

Robert L. Jackson
Assistant Professor
Department of Mechanical Engineering
Auburn University

Professional Preparation

- Ph.D. Mechanical Engineering, Georgia Institute of Technology,
Thesis Title: *The Wear and Thermo-elastohydrodynamic Behavior of Thrust Washer Bearings Under Non-Axisymmetric Loads*
Major: Friction, Lubrication and Wear Minor: Dynamics and Vibrations
Advisor: Itzhak Green
- M.S. Mechanical Engineering, Georgia Institute of Technology
- B.S. Mechanical Engineering, Georgia Institute of Technology

Appointments

Auburn University – Department of Mechanical Engineering
Assistant Professor, 2004-current

Description: Education and research in Mechanical Engineering, specifically multi-scale tribology and machine design.

The Center for Surface Engineering and Tribology – Georgia Institute of Technology
Graduate Research Assistant, 1998-2004

Description: Design, maintenance and operation of thrust washer bearing test rig.
Construction and implementation of numerical simulation of thrust washer bearing system.

Georgia Institute of Technology – The Woodruff School of Mechanical Engineering
Undergraduate Research Position, Summer 1997

Raytheon E-Systems Communications Division
Engineering Intern, Summer 1996

Classes Taught: 13, MECH 3230: Machine Design Fall 2004, Spring 2005, Fall 2006, Spring 2007, Summer 2007, Fall 2007, Spring 2008, Fall 2008. MECH 3130 in Fall 2005. MECH 5970/6970 Friction Wear and Lubrication, Spring 2006, Spring 2007, Fall 2008, MECH 7970 Multiscale Contact Mechanics, Fall 2007.

Guest Lecturer: ELEC 5970/6970 (Special Topics): MEMS sensors and actuators-Spring 2005+2006

Graduate Students Supervised:

Manoj Mahajan (Masters), Ravi Duvvuru (Masters), Vijaykumar Krithivasan (Masters), Jiang Lei (PhD), Santosh Angadi (Masters, PhD), W. Everett Wilson (Masters), Saurubh Wadwalker (Masters), Chandru Periasamy (Masters), Jeremy J.

Dawkins (PhD), Bhavin Vadgama (co-advisor with Harris, PhD), Cory Steigerwald (Masters).

Other Thesis Committees: Darshanuday Shinde (Masters to Completion), Jordan Roberts (Masters to Completion), Darrell Krueger (Masters to Completion), Chris Johnson (Masters to Completion), Piyush-chunilal Savalia (Masters to Completion), Lia Almeida (EE Masters to Completion), Paul Pearson (Masters to Completion), Prakriti Choudhary (Masters to Completion), Liwei Wang (Mat. Eng. PhD to Completion), Kendall Hurst (ChemE PhD), Dhananjay Panchagade (ME PhD), Sameep U. Gupte, (ME Masters), Chen Chen (ME PhD), Eliza Banu (ME PhD), Sakthivael Kandaswaamy (ME PhD)

Undergraduate Research Projects: “Finite Element Modeling of Sliding Asperity Contact” - Hasnain Meghani, “Hard Hybrid Transmissions” – Jenny Robinson, “Micro-encapsulated Friction Surfaces” – Michael Buder, “A Dry Coated Bearing for Baking Applications” – Christine Taylor, David Came, Michael Zabala, Bryant Hains, James Ratliff, Jared Whisenant “Experimental Investigation of Self Adapting Surfaces” - Andrew Nevins, Josh Westmoreland

Publications and Submissions: (Accepted: 24, Submitted: 4)

Jackson, R. L., Krithivasan, V., Wilson, W. E., The Pressure to Cause Complete Contact between Elastic Plastic Sinusoidal Surfaces, *IMEchE Part J*, In Print.

Jackson, R. L., Wilson, W. E., Angadi, S., A Theoretical Study of the Average Real Contact Pressure between Rough Surfaces, Submitted to *Trib. Letters*.

Singh, R. A., Yoon, E.-S., Jackson, R. L., Biomimetics: The newly emerging trend in Tribology, Submitted to *Tribology and Lubrication Technology*.

Duvvuru, R. S., Jackson, R. L., Hong, J. W., Novel Micro Scale Surface Textures For Hydrodynamic Lubrication, 2007, *Trib. Trans.*, In Print.

Jackson, R. L., Ashurst, W. R., Flowers, G. T., Angadi, S., Choe, S., Bozack, M. J., The Effect of Initial Connector Insertions on Electrical Contact Resistance, Submitted to *IEEE Transactions on Components and Packaging Technologies*.

Jackson, R. L., Green, I., An Experimental Investigation of Various Materials on Thrust Washer Bearing Operation, 2007, *IMEchE Part J*, 221, 7 pp. 761-770.

Jackson, R. L., Green, I., Marghitu, D., Predicting the Coefficient of Restitution of Impacting Elastic-Perfectly Plastic Spheres, Submitted to *J. of Tribol., Trans. ASME*.

Jackson, R. L., Bhavnani, S. H., Ferguson, T. P., A Multi-scale Model of Thermal Contact Resistance between Rough Surfaces, *J. of Heat Transfer, Trans. ASME*, In Print.

Krithivasan, V., Jackson, R. L., An Analysis of Three-Dimensional Elasto-Plastic Sinusoidal Contact, 2007, *Tribology Letters*, 27, 1, pp. 31-43.

Almeida, L., Ramadoss, R., Jackson, R. L., Ishikawa, K., Yu, Q., Laterally actuated multi-contact MEMS Relay fabricated using MetalMUMPS process: Experimental Characterization and Multiscale Contact Modeling, 2007, *J. Micro/Nanolith. MEMS MOEMS*, 6, 2, 023009.

Mahajan, M., Jackson, R. L., Flowers, G. T., Experimental and Analytical Investigation of a Dynamic Gas Squeeze Film Bearing, 2008, *Trib. Trans.*, 51, 1, pp. 57-67.

Jackson, R. L., Green, I., The Thermoelastic Behavior of Thrust Washer Bearings Considering Boundary Lubrication, Asperity Contact and Thermoviscous Effects, 2008, *Trib. Trans*, 51, 1, pp. 19–32.

Jackson, R. L., Kogut, L., Electrical Contact Resistance Theory for Anisotropic Conductive Films Considering Electron Tunneling and Particle Flattening, 2007, *IEEE Transactions on Components and Packaging Technologies*, 30, 1, pp. 59-66.

Jackson, R. L., Duvvuru, R. S., Meghani, H., Mahajan, M., An Analysis of Elasto-plastic Sliding Spherical Asperity Interaction, 2007, *Wear*, 262, 1-2, pp. 210-219.

Jackson, R. L., Streater, J. L., A Multiscale Model for Contact between Rough Surfaces, 2006, *Wear*, 261, 11-12, pp. 1337-1347.

Jackson, R. L., Self Adapting Mechanical Step Bearings for Variations in Load, 2005, *Tribology Letters*, 20, 1, pp. 11-20.

Jackson, R. L., The Effect of Scale Dependant Hardness on Elasto-plastic Asperity Contact between Rough Surfaces, 2006, *Trib. Trans.*, 49, 2, pp.135-150.

Almeida, L., Jackson, R., Ramadoss, R., Ishikawa, K., Yu, Q., Reliability Study of multi-contact MEMS Relay fabricated using MetalMUMPS process, 2006, *J. Micromech. Microeng.*, 16, 7, pp. 1189-1194.

Kim, D., Jackson, R. L., Green, I., Experimental Investigation of Thermal and Hydrodynamic Effects on Radial Grooved Thrust Washer Bearings, 2006, *Trib. Trans.* 49, 2, pp.192-201.

Jackson, R. L., Green, I., The Behavior of Thrust Washer Bearings Considering Boundary Lubrication and Asperity Contact, 2006, *Trib. Trans.*, 49, 2, pp.233-247.

Jackson, R. L., Kogut, L., A Comparison of Flattening and Indentation Approaches for Contact Mechanics Modeling of Single Asperity Contacts, 2006, *J. of Tribol., Trans. ASME*, 128, 1, pp. 209-212.

Kogut, L., Jackson, R. L., Comparison of Elastic Contact Modeling Utilizing Statistical and Fractal Approaches, 2006, *J. of Tribol., Trans. ASME*, 128, 1, pp. 213-217.

Jackson, R. L., Green, I., 2005, A Finite Element Study of Elasto-plastic Hemispherical Contact, *J. of Tribol., Trans. ASME*, 127, 2, pp. 343-354.

Jackson, R. L., Chusoipin, I., Green, I., A Finite Element Study of the Residual Stress and Strain Formation in Spherical Contacts, 2005, *J. of Tribol., Trans. ASME*, 127, 3, pp. 484-493.

Jackson, R. L., Green, I., A Statistical Model of Elasto-plastic Asperity Contact of Rough Surfaces, 2006, *Tribol. Int.*, 39, 9, pp. 906-614.

Quicksall, J., Jackson, R. L., Green, I., 2004, Elasto-plastic Hemispherical Contact for Varying Mechanical Properties, *IMechE J. of Eng. Trib. – Part J*, 218, pp.313-322.

Jackson, R. L., Green, I., 2003, Experimental Analysis of the Wear, Life and Behavior of PTFE Coated Thrust Washer Bearings Under Non-axisymmetric Loading, *Trib. Trans.*, 46, 4, pp. 600-607.

Jackson, R. L., Green, I., 2001, Study of the Tribological Behavior of a Thrust Washer Bearing, *Trib. Trans.*, 44, 3, pp. 504-508.

Other Publications:

Jackson, R. L., Green, I., Discussion of “Experimental Investigation of Fully Plastic Contact of a Sphere Against a Hard Flat” by J. Jamari and D. J. Schipper, *J. of Tribol., Trans. ASME*.

Invited Lectures and other Seminars: 9

ASME Chattahoochee Contact Mechanics Symposium

“Multiscale Contact Modeling: Incorporating Micro and Nano-scale Surface Contact Effects into Larger Scale Component Models,” 2008 Materials Engineering Seminar Series, Auburn University.

“Multiscale Modeling of Contact and Friction,” May 22, 2007, *Korea Institute of Science and Technology*.

“Multiscale Contact Modeling: Incorporating Micro and Nano-scale Surface Contact Effects into Larger Scale Component Models,” Symposium on Virtual Tribology, 2007 *STLE/ASME International Joint Trib. Conference*.

“Multi-scale ‘Smart’ Surfaces for Bearing and Machine Interfaces,” March 31, 2006, NASA Glenn Research Center, Cleveland, OH.

“Multi-scale ‘Smart’ Surfaces for Bearing and Machine Interfaces,” March 23, 2006, Caterpillar Inc., Peoria, IL

“Compressible Squeeze Film Damping,” January 24, 2006, *Qualcomm, MEMS Technologies*, San Jose, CA.

“Multi-scale ‘Smart’ Surfaces for Bearing and Machine Interfaces,” December 14, 2005, *Hughes Christensen*, Houston, TX.

“The Behavior of Thrust Washer Bearings Considering the Effects of Thermoelastic Deformation and Asperity Contact,” *March 30, 2005, Oak Ridge National Laboratory*.

“The Behavior of Thrust Washer Bearings Considering the Effects of Thermoelastic Deformation and Asperity Contact,” *February 11, 2005, Society of Tribologists and Lubrication Engineers, Dayton, Ohio Section*.

Proceedings and Conference Presentations:

Jackson, R. L., Green, I., An Investigation of a Tilted Thrust Washer Bearing Including TEHD, Asperity Contact and Boundary Lubrication Part 1: Numerical Model, *Presented at the 2004 STLE Annual Meeting*.

Jackson, R. L., Green, I., An Investigation of a Tilted Thrust Washer Bearing Including TEHD, Asperity Contact and Boundary Lubrication Part 2: Experimental Results, *Presented at the 2004 STLE Annual Meeting*.

Jackson, R. L., Chusoipin, I., Green, I., A Finite Element Study of the Residual Stress and Strain Formation in Spherical Contacts, *Presented at the 2004 ASME/STLE International Tribology Conference*.

L. Almeida, K. Ishikawa, Q. Yu, R. Jackson, and R. Ramadoss, "Reliability Study of Ohmic contact type MEMS Relay Fabricated Using MetalMUMPS Process," *IEEE International Microwave Symposium 2005*.

Jackson, R. L., The Effect of Scale Dependant Hardness on Elasto-plastic Asperity Contact between Rough Surfaces, *Proceedings of the STLE Annual Meeting, Las Vegas, NV, May, 2005*.

Kim, D., Jackson, R. L., Green, I., Experimental Investigation of Thermal and Hydrodynamic Effects on Radial Grooved Thrust Washer Bearings, *Proceedings of the STLE Annual Meeting, Las Vegas, NV, May, 2005*.

Quicksall, J., Jackson, R. L., Green, I., 2004, Elasto-plastic Hemispherical Contact for Varying Mechanical Properties, *Accepted for Presentation at the World Tribology Conference, Washington, D.C., September 2005*.

Jackson, R. L., Streater, J. L., A Model for Multi-scale Contact between Real Rough Surfaces, *Accepted for Presentation at the World Tribology Conference, Washington, D.C., September 2005*.

Kogut, L., Jackson, R. L., Comparison of Elastic Contact Modeling Utilizing Statistical and Fractal Approaches, *Accepted for Presentation at the World Tribology Conference, Washington, D.C., September 2005*.

Jackson, R. L., Self Optimizing 'Smart' Step Bearings, *Presentation at the 2005 ASME International Mechanical Engineering Congress and Exposition*.

Jackson, R. L., A Micro to Nano-scale Simulation of Liquid Lubricated Textured Surfaces, *2006 ECI Frontiers of Boundary Lubrication Conference*.

L. Almeida , K. Ishikawa , Q. Yu, R. Jackson , and R. Ramadoss, "Experimental and Theoretical Investigation of Contact Resistance and Reliability of Lateral Contact type Ohmic MEMS Relays," (Invited paper) SPIE & Photonics West MOEMS-MEMS MICRO & NANOFABRICATION Symposium, , 2006.

Mahajan, M., Jackson, R. L., Flowers, G. T., Experimental and Analytical Investigation of a Dynamic Gas Squeeze Film Bearing, *2006 STLE Annual Meeting*.

Jackson, R. L., Green, I., An Experimental Investigation of Various Materials on Thrust Washer Bearing Operation, *2006 STLE Annual Meeting*.

Jackson, R. L., Investigating the Lubricating Properties of Biofuels, Alternative Energy Solutions From Alabama's Natural Resources, October 23-24, 2006.

Jackson, R. L., Almeida, L., Ramadoss, R., Multiscale Contact Resistance Modeling of Ohmic MEMS Relays including Scale Dependant Properties, Dry

and Meniscus Adhesion, Proceedings of the 2006 *STLE/ASME International Joint Trib. Conference* (Paper No: IJTC2006-12290).

Jackson, R. L., Kogut, L., Electrical Contact Resistance Theory for Anisotropic Conductive Films Considering Electron Tunneling and Particle Flattening. 2006 *STLE/ASME International Joint Trib. Conference*.

Jackson, R. L., Duvvuru, R. S., Meghani, H., Mahajan, M., An Analysis of Elasto-plastic Sliding Spherical Asperity Interaction, 2006 *STLE/ASME International Joint Trib. Conference*.

Jackson, R. L., Marghitu, D. B., Green, I., Predicting the Coefficient of Restitution of Impacting Elastic-Perfectly Plastic, 2006 *STLE/ASME International Joint Trib. Conference*.

Jackson, R. L., Bhavnani, S. H., Ferguson, T. P., A Multi-scale Model of Thermal Contact Resistance between Rough Surfaces, 2006 *ASME International Mechanical Engineering Congress and Exposition*.

Duvvuru, R. S., Jackson, R. L., Hong, J. W., Novel Micro Scale Surface Textures For Hydrodynamic Lubrication, Presented at the 2007 *STLE Annual Meeting*, Philadelphia, PA, May 6-10, 2007.

Lei, J., Jackson, R. L., A Numerical Simulation of Lubricated Grooved Self Adapting Surfaces, Presented at the 2007 *STLE Annual Meeting*, Philadelphia, PA, May 6-10, 2007.

Jackson, R. L., Ashurst, W. R., Flowers, G. T., Angadi, S., Choe, S., Bozack, M. J., The Effect of Initial Connector Insertions on Electrical Contact Resistance, *The 53rd IEEE Holm Conference on Electrical Contacts*, Pittsburg, PA, September 16-19, 2007.

Streator, J. L., Jackson, R. L., Critical Conditions for Liquid Mediated Collapse of Two Dimensional Rough Surfaces, *STLE/ASME International Joint Trib. Conference*, San Diego, CA, October 22-24, 2007 (IJTC2007-44411).

Wilson, W. E., Jackson, R. L., Angadi, S., Streator, J. L., Surface Separation and Contact Resistance considering Elasto-plastic Multi-Scale Rough Surface Contact, 2007 *STLE/ASME International Joint Trib. Conference*, San Diego, CA, October 22-24, 2007 (IJTC2007-44324).

Krithivasan, V., Jackson R. L., An Analysis of Three-Dimensional Elasto-Plastic Sinusoidal Contact, 2007 *STLE/ASME International Joint Trib. Conference*, San Diego, CA, October 22-24, 2007 (IJTC2007-44014).

Taylor, C.L., Came, D.G., Zabala, M., and Jackson, R.L., A High Temperature

Test Rig to Evaluate Bearings Using in Food Baking Applications, *2008 STLE Annual Meeting*, Cleveland, OH, May 18-22, 2008.

Jackson, R. L., A Micro to Nano-scale Simulation of Liquid Lubricated Textured Surfaces, *2008 STLE Annual Meeting*, Cleveland, OH, May 18-22, 2008.

Wang, H., Zou, M., Jackson, R. L., Larson, P., Johnson, M., Nanoindentation on a Ni Nanodot-patterned Surface, *Proceedings of 2nd Integration & Commercialization of Micro & Nanosystems International Conference & Exhibition (MicroNano2008)*, Clear Water Bay, Kowloon, Hong Kong, June 3-5, 2008.

Jackson, R. L., Wilson, W. E., Multiscale Contact Modeling Using the Fourier Series and Some Recent Findings *Gordon Research Conference on Tribology*, Colby College, ME, July 6-11, 2008.

Wilson, W. E., Angadi, S., Jackson, R. L., Electrical Contact Resistance Considering Multi-Scale Roughness, *The 54th IEEE Holm Conference on Electrical Contacts*, Orlando, FL, October 27-29, 2008.

Angadi, S., Wilson, W. E., Jackson, R. L., Flowers, G. T., Rickett, B. I., A multi-physics finite element model of an electrical connector considering rough surface contact, *The 54th IEEE Holm Conference on Electrical Contacts*, Orlando, FL, October 27-29, 2008.

Jackson R. L., Wilson, W. E., Angadi, S., A Study of the Average Real Contact Pressure Between Rough Surfaces, *2008 STLE/ASME International Joint Trib. Conference*, Miami, FL, October 22-24, 2008.

Jackson R. L., Krithivasan, V., Wilson, W. E., The Pressure to Cause Complete Contact between Elastic Plastic Sinusoidal Surfaces, *2008 STLE/ASME International Joint Trib. Conference*, Miami, FL, October 22-24, 2008.

Wilson, W. E., Jackson R. L., Multiscale Prediction of the Surface Separation between Rough Surfaces, *2008 STLE/ASME International Joint Trib. Conference*, Miami, FL, October 22-24, 2008.

Huang, W., Jackson R. L., A Molecular Model of Asperity Contact and Comparison to Continuum Based Models, *2008 STLE/ASME International Joint Trib. Conference*, Miami, FL, October 22-24, 2008.

Wadwalker, S. Jackson R. L., Payton, L., A Study of Plastic Deformation of Heavily Loaded Spherical Surfaces, *2008 STLE/ASME International Joint Trib. Conference*, Miami, FL, October 22-24, 2008.

Other Presentations Made:

Jackson, R. L., Multiscale Tribology, Center for Advanced Vehicle Electronics, March 8th, 2007.

Jackson, R.L., Tribology: Friction, Wear, and Lubrication, *Mechanical Engineering Alumni Advisory Board*, September 30th, 2004.

Jackson, R. L., Contact and Friction: From Asperity Interaction to Hardness Testing, *Chemical Engineering Seminars at Auburn University*, September 10th, 2004.

Other Activities:

Technology Disclosure submitted to the Auburn University Technology Transfer Office on “Controlled Surface Texture and Profile via Microfluidics.”

Technology Disclosure submitted to the Auburn University Technology Transfer Office on “Self Adapting Mechanical Smart Bearings for Variations in Load.”

Application for new class in Friction, Wear and Lubrication approved.

Helped organize several seminars through the Mechanical Engineering Graduate Seminar Series:

Itzhak Green, Professor, Georgia Institute of Technology

Brad Miller, Assistant Professor, University of Missouri-Rolla

Ward Winer, Chair, Georgia Institute of Technology

Helped organize several seminars through the ASME Chattahoochee Section:

Nels Madsen, Professor, Auburn University

Ali Syed Firasat, Tuskegee University

Reviewer Book Chapter on “Mechanical characterization and properties of DLC films”

Achievements and Professional Service

2008 NSF-CMMI CAREER Proposal Writing Workshop Attendee

Chair, 2007 Steering Committee for Technical Committees and Industrial Boards (STLE)

Nominated for a position on the Executive Committee of the ASME Tribology Division

Judge, 2007 South's BEST Regional Robotics Championship

2007 Marquis Who's Who in America

ASME 2007 Student Leadership Seminar

Member, ASME Nanotribology and Micro-/Nano-Systems Committee, 2006-2008

Track Co-Chair, Nanotribology, ASME/STLE International Joint Tribology Conference, 2007-2008.

Chair, ASME Chattahoochee Section, 2006-2008

Faculty Advisor, ASME Auburn Student Section

Judge 2007 Undergraduate Research Forum

Auburn Univ. Mentor Grant Selection Committee, 2006, 2007
Judge 2006 Graduate Research Forum
E-Day Co-organizer for the Mechanical Engineering Department, 2006-2008
ASME 2007 Leadership Training Conference
NSF Fellowship – NSF Summer Institute on Science Fundamentals for Nano-and Bio-Mechanics of Materials, July 2006
Fundamentals of Engineering Exam: Mechanics of Materials, Review Lecturer
Judge for 2006 ASME Tribology Division Student Paper Competition
Oak Ridge National Laboratory Day of Science, 2005, Faculty Participant
NSF Fellowship – Nanomechanics Summer Short Course on Nanocoatings, July 2004
Society of Tribologists and Lubrication Engineers (STLE) Awards Committee
Chair, PSC, STLE Surface Engineering Technical Committee
Chair, Session 2E, Surface Engineering II, 2006 STLE Annual Meeting
ASME Tribology Division Membership Committee
ASME Tribology Division Contact Mechanics Committee
Reviewer for the following journals:
IEEE Transactions on Components and Packaging Technologies
International Journal of Solids and Structures
ASME Journal of Vibrations and Acoustics
ASME Journal of Tribology
ASME Journal of Applied Mechanics
STLE Tribology Transactions
IMechE Journal. of Engineering Tribology – Part J
Journal of Colloid and Interface Science
Tribology Letters
Wear
2001 Who's Who Among Students in American Universities and Colleges
Pi Tau Sigma
Gamma Beta Phi Honor Society