Symposium on Origami-Based Engineering Design

As part of the 37th ASME Mechanisms & Robotics Conference
At the ASME 2013 International Design Engineering Technical Conferences
August 6-7, 2013, Portland, Oregon, USA

Origami shows great promise for providing insight and inspiration for future discoveries and new applications. The Symposium on Origami-Based Engineering Design has been created to provide a venue for researchers to present their work, interact with other researchers in the field, and discuss future trends and needs. The symposium consists of technical presentations by authors of accepted papers, a plenary address, and opportunities for informal discussions and networking.

SYMPOSIUM ORGANIZERS
Larry L. Howell  Mary Frecker  James J. Joo
Brigham Young University  Penn State University  Air Force Research Laboratory
lhowell@byu.edu  Mxf36@psu.edu  James.joo@wpafb.af.mil

LOCATION
All sessions will be held at the Oregon Convention Center, 777 NE MLK, Jr. Blvd., Portland, Oregon. Specific rooms for the sessions will be printed in the conference program available at registration.

SYMPOSIUM SCHEDULE
The symposium is organized into six sessions. The first session includes the plenary address followed by two technical papers. The other sessions include technical presentations organized into sessions with similar topics. There is also time between session and in evenings for informal discussions between symposium attendees.

MR-11-1 Actuation for Origami Structures
Tuesday, August 6, 2013 8:30 AM - 10:10 AM
Session Chair: Larry Howell, Brigham Young University
Session Co-Chair: Timothy Simpson, Penn State University
Symposium Plenary Address
“From Flapping Birds to Space Telescopes: The Math and Magic of Origami”
Robert Lang
Lang Origami

DETC2013-12405: Multi-Field Responsive Origami Structures: Preliminary Modeling and Experiments
By: Saad Ahmed, Pennsylvania State University, Carlye Lauff, Pennsylvania State University, Adrienne Crivaro, Pennsylvania State University, Kevin McGough, Pennsylvania State University, Robert Sheridan, Rowan University, Mary Frecker, Pennsylvania State University, Paris Von Lockette, Rowan University,
Zoubeida Ounaies, Pennsylvania State University, Timothy Simpson, Pennsylvania State University, Jyh-Ming Lien, George Mason University, Rebecca Strzelec, Pennsylvania State University

DETC2013-13439: Simulation-Based Design of a Self-Folding Smart Material System
By: Edwin Peraza-Hernandez, Texas A&M University, Darren Hartl, Texas A&M University, Richard Malak, Texas A&M University

**DED Luncheon**
Tuesday, August 6, 2013 12:15 PM – 1:45 PM

**MR-11-2 Origami as Mechanisms**
Tuesday, August 6, 2013 1:45 PM – 3:25 PM
*Session Chair:* Jian Dai, Kings College-Univ of London
*Session Co-Chair:* Gregory Chirikjian, Johns Hopkins University

DETC2013-12227: Classification of Origami-Enabled Foldable Linkages and Emerging Applications
By: Ketao Zhang, King’s College of London, Jian Dai, King’s College-Univ of London

DETC2013-12584: Four Motion Branches of an Origami Based Eight Bar Spatial Mechanism
By: Yun Qin, King’s College of London, Jian Dai, King’s College-Univ of London

DETC2013-13407: An Approach for Understanding Action Origami as Kinematic Mechanisms
By: Landen Bowen, Brigham Young University, Clayton Grames, Brigham Young University, Spencer Magleby, Brigham Young University, Robert Lang, Lang Origami, Larry Howell, Brigham Young University

DETC2013-12753: Origami Rotors: Imparting Continuous Rotation to a Moving Platform Using Compliant Flexure Hinges
By: Matthew Moses, Independent Consultant, M. Kendal Ackerman, Johns Hopkins University, Gregory Chirikjian, Johns Hopkins University

DETC2013-12947: The Rigid Origami Patterns for Flat Surface
By: Yan Chen, Tianjin University, Sicong Liu, Nanyang Technological University, Guoxin Lu, Nanyang Technological University

**MR-11-3 Origami Inspired Deployable Systems**
Tuesday, August 6, 2013 3:45 PM – 5:25 PM
*Session Chair:* Mary I. Frecker, The Pennsylvania State University
*Session Co-Chair:* Robert Lang, Lang Origami

DETC2013-12348: Accommodating Thickness in Origami-Based Deployable Arrays
By: Shannon Zirbel, Brigham Young University, Robert Lang, Lang Origami, Spencer Magleby, Brigham Young University, Mark Thomson, NASA Jet Propulsion Laboratory, Deborah Sigel, NASA Jet Propulsion Laboratory, Phillip Walkemeyer, NASA Jet Propulsion Laboratory, Brian Trease, NASA Jet Propulsion Laboratory, Larry Howell, Brigham Young University

DETC2013-12725: Application of Conformal Maps to Origami-Based Structures: New Method to Design Deployable Circular Membranes
By: Sachiko Ishida, Meiji University, Taketoshi Nojima, Art Excel Co., Ltd., Ichiro Hagiwara, Meiji University

DETC2013-12901: New Deployable Structures Based on Elastic Origami Model
By: Kazuya Saito, The University of Tokyo, Akira Tsukahara, The University of Tokyo, Yoji Okabe, The University of Tokyo

DETC2013-13378: Advanced Folding Approaches for Deployable Spacecraft Payloads

DETC2013-13490: Conceptual Model Study Using Origami for Membrane Space Structures
By: M.C. Natori, Waseda University, Nobuhisa Ktsumata, Waseda University, Hiroshi Yamakawa, Waseda University, Hiraku Sakamoto, Tokyo Institute of Technology, Naoko Kishimoto, Setsuman University

MR-11-4 Origami Methods in Non-Paper Materials
Wednesday, August 7, 2013 8:30 AM – 10:10 AM
Session Chair: Spencer Magleby, Brigham Young University
Session Co-Chair: Zhong You, Oxford University

By: Yoav Sterman, MIT, Erik D. Demaine, MIT, Neri Oxman, MIT

DETC2013-12343: Kinematic and Stiffness Analysis of an Origami-Type Carton
By: Chen Qiu, King’s College London, Vahid Aminzadeh, King’s College London, Jian Dai, King’s College-University of London

DETC2013-12226: Novel Design Concept of Planar Litz Winding Without Via Using Folded Printed Circuit Board
By: Tsuyoshi Nomura, Toyota Research Institute of North America, Kayoko Seto, Toyota Motor Corporations, Ken Toshiyuki, Toyota Motor Corporations

DETC2013-12681: Quasi-Static Impact Response of Alternative Origami-Core Sandwich Panels
By: Joseph Gattas, Oxford University, Zhong You, Oxford University

DETC2013-13495: A Novel Origami Crash Box with Varying Profiles
By: Jiayao Ma, University of Oxford, Zhong You, Oxford University

MR-11-5 Origami-Based Methods
Wednesday, August 7, 2013 1:30 PM – 3:10 PM
Session Chair: Brian Trease, NASA Jet Propulsion Laboratory
Session Co-Chair: Richard Malak, Texas A&M University

DETC2013-13231: Designing Origami Structures through Computational Evolutionary Embryogeny
By: Wei Li, Texas A&M University, Daniel McAdams, Texas A&M University
DETC2013-12692: Joining Unfoldings of 3-D Surfaces  
By: Cynthia Sung, MIT, Erik D. Demaine, MIT, Martin L. Demaine, MIT CSAIL, Daniela Rus, MIT

DETC2013-13553: Folding Mechanics of Natural and Synthetic Construction Papers  
By: Abhinav Rao, University of Michigan, Sameh Tawfick, University of Michigan, Matthew Shlian, University of Michigan, A. John Hart, University of Michigan

DETC2013-13477: Digital Origami from Geometrically Frustrated Tiles  
By: C. K. Harnett, University of Louisville, C. J. Kimmer, Indiana University Southeast

DETC2013-13016: The Deformable Wheel Robot Using Magic-Ball Origami Structure  
By: Dae-Young Lee, Seoul National University, Ji-Suk Kim, Seoul National University, Sa-Reum Kim, Seoul National University, Je-Sung Koh, Seoul National University, Kyu-Jin Cho, Seoul National University

MR-11-6 Tessellations  
Wednesday, August 7, 2013 3:30 PM – 5:10 PM  
Session Chair: Alexander Slocum, MIT  
Session Co-Chair: Tomohiro Tachi, The University of Tokyo

DETC2013-12326: Freeform Origami Tessellations by Generalizing Resch’s Patterns  
By: Tomohiro Tachi, The University of Tokyo

DETC2013-12659: Realtime Rigid Folding Algorithm for Quadrilateral-Based 1-DOF Tessellations  
By: Yves Klett, Institut für Flugzuegbau, Universität Stuttgart

DETC2013-12710: Reconstructing David Huffman’s Origami Tessellations  
By: Eli Davis, MIT CSAIL, Erik D. Demaine, MIT, Martin L. Demaine, MIT CSAIL, Jennifer Ramseyer, MIT CSAIL

DETC2013-12743: Manufacture of Arbitrary Cross-Section Composite Honeycomb Cores Based on Origami Techniques  
By: Kazuya Saito, The University of Tokyo, Sergio Pellegrino, California Institute of Technology, Taketoshi Nojima, Art Excel Co., Ltd.

DETC2013-13324: Performance of Foldcores – Mechanical Properties and Testing  
By: Marc Grzeschik, University of Stuttgart Institute of Aircraft Design