computers and Information in Engineering Conference, Boston, MA, Aug. 2-5, 2015.

Technical Session Chair, "Design for the Developing World 2," Session DAC-7-2, ASME 2015 International Design Engineering Conferences & Computers and Information in Engineering Conference, Boston, MA, Aug. 2-5, 2015.

Panelist "Engineering for Global Development Panel", ASME Advanced Design and Manufacturing Impact Forum, Buffalo, NY, Aug. 17-20, 2014.

Technical Session Chair, "Design for the Developing World 1," Session DAC-7-1, ASME 2014 International Design Engineering Conferences & Computers and Information in Engineering Conference, Buffalo, NY, Aug. 17-20, 2014.

Technical Session Chair, "Design for the Developing World," Session DAC-7-1, ASME 2013 International Design Engineering Conferences & Computers and Information in Engineering Conference, Portland, OR, Aug. 4-7, 2013.

Technical Session Chair, "Design for the Developing World," Session DAC-16-1, ASME 2012 International Design Engineering Conferences & Computers and Information in Engineering Conference, Chicago, Il, Aug. 13-15, 2012.

Technical Session Chair, "Design for the Developing World," Session DAC-11-1, ASME 2011 International Design Engineering Conferences & Computers and Information in Engineering Conference, Washington, DC, Aug. 28-31, 2011.

Technical Session Chair, "MA&O Applications: Energy Systems I," Session 82-MAO-38, 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, Texas, Sep. 13-15, 2010.

Technical Session Chair, "MA&O Applications: Energy Systems II," Session 98-MAO-39, 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, Texas, Sep. 13-15, 2010.

Technical Session Chair, "Multiobjective Optimization and Sensitivity Analysis," Session DAC-22-1, ASME 2010 International Design Engineering Conferences & Computers and Information in Engineering Conference, Montreal, Quebec, Canada, Aug.13-18, 2010.

Technical Session Chair, "MDO Methods," Session 82-MAO-6, 6th AIAA MDO Specialists Conference, Orlando, Florida, Apr. 12-15, 2010.

Technical Session Chair, "Optimal Design 1," Session 37-MAO-37, 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, Sep. 10-12, 2008.

Technical Track Leader - Design, 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, Canada, Sep. 10-12, 2008.

Technical Session Chair, "Topology and Shape Optimization 1," Session 2-MDO-1, 49th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Schaumburg, Illinois, April 7-10 2008.

Technical Session Chair, "MDO Methodologies," Session 137-MDO-4, AIAA 46th Aerospace Sciences Meeting and Exhibit, 7-10 January 2008, Reno, NV.

Technical Session Chair, "Surrogate Model Applications," Session 83-MDO-9, 47th AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, Honolulu, Hawaii, April, 23-26, 2007.

Technical Session Chair, "Multifidelity Modeling Methods," Session 38-MAO-38, 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Portsmouth, Virginia, Sep. 6-8, 2006.

Technical Track Leader - Design, 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, 2004, Albany, NY, Aug. 30 - Sep. 2, 2004.

Technical Session Chair, "Sensitivity and Approximation Methods," Session 16-MDO-1, AIAA 42nd Aerospace Sciences Meeting and Exhibit, 5-8 January 2004, Reno, NV.

Technical Session Chair, "Work-in-Progress," Session 26-SDM-21, 43rd AIAA/ASME/ASCE/AHS Structures, Structural Dynamics, and Materials Conference, April 2002, Denver, Co.

Panelist, Panel on Industry-University Educational Partnerships for the New Millennium: Experiences and Lessons Learned, ASME International Mechanical Engineering Congress & Exposition, 15 November 2001, New York, NY.

Journal Paper Reviews

Manuscript Reviewer, Structural and Multidisciplinary Optimization, 2003, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015.

Manuscript Reviewer, ASME Journal of Mechanical Design, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016.

Manuscript Reviewer, AIAA Journal 2001, 2002, 2003, 2006, 2011, 2012.

Manuscript Reviewer, Engineering Optimization, 2008, 2011, 2012.

Manuscript Reviewer, Journal of Engineering, Design and Technology, 2011, 2012.

Manuscript Reviewer, Computer-Aided Design, 2011.

Manuscript Reviewer, International Journal of Product Development, 2007.

Manuscript Reviewer, European Journal of Operations Research, 2006.

Manuscript Reviewer, Inverse Problems in Science and Engineering, 2004.

Manuscript Reviewer, Optimization in Engineering OPTE, 2002.

University Service

University Assignments

Steering Committee Member, Center for European Studies, 2014 – present.

ORCA Grant Reviewer (2007, 2012, 2015). Reviewed undergraduate student research proposals for the BYU ORCA Grant program.

Department Service

Member of Faculty Search Committee, Aug. 2015 – Present.

Chair of Department External Relations Committee, Aug. 2011 – July 2014.

Member of Department External Relations Committee, Dec. 2008 – Aug. 2011.

Member of Department ABET (Accreditation) Committee, Aug. 2007 – Aug. 2008.

Member of Ph.D. Design Qualifying Exam Committee, 2009 – Present.

Member of Ph.D. Strength of Materials Qualifying Exam Committee, Jan. 2007 – 2009.

Presenter in New Student Seminar (Me En 191), Oct. 2007, Feb. 2008, Oct. 2008, Feb 2009, Oct. 2009, Feb. 2010, Oct. 2010, Feb. 2011, Oct 2011, Feb. 2012, Oct. 2012, Feb. 2013, Oct. 2013, Oct. 2015.

Presenter in Graduate Student Seminar, Oct. 2007, Nov. 2009, Oct. 2011, Nov. 2015.

Oversight of upgrade of room in 230 CB (Mechanical Engineering Department modular team and individual teaching room), Jan. 2008–2012.

Student Advisement

Current Graduate Students

Wood, Amy, Ph.D. Thesis in process (expected completion 2016), Brigham Young University.

Allen, Jeffery, Ph.D. Thesis in progress (expected completion 2017), Brigham Young University.

Ottosson, Hans, Ph.D. Thesis in process, (expected completion 2018), Brigham Young University.

Thacker, Kendall, M.S. Thesis in progress, Brigham Young University.

Pack, Andrew, M.S. Thesis in progress, Brigham Young University.

Phillip Stevenson, M.S. Thesis in progress, Brigham Young University.

Graduate Students Advised

Lewis, Patrick, "An Optimization-Based Method of Traversing Dynamic s-Pareto Frontiers," **Ph.D.** Dissertation, December 2012, Brigham Young University.

Larson, Brad, "Mathematical Framework for Early System Design Validation Using Multidisciplinary System Models," **Ph.D.** Dissertation, April 2012, Brigham Young University.

Harston, Stephen, "A Methodology for Designing Product Components with Built-in Barriers to Reverse Engineering," **Ph.D.** Dissertation, Brigham Young University, April 2012.

Watson, Jason, "A Multi-objective Optimization Method for Maximizing the Value of System Evolvability Under Uncertainty," M.S., Brigham Young University, 2015

Duffield, Luke, "Variable Fidelity Optimization with Hardware-in-the-Loop for Flapping Flight," M.S. Thesis, Brigham Young University, August 2013.

Tackett, Morgan, "A Mathematical Model for Quantifying System Evolvability Using Excess and Modularity," M.S. Thesis, Brigham Young University, August 2013.

Wasley, Nicholas, "Multiobjective Optimization Method Used in Designing Collaborative Products with Application to Engineering-Based Poverty Alleviation," M.S. Thesis, Brigham Young University, August 2013.

LeBaron, Devin, "Using Topology Optimization to Numerically Improve Barriers to Reverse Engineering," M.S. Thesis, Brigham Young University, August 2013.

Campbell, Robert, "A Methodology for the Extraction of Design Principles for Unfamiliar Markets," M.S. Thesis, Brigham Young University, April 2013.

Curtis, Shane, "A Method for Exploring Optimization Formulation Space in Conceptual Design," M.S. Thesis, Brigham Young University, August 2012.

Morrise, Jacob, "Collaborative Products: A Design Methodology with Application to Engineering-Based Poverty Alleviation," M.S. Thesis, Brigham Young University, August 2011.

Anderson, Travis, "Efficient, Accurate, and Non-Gaussian Statistical Error Propagation Through Nonlinear, Closed-Form, Analytical System Models," M.S. Thesis, Brigham Young University, July 2011.

Knight, Darren, "Return on Investment Analysis for Implementing Barriers to Reverse Engineering and Imitation," M.S. Thesis, Brigham Young University, June 2011.

Anderson, Nikki, "Characterization of the Initial Flow Rate of Information During Reverse Engineering," M.S. Thesis, Brigham Young University, June 2011.

Barnum, Garrett J., "A Computationally-Assisted Methodology for Rapid Exploration of Design Possibilities in Conceptual Design," M.S. Thesis, Brigham Young University, August 2010.

Lewis, Patrick K., "Multiobjective Optimization Method for Identifying Modular Product Platforms and Modules that Account for Changing Needs Over Time," M.S. Thesis, Brigham Young University, August 2010.

Harston, Stephen P., "A Methodology for Designing Product Components with Built-in Barriers to Reverse Engineering," M.S. Thesis, Brigham Young University, August 2009.

Haddock, Neil D., "Characterizing Material Property Tradeoffs of Polycrystalline Diamond for Design Evaluation and Selection," M.S. Thesis, Brigham Young University, August 2009.

Yearsley, Jonathan D., "Product Family Design Using Smart Pareto Filters," M.S. Thesis, Brigham Young University, April 2009.

Bowman, K. Eric, "Optimization Constrained CAD Framework with Iso-Performing Design Generator," M.S. Thesis, Brigham Young University, December 2008.

Meaders, John C., "An Optimization-Based Framework for Designing Robust CAM-Based Constant-Force Compliant Mechanism," M.S. Thesis, Brigham Young University, August 2008.

Current Undergraduate Research Assistants

Barger, McCall

Noorda, Gerrit

Arnett, Pierce

Beard, Justin

Smith, Danny

Undergraduate Research Students Advised

Christensen, Abigail – Currently employed by Ford Motor Company.

Hancock, Braden, B.S. Honors Thesis: "L-Dominance: An Approximate-Domination Mechanism for Adaptive Resolution Pareto Frontiers". Co authored four journal papers. Currently pursuing a PhD at Stanford.

Nysetvold, Tim – Co-authored journal paper in the area of multiobjective optimization. Currently an LDS Missionary.

Thacker, Kendall – Co-Authored paper in the area of cookstove design. Currently pursuing an MS/MBA at Brigham Young University.

Wood, Charles – Co-Authored conference and journal paper in the area of design for the developing world. Participated in multiple field studies. Currently working in industry.

Francis, Kevin – Co-Authored paper in the area of developing barriers to reverse engineering using topology optimization. Received MS from Brigham Young University.

Halgren, Kyle – Helped with the design and construction of a modular pump to support a research project. Currently employed by Ford Motor Company.

Koecher, Michael – Co-authored publication as an undergraduate. Received MS degree from Brigham Young University.

Prasai, Dikshya – Co-authored publication as an undergraduate.

Wasley, Nicholas – Helped with proposal writing, and eventually earn an M.S. degree at Brigham Young University.

Murray, Vance – Co-authored publication as an undergraduate and helped with proposal writing. Vance earned an MS degree from Purdue University.

Curtis, Shane – Received ORCA Grant, co-authored publication as an undergraduate and pursued an M.S. degree at Brigham Young University in Mechanical Engineering.

Boyce, Nathan – Received ORCA Grant, co-authored publication as an undergraduate, earned an M.S. degree from Air Force Institute of Technology.

Harston, Stephen – Received ORCA Grant, co-authored multiple publications, completed MS and PhD in Mechanical Engineering at BYU and is currently an engineer for Global Good a division of Intellectual Ventures.

Bowman, K. Eric – Co-authored publication as undergraduate, completed M.S. degree at Brigham Young University. Eric is currently pursuing a PhD in Mechanical Engineering.

Carlson, Owen – Helped in preparing research proposal. Earned graduate degree at Hong Kong University.

Visiting Scholars

Dr. Hong Jia, Associate Professor of Mechanical Engineering, Zhejiang University of Technology, China. Visiting scholar researching engineering design, 9/2015 – 1/2016.

Mr. Xing Zhong, Lecturer, Jiangsu Polytechnic College of Agriculture and Forestry, China. Visiting scholar researching machine design of agricultural products for emerging markets, 9/2016 – 1/2017.

Courses Taught

Mechanical Engineering Courses

Me En 579, Global Product Development (Graduate Class)

Me En 576, Product Design (Graduate Class)

Me En 495, Advanced Innovation and Entrepreneurship for Crocker Fellows

Me En 497, Fundamentals of Innovation and Entrepreneurship for Crocker Fellows

Me En 476, Integrated Product and Process Design 2

Me En 475, Integrated Product and Process Design 1

Me En 373, Introduction to Scientific Computing and Computer-Aided Engineering

Me En 372, Mechanical Systems Design Fundamentals

International Study Abroad Directorships

Study Abroad Director, (Co-directed with Prof. Spencer Magleby, College of Engineering and Technology, BYU), Global Product Development (Me En 579), USA, The Netherlands, Hungary, Austria, and Czech Republic, April-May 2016.

Study Abroad Director, (Co-directed with Prof. Spencer Magleby, College of Engineering and Technology, BYU), Global Product Development (Me En 579), USA, Spain, Italy, Romania, Greece, April-May 2014.

Director (Co-directed with Prof. Spencer Magleby, College of Engineering and Technology, BYU), Global Product Development (Me En 579), USA, Denmark, Sweden, Lithuania, Latvia, Estonia, Finland, and Russia, April-May 2012.

Director, Human Powered Water Well Drill Field Testing (Part of BYU Capstone), Tanzania, May 2011.

Co-Director (with Prof. Randy Lewis, Chemical Engineering, BYU), Global Engineering Outreach (GEO), Peru, April-May 2011.

Director, Global Product Development (Me En 579), USA, England, Luxembourg, France, Czech Republic, Hungary, May 2010.

Co-Director (with Prof. Robert H. Todd, Mechanical Engineering, BYU), Global Product Development (Me En 579), USA, England, France, Luxembourg, German, Czech Republic, Poland, Slovakia, Hungary, May 2008.

Community Service

Guest Speaker, "Be An Engineer," Centennial Middle School, Provo, UT, 3 March 2016.

Guest Speaker, "7 Ways to Become a Better Designer," Rawlins Academy (High School), Quorn, England, UK, 16 June 2015.

Troop Committee Chairman, Boy Scouts of America, Troop 747, Utah National Parks Council, 2015 - Present.

Scoutmaster, Boy Scouts of America, Troop 747, Utah National Parks Council, 2007 - 2012.

Assistant Scoutmaster, Boy Scouts of America, Troop 84, Twin Rivers Council - Upstate New York, 2001 - 2004.

Full time Missionary, The Church of Jesus Christ of Latter-day Saints, Mission Manaus (Amazonas) Brazil. Served as District Leader, Zone Leader, and Assistant to the Mission President, May 1994-May 1996.

Published Article "The American Experience" 4 July 1996, Page F01, Contra Costa Times (San Francisco Bay Area Newspaper).

Chair, BYUSA (BYU Student Service Association) Homecoming Fireside (Devotional) Committee, Brigham Young University, 1993.