

# Curriculum Vitae

## Changki Mo, Ph.D.

Associate Professor, School of Mechanical and Materials Engineering  
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### Education:

1996	Ph.D., Mechanical Engineering	University of Oklahoma
1992	MS, Mechanical Engineering	University of Oklahoma
1983	BS, Mechanical Engineering	Inha University, South Korea

### Areas of Research Interest:

- ♦ Vehicular and Structural Vibration Control
- ♦ Smart Materials and Structures
  - Vibration-based Piezoelectric Energy Harvesting
  - MEMS Actuators and Sensors
  - Adaptive Structures using Shape Memory Polymers
- ♦ Robotics and Automation
- ♦ Renewable Bio-nanomaterials

### Professional Experience:

2010- : Assistant/Associate Professor, School of Mechanical and Materials Engineering, Washington State University-Tri-Cities

2004 – 2010: Visiting Professor, Mechanical Engineering and Materials Science Department, University of Pittsburgh

2003 – 2004: Director, Cooperative Research Center of Industry and University, Kyungpook National University Sangju, South Korea

1997 – 2004: Assistant/Associate Professor, Department of Automotive Engineering, Kyungpook National University Sangju, South Korea

1996 – 1997: Post Doctor and Instructor, School of Aerospace and Mechanical Engineering, University of Oklahoma

1990 – 1996: Research Assistant and Teaching Assistant, School of Aerospace and Mechanical Engineering, University of Oklahoma

1986 – 1989: Research and Test Engineer, Technology and Research Institute, Hyundai Motor Company, South Korea

### Honors:

2003 : Excellent Research Award (Kyungpook National University Sangju, South Korea)

2016 : Nominated for the WSU Tri-Cities Outstanding Teaching Award

### Research Projects:

- Plant Based Dispersion for Fruit Frost Protection, OFF OF COMM-WSU Commercialization Gap Fund, 1/2019-12/2019 (Co-PI)
- Design of a Robotic Sensor Deployment System for Hanford Under-Tank Inspection, WRPS/PNNL, 10/2017-9/2018 (PI)
- Reducing Cold Damage with Cellulose Nanocrystals, WA TREE FRUIT RES CM, 2/2018-1/2019 (Co-PI).
- Cellulose NanoCrystals for Preventing Frost Damage in Tree Fruits and Grapes, USDA-NIFA, 1/2018-1/2021 (Co-PI).
- Autonomous Instrumented Vehicles (AIV), WRPS/DOE/OFC River Protection, 11/2017-9/2018 (Co-PI).
- Human-robot Collaboration for Automated Harvesting of Tree Fruits, National Robotics Initiative

- (NRI)-USDA, 9/2013-8/2017 (Co-PI).
- Design and Development of an Apple Catching Robot, WSU Tri-Cities Chancellor's Seed Grant, 9/2016-6/2017 (PI).
  - Machinescape, WSU Tri-Cities Chancellor's Seed Grant, 9/2016-6/2017 (Co-PI).
  - Differential Scanning Calorimeter for interdisciplinary and collaborative research and educational uses, WSU Tri-Cities Chancellor's Equipment Grant, 9/2016-6/2017 (Co-PI).
  - Performance Validation of IceCOLD Refrigerant Catalyst, Enviroficient, 5/2015-5/2016 (PI).
  - Empirical Characterization of the Thermo-mechanical Behavior of a Shape Memory Polymer, 5/2012-8/2014, WSU New Faculty Seed Grant (PI).
  - Modeling of the Piezoelectric Disc Response to a Non-parallel Incident Wave in Transcutaneous Power Transmission, 3/2012-8/2012, Piezo Energy Technologies, LLC (PI).
  - Self-powered Highway Bridge Monitoring System, ODOT (Oklahoma Department of Transportation) (Co-Writer and Research Associate).
  - Investigation of Thermal Semi-Conductors for Adaptive Heat Management in Buildings, Mascaro Center for Sustainable Innovation (MCSI) at the University of Pittsburgh (Co-Writer and Research Associate).
  - Adaptive Mechatronics Technologies, University of Pittsburgh (Co-Writer and Research Associate).
  - Animal Trial to Validate Energy Harvesting Devices for the Medical Implants, Greatbatch, Inc/Piezo Energy Technologies, LLC (Co-Writer and Research Associate).
  - Micro-Fabricated PMN-PT Energy Harvesters for Self-Powered Sensors in Sustainable Buildings, Mascaro Sustainability Initiative (MSI) at the University of Pittsburgh (Role: Co-Writer and Research Associate).
  - Battery Augmentation for Medical Devices, NSF STTR Program (with Piezo Energy Technologies, LLC) (Role: Co-Writer and Research Associate).
  - Mechanical Energy Harvesting for Machinery Diagnostics, Bechtel Bettis Atomic Power Lab (Role: Co-Writer and Research Associate).
  - Thin Piezoelectric Structures for Print Head Transducers and Energy Harvesters, Xerox University Affairs Program (Research Associate).
  - Harvesting Vehicular Vibration Energy with Piezoelectric Benders, KRF (Korea Research Foundation) (PI)

### **Publications:**

#### **Journal Articles:**

- Hohimer, J. H., Wang, H., Bhusal, S., Miller, J., Mo, C., and Karkee, M., "Design and field evaluation of a robot apple harvesting system with 3D printed soft-robotic end-effector," In Press, *Transactions of the ASABE*, 2019.
- Han, F., Mo, C., and Hao, H., "An Adaptive Hybrid Differential Evolution Algorithm for the Parameter Identification of Rotating Machinery," *Journal of Vibration and Control*, Vol. 24(21), pp. 5087-5096, 2018.
- Karri, N. K. and Mo, C., "Structural Reliability Evaluation of Thermoelectric Generator Modules - Influence of End Conditions, Leg Geometry, Metallization, and Processing Temperatures," *Journal of Electronic Materials*, Vol. 47(10), pp. 6101-6120, 2018.
- Alhamid, J., Mo, C., Zhang, X., Wang, P., Whiting, M. and Zhang, Q., "Research Note: Cellulose Nanocrystals reduce cold damage to reproductive buds in fruit crops," *Biosystems Engineering Journal*, Vol. 172, pp. 124-133, 2018.
- Karri, N. K. and Mo, C., "Reliable Thermoelectric Module Design under Opposing Requirements from the Structural and Thermoelectric Considerations," *Journal of Electronic Materials*, Vol. 47(6), pp. 3127-3135, <https://doi.org/10.1007/s11664-017-5934-6>, 2018.
- Wang, W., Lu, H., Mo, C., Yang, Z., Hohimer, C., and Qiu, G., "Experiments on the mechanical harvesting of litchis and its effects on litchi storage," *Transactions of the ASABE*, Vol. 60(5), pp. 1529-1535, 2017.
- Silwal, A., Davidson, J., Karkee, M., Mo, C., Zhang, Q. and Lewis, K., "Design, Integration, and Field Evaluation of a Robotic Apple Harvester," *Journal of Field Robotics*, Vol. 34(6), pp. 1140-1159, <https://doi.org/10.1002/rob.21715>, 2017.

- Han, F., Guo, X., Mo, C., Gao, H., and Hou, P., “Parameter identification of nonlinear rotor-bearing system based on improved Kriging surrogate model and evolutionary algorithm,” *Journal of Vibration and Control*, Vol. 23(5), pp. 794-807, 2017.
- Davidson, J., Silwal, A., Karkee, M., Mo, C., and Zhang, Q., “Hand Picking Dynamic Analysis for Undersensed Robotic Apple Harvesting,” *Transactions of the ASABE*, Vol. 59(4), pp. 745-758, 2016.
- Balogun, O. A. and Mo, C., “Three-Dimensional Thermo-mechanical Viscoelastic Model for Shape Memory Polymers with Binding Factor,” *Journal of Intelligent Material systems and Structures*, Vol. 27(14), pp. 1908-1916, 2016.
- Bankston, S. and Mo, C., “Geometry Modification of Flywheels and Its Effect on Energy Storage,” *Energy Research Journal*, Vol. 6(2), pp. 54-63, 2015.
- Bagade, A., Mo, C., and Mazher, A. K., “Degradation of Power Generation Performance due to Effects of Various Ice Shapes and Accretions on Wind Turbine Blades,” *Energy Research Journal*, Vol. 6(2), pp. 42-53, 2015.
- Snyder, J. and Mo, C., “A Study of Vibration Control of a Critical Lift Tower,” *Journal of Vibration Analysis, Measurement, and Control*, Vol. 2(1), pp. 41-56, 2014.
- Hanson, D. and Mo, C., “Monitoring Cattle Motion using 3-axis Accelerometer and GPS Data,” *Journal of Research in Agriculture and Animal Science*, Vol. 2(10), pp. 1-8, 2014.
- Davidson, J. R. and Mo, C., “Recent Advances in Energy Harvesting Technologies for Structural Health Monitoring Applications,” *Smart Materials Research*, Vol. 2014, 410314 (14pp), 2014.
- Balogun, O. A. and Mo, C., “Shape Memory Polymers: Three-Dimensional Isotropic Modeling,” *Smart Materials and Structures*, Vol. 23(4), 045008 (7pp), 2014.
- Mo, C., Davidson, J. R., and Clark, W. W., “Energy Harvesting with Piezoelectric Circular Membranes under Pressure Loading,” *Smart Materials and Structures*, Vol. 23(4), 045005 (7pp), 2014.
- Balogun, O. A., Mo, C., and Mazher, A. K., “Exergy Analysis of Gas Turbine-Burner Engine,” *Int. J. of Scientific & Technology Research*, Vol. 3(1), pp. 62-67, 2014.
- Davidson, J. R. and Mo, C., “Energy Harvesting with Frequency Tuning for Ventilation System Monitoring,” *Inter. J. of Engineering, Science and Innovative Technology*, Vol. 2(5), pp. 114-124, 2013.
- Mo, C., Arnold, D., Kinsel, W., and Clark, W. W., “Modeling and Experimental Validation of Unimorph PZT Cymbal Design in Energy Harvesting,” *Journal of Intelligent Material Systems and Structures*, Vol. 24(7), pp. 828-836, 2013.
- Mo, C., Wright, R., Knight, R. R., and Clark, W. W., “Finite element analysis of unimorph rectangular piezoelectric diaphragm actuators with experimental verification,” *Smart Materials and Structures*, Vol. 21(8), 085025 (7 pp), 2012.
- Knight, R. R., Mo, C., and Clark, W. W., “MEMS interdigitated electrode pattern optimization for a unimorph piezoelectric beam,” *Journal of Electroceramics*, Vol. 26(1), pp. 14-22, 2011.
- Mo, C., Knight, R. R., Frederick, A. A., and Clark, W. W., “Fabrication and Energy Harvesting Measurements of Vibrating MEMS Piezoelectric Benders,” *ASME Journal of Vibrations and Acoustics*, Vol. 133, 011006 (7pp), 2011.
- Knight, R. R., Frederick, A. A., Mo, C., and Clark, W. W., “Tuning of sol-gel derived PZT MEMS resonators,” *Journal of Micromechanics and Microengineering*, Vol. 20, 125028 (10pp), 2010.
- Mo, C., Radziemski, L. J., and Clark, W. W., “Experimental Validation of Energy Harvesting Performance for Pressure-Loaded Piezoelectric Circular Diaphragms,” *Smart Materials and Structures*, Vol. 19(7), 075010 (7pp), 2010.
- Mo, C., Radziemski, L. J., and Clark, W. W., “Analysis of piezoelectric circular diaphragm energy harvesters for use in a pressure fluctuating system,” *Smart Materials and Structures*, Vol. 19(2), 025016 (10pp), 2010.
- Mo, C., Kim, S., and Clark, W. W., “Theoretical Analysis of Energy Harvesting Performance for Unimorph Piezoelectric Benders with Interdigitated Electrodes,” *Smart Materials and Structures*, Vol. 18(5), 055017 (8pp), 2009.
- Mo, C., Ban, G., David, C., and Clark, W. W., “Energy Harvesting from a Vibrating Piezoelectric Unimorph Bender,” *Journal of KSIA*, Vol. 10(3), pp. 157-163, 2007.

- Mo, C., Wright, R., and Clark, W. W., “The Effect of Electrode Pattern on the Behavior of Piezoelectric Actuators in a Circular Diaphragm Structure,” *Journal of Intelligent Material Systems and Structures*, Vol. 18(5), pp. 467-476, 2007.
- Ban, G., Mo, C., and Suh, E., “A Study on the Binding Force of Drawbead in the Sheet Metal Forming Process through the Finite Element and Experimental Analysis,” *Journal of KSIA* (Korean), Vol. 10(1), pp. 5-14, 2007.
- Mo, C., Wright, R., Slaughter, W. S., and Clark, W. W., “Behavior of a Unimorph Circular Piezoelectric Actuator,” *Smart Materials and Structures*, Vol. 15, pp. 1094-1102, 2006.
- Ban, G., Lee, K. H., Mo, C., and Lee, J. G., “Analysis of Stability for Overhead Crane Systems,” *Journal of the KSPE* (Korean), Vol. 22, No. 4, pp. 128-135, 2005.
- Ban, G., Lee, K. H., Mo, C. and Seo, Y., “A Study on the Characteristics for the Blanking of Lead Frame with the Nickel Alloy 42,” *Journal of KSMTE* (Korean), Vol. 13(6), pp. 87-93, 2004.
- Pang, J., Mo, C., and Sheng, G., “Automotive seat cushion nonlinear phenomenon: experimental and theoretical evaluation,” *International Journal of Vehicle Autonomous Systems*, Vol. 1(3-4), pp. 421-435, 2003.
- Mo, C., “Automotive Seat Vibration Control with a Nonlinear Seat Cushion Model,” *Journal of KSIA*, Vol. 6(3), pp. 261-266, 2003.
- Cho, D., Mo, C., Ban, G., and Lee, K. H., “Modal Interactions in an Autoparametric Vibration Absorber to Narrow Band Random Excitation,” *Journal of Mechanical Science and Technology*, Vol. 17(1), pp. 97-104, 2003.
- Mo, C., and Sunwoo, M., “A Hydraulic Semiactive Vibration Absorbers (SAVA) for Automotive Suspensions,” *International Journal of Vehicle Design*, Vol. 29(1), pp. 83-95, 2002.
- Mo, C., Sunwoo, M., and Yan, W., “An Application of Sliding Horizon Control to an Electro-Hydraulic Automotive Seat Simulator,” *Journal of Mechanical Science and Technology*, Vol. 16(3), pp. 283-291, 2002.
- Mo, C., and Lee, J., “Semiactive Control for Structural Vibration Mitigation”, *Journal of KSNVE*, Vol. 11(1), pp. 96-103, 2001.
- Mo, C., Sunwoo, and Patten, W. N., “Automotive Seat Vibration Control via Hydraulic Semiactive Vibration Absorbers (SAVA),” *Journal of Mechanical Science and Technology*, Vol. 13(6), pp. 459-469, 1999.
- Mo, C., “Vibration Control for Building Structures,” *Journal of KSNVE* (Korean), Vol. 9(6), pp.1082-1090, 1999.
- Mo, C., Kuehn, J., Sarah, L. and Lee, J., “Discussion and Closure on A Primer on Design of Semiactive Vibration Absorbers (SAVA),” *ASCE Journal of Engineering Mechanics*, Vol. 125(9), pp. 1095-1098, 1999.
- Sha, S., Patten, W. N., and Mo, C., “A Vibration Model of Open Celled Polyurethane Foam Automotive Seat Cushions,” *Journal of Sound and Vibration*, Vol. 217 (1), pp. 145-161, 1998.
- Patten, W. N., Mo, C., Keuhn, J., and Lee, J., “A Primer on Design of Semiactive Vibration Absorbers (SAVA),” *ASCE Journal of Engineering Mechanics*, Vol. 124(1), pp. 61-68, 1998.

#### **Books and Book chapters:**

- Clark, W. W. and Mo, C., book chapter 16, “Piezoelectric Energy Harvesting for Bio MEMS Applications,” *Energy Harvesting Technologies* (Eds: Priya, S. and Inman, D. J.), pp 405-430, Springer, 2009.
- Kim, D., Mo, C., *et al.*, *Fluid Power System* (Korean - Translated Version), 2003.
- Kim, D., Mo, C. *et al.*, *Technology of Fluid Power* (Korean - Translated Version), 1999.

#### **Patents:**

- Zhang, X., Mo, C., Whiting, M., and Zhang, Q., “Cellulose Dispersions for Reducing Cold Damage in Tree Fruit,” Provisional Patent Application filed through WSU Office of Commercialization, 2018.
- Davidson, J., Hohimer, C. and Mo, C., “Robotic system for catching and storing fresh market apples,” Provisional Patent Application filed through WSU Office of Commercialization, 2017.
- Mo, C., Zhang, Q., and Karkee, M., “An exoskeleton type wearable, lifting-walking robot for orchard operations,” Provisional Patent Application filed through WSU Office of Commercialization, 2016.
- Davidson, J. Mo, C., Zhang, Q., Silwal, A., and Karkee, M., “Robotic systems, methods, and end-

effectors for harvesting produce,” US Patent No. 9,554,512 B2, Jan. 31, 2017.

- Karkee M., Long, H., Mo, C., and Zhang, Q., “Robotic Harvesting Solutions for Fresh Market Blueberries,” Provisional Patent Application filed through WSU Office of Commercialization, 2015.
- Mo, C., Saad, M., Jordan, S., and Rodrigues, C., “Geothermal and Peltier cooling systems for pasteurized milk cooling,” Provisional Patent Application filed through WSU Office of Commercialization, 2015.
- Clark, W. W., Schaefer, L. A., Knotts, W., Mo, C., and Kimber, M., “Variable Thermal Insulation,” US Patent No. 0081786A1, April 4, 2013.
- Mo, C. and Kim, T., “A Gun Adaptor for Pouring Polyurethane,” South Korea Patent Number 1004924890000, 2005.
- Mo, C. and Kim, T., “A Mortar Device of Wall Panels in Building Structure, South Korea Patent Number 1004903660000, 2005.
- Mo, C. and Park, H., “Control Device for High Definition Constant Pressure Press,” South Korea Patent Number 2003642440000, 2004.
- Mo, C. and Choi, Y., “Small Size Auto Carton Case Former,” South Korea Patent Number 2003350120000, 2003.

### **Conference Proceedings:**

- Denslow et al., “Progress on Advancing Robotic Ultrasonic Volumetric Inspection Technology for Hanford Under-tank Inspection,” submitted to WM2019 Conference, March 3–7, Phoenix, AZ, 2019.
- Wang, H., Hohimer, C. J., Bhusal, S., Karkee, M., Mo, C., and Miller, J. H., “Simulation as a Tool in Designing and Evaluating a Robotic Apple Harvesting System,” IFAC 6<sup>th</sup> Conference on Bio-Robotics (Bio-Robotics 2018), July 13–15, Beijing, China, 2018.
- Loeffler, E., Porter, A., and Mo, C., “A Prototype Dual Robot System to Perform Ultrasonic and Visual Inspection for a Bottom of Dual-Shell Tanks,” WM2018 Conference, March 18–22, Phoenix, AZ, 2018.
- Hohimer, C., Petrossian, G., Ameli, A., Mo, C., and Pötschke, P., “Electrical Conductivity and Piezoresistive Response of 3D Printed Thermoplastic Polyurethane/Multiwalled Carbon Nanotube Composites,” SPIE 2018 Conference Smart Materials/NDE, March 4–8, Denver, CO, 2018.
- Hohimer, C., Aliheidari, N., Mo, C. and Ameli, A., “Mechanical Behavior of 3D Printed Multiwalled Carbon Nanotube/Thermoplastic Polyurethane Nanocomposites,” ASME SMASIS Conference 2017, Snowbird, UT, September 18–20, 2017.
- Davidson, J., Hohimer, C., Mo, C., and Karkee, M., “Dual Robot Coordination for Apple Harvesting,” 2017 ASABE Annual International Meeting, Spokane, WA, July 16–19, 2017.
- Hohimer, C., Christ, J., Aliheidari, N., Mo, C., and Ameli, A., “3D Printed Thermoplastic Polyurethane with Isotropic Material Properties,” SPIE 2017 Conference on Smart Materials/NDE, Portland, OR, 25-29 March, 2017, <http://dx.doi.org/10.1117/12.2259810>.
- Christ, J. F., Hohimer, C. J., Aliheidari, N., Ameli, A., and Mo, C., “3D printing of highly elastic strain sensors using polyurethane/multiwall carbon nanotube composites,” SPIE 2017 Conference on Smart Materials/NDE, Portland, OR, 25-29 March, 2017, <http://dx.doi.org/10.1117/12.2259820>.
- Davidson, J., Silwal, A., Hohimer, C., Karkee, M., Mo, C., and Zhang, Q., “Proof-of-Concept of a Robotic Apple Harvester,” IEEE IROS 2016 International Conference, Daejeon, South Korea, 9-14 October, 2016.
- Davidson, J., Hohimer, C., and Mo, C., “Preliminary Design of a Robotic System for Catching and Storing Fresh Market Apples,” IFAC AgriControl 2016 Conference, Seattle, WA, 14-17 August, 2016.
- Wang, W., Wu, T., Hohimer, C., Mo, C., and Zhang, Q., “Stability Analysis for Orchard Wearable Robotic System,” IFAC AgriControl 2016 Conference, Seattle, WA, 14-17 August, 2016.
- Silwal, A., Davidson, J., Karkee, M., Mo, C., Zhang, Q., and Lewis, K., “Effort towards robotic apple harvesting in Washington State,” 2016 ASABE Annual International Meeting, July 17–20, Orlando, Florida, 2016.
- Davidson, J. and Mo, C., “Mechanical Design and Initial Performance Testing of an Apple-Picking End-Effector,” ASME IMECE 2015, November 13 – 19, Houston, TX, 2015.
- Davidson, J., Mo, C., Silwal, A., Karkee, M., Li, J., Xiao, K., Zhang, Q., and Lewis, K., “Extended Abstract: Human-Machine Collaboration for the Robotic Harvesting of Fresh Market Apples,” IEEE ICRA 2015 Ag Robotics Workshop, May 30, Seattle, WA, 2015.

- Karkee, M., Lewis, K., Mo, C., and Zhang, Q., *Invited presentation*, “Human Robot Collaboration for Apple Harvesting,” 2<sup>nd</sup> International Conference on Agricultural and Food Engineering, Kuala Lumpur, Malaysia, Dec 1-3, 2014.
- Davidson, J. and Mo, C., “Conceptual Design of an End-Effector for an Apple Harvesting Robot,” International Conf. on Automation Technology for Off-road Equipment (ATOE), Beijing, China, September 16-19, 2014.
- Balogun, O. A. and Mo, C., “Shape Memory Polymers – Energy Method Superposition Constitutive Modeling,” ASME SMASIS Conference, Newport, RI, 8-10 September, 2014.
- Balogun, O. A. and Mo, C., “Shape Memory Polymers – Viscoelastic Constitutive Modeling,” ASME SMASIS Conference, Newport, RI, 8-10 September, 2014.
- Balogun, O. A. and Mo, C., “Shape Memory Polymers: Thermo-mechanical Constitutive Numerical Model,” NSBE Aerospace Systems Conference, Los Angeles, CA, 22-24 January, 2014.
- Mazher, A. K. and Mo, C., “Dynamic Modeling of Turbulence,” ASME International Mechanical Engineering Congress & Exposition (IMECE), San Diego, CA, 15 – 21 November, 2013.
- Balogun, O. A., Mo, C., Brigham, J. C., and Mazher, A. K., “Three-Dimensional Numerical Simulation of Thermo-mechanical Constitutive Model for Shape Memory Polymers with Application to Morphing Wing Skin,” ASME SMASIS Conference, Snowbird, UT, 16-18 September, 2013.
- Purviance, T., Wickler, S., Clayson, K., Barnes, T., and Mo, C., “Development of low-profile piezoelectric energy harvester for high load application,” IEEE Conf. on Technologies for Sustainability (SusTech), Portland, OR, 1-2 August, pp. 120-125, 2013.
- Mo, C. and Davison, J., *Invited Paper*, “Energy harvesting technologies for structural health monitoring application,” IEEE Conf. on Technologies for Sustainability (SusTech), Portland, OR, 1- 2 August, pp. 192-198, 2013.
- Mo, C., Hudson, S., and Radziemski, L. J., “Effect of Misalignment between Ultrasound Piezoelectric Transducers on Transcutaneous Energy Transfer,” SPIE 2013 Conference, San Diego, CA, 10-14 March, 2013.
- Mo, C., Jordan, S., and Clark, W. W., “Bimorph Piezoelectric Cymbal Design in Energy Harvesting,” ASME 2012 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, Stone Mountain, GA, 19-21 September, 2012.
- Knotts, W., Miller, D., Mo, C., Schaefer, L., and Clark, W. W., “Smart Insulation for Thermal Control in Buildings,” ASME 2011 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, Scottsdale, AZ, 18-21 September, 2011.
- Mo, C., Arnold, D., Kinsel, W., and Clark, W. W., “Unimorph PZT Cymbal Design in Energy Harvesting,” ASME 2011 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, Scottsdale, AZ, 18-21 September, 2011.
- Arnold, D., Kinsel, W., Clark, W. W., and Mo, C., “Exploration of New Cymbal Design in Energy Harvesting,” Proc. of SPIE, Smart Structures and Materials, Vol. 7977, San Diego, CA, 6-10 March, 2011.
- Clark, W. W., Brigham, J. C., Mo, C., and Joshi, S. “Modeling of High-Deformation Shape Memory Polymer Locking Link,” Proc. of SPIE, Smart Structures and Materials, San Diego, CA, 2010.
- Mo, C., Knight, R. R., Frederick, A. A., and Clark, W. W., “Energy Harvesting by Vibrations with MEMS Piezoelectric Benders,” Symposium on Energy Harvesting, ASME 2009 IDETC Conf. (22<sup>nd</sup> Biennial Conf. on Mechanical Vibration and Noise Conf.), San Diego, CA. August 30-September 2, 2009.
- Knight, R. R., Mo, C., and Clark, W. W., “Development and Testing of a MEMS Piezoelectric Energy Harvester,” Proc. of SPIE, Smart Structures and Materials, San Diego, CA, 8-12 March, 2009.
- Mo, C., Radziemski, L. J., and Clark, W. W., “Energy Harvesting with Piezoelectric Unimorph Circular Diaphragms,” ASME 2008 Conference on Smart Materials, Adaptive Structures and Intelligent Systems, SYMP 2-9, Ellicott City, MD, 28-30 October, 2008.
- Mo, C., Radziemski, L. J., and Clark, W. W., “Performance comparison of implantable piezoelectric energy harvesters,” Proc. of SPIE, Active and Passive Smart Structures and Integrated Systems, Vol. 6928, San Diego, CA, March 2008.
- Clark, W. W., Romeiko, J. R., Charnegie, D. A., Kusic, G., and Mo, C., *Invited Paper*, “A Case Study in Energy Harvesting for Powering a Wireless Measurement System,” Proceedings of the International Workshop on Structural Health Monitoring, Stanford University, pp. 1765-1772 11-13 September, 2007.

- Mo, C., Radziemski, L. J., and Clark, W. W., “Analysis of PMN-PT and PZT Circular Diaphragm Energy Harvesters for Use in Implantable Medical Devices,” 14<sup>th</sup> SPIE International Symposium on Smart Structures and Materials, Vol. 6525, 652507 (9pp), San Diego, CA, March 2007.
- Charnegie, D., Mo, C., Frederick, A. A., and Clark, W. W., “Tunable Piezoelectric Cantilever Beams for Energy Harvesting,” Proc. of IMECE, Chicago, IL., 5-10 Nov., 2006.
- Boyerinas, B., Mo, C., and Clark, W. W., “Behavior of Unimorph Rectangular Piezoelectric Diaphragm Actuators,” 13<sup>th</sup> SPIE International Symposium on Smart Structures and Materials, Vol. 6173, San Diego, CA, March 2006.
- Mo, C., and Clark, W. W., “Harvesting Vibration Energy with a Piezoelectric Unimorph Bender”, KSAE Fall Conference, Daegu, Korea, Oct. 2005.
- Mo, C., Kim, S., and Clark, W. W., “Analysis of Power Generating Performance for Unimorph Cantilever Piezoelectric Beams with Interdigitated Electrodes”, Proc. of ASME IDETC2005, ASME International Design Engineering Technical Conference, 24-28 Sep., Long Beach, CA, U.S.A., 2005.
- Wright, R., Mo, C., and Clark, W. W., “Effect of Electrode Pattern on the Performance of Unimorph Piezoelectric Diaphragm Actuators,” 12<sup>th</sup> SPIE International Annual Symposium on Smart Structures and Materials, San Diego, CA, March 2005.
- Mo, C., and Oh, J., “Vibration Control of the Vehicle Seat/Chassis Suspension System Using a MR (Magnetorheological) Damper”, Symposium on Automotive Electronics and I.T.S. of KSAE (Korean), pp.57-65, 2003.
- Mo, C., “Semi-active Vibration Control for the Integrated Seat/Chassis Suspension with a Nonlinear Seat Cushion,” Joint Symp. Between Sister Universities in Mechanical Engineering, Kyongju, Korea, Aug. 22-24, 2002.
- Mo, C., Koh, H. M., and Kwon, S. D., *Invited Paper*, “Recent Development and Application of Active Semi-active and Hybrid Structural Control in Korea,” Int. Conf. on Seismic Isolation, Passive Energy Dissipation and Active Control of Vibrations of Structures, Jeju, Korea, pp. 507-518, 1999.
- Mo, C., Sunwoo, M., and Patten, W. N., “A Bistate Control of a Semiactive Automotive Suspension”, SAE Technical Paper No. 1999-01-0725, 1999.
- Mo, C., Lee, J., Khaw, C., Kuehn, J., and Patten, W. N., “Fluid Compressibility Effects in Semiactive Vibration Absorbers (SAVA),” ASME Conference, Active Control of Vibration and Noise, DE-Vol. 93, pp. 197-204, 1996.
- Shen, K., Liu, L., Mo, C., Sunwoo, M., and Patten, W. N., “Predictive Feedforward Control of an Electro-Hydraulic Automotive Seat Motion Simulator,” IFAC 13<sup>th</sup> Triennial World Congress, San Francisco, CA, pp. 267-272, 1996.
- Patten, W., Mo, C., Kuehn, J., Lee, J., and Khaw, C., “Hydraulic Semiactive Vibration Absorbers (SAVA); Separating Myth from Reality,” IFAC 13<sup>th</sup> Triennial World Congress, San Francisco, CA., pp. 157-162, 1996.
- Wu, H. C., Yan, W. Z., Mo, C., and Patten, W. N., “A prototype Semiactive Damper,” ASME conference, Advanced Automotive Technologies, DSC-Vol. 52, pp. 51-57, 1993.
- Patten, W. N., Sack, R. L., Yan, W., Mo, C., and Wu, H. C., “Seismic Motion Control Using Semiactive Hydraulic Force Actuators,” Proc. of ATC-17-1 Seminar on Seismic Isolation, Passive Energy Dissipation, and Active Control, San Francisco, CA, pp. 727-736, 1993.
- Patten, W. N., Wu, H.C., Yan, W., Mo, C., Sack, R. L., and Ebrahimpour, A., “Mitigating structural vibrations with semi-active control,” EURO DYN’93, Structural Dynamics, Balkema, Rotterdam, pp. 861-868, 1993.

#### **Conference without Proceedings:**

- Alhamid, J., Arnoldussen, B., Mo, C., Zhang, X., Wang, P., Zhang, Q., and Whiting, M., “Cellulose Nanocrystals reduce cold damage to reproductive buds in fruit crops,” 11<sup>th</sup> International Plant Cold Hardiness Seminar (IPCHS): Importance of Cold Hardiness in a Warming Climate, 5-10 August, Univ. of Wisconsin-Madison, Madison, WI, 2018.
- Mo, C., *Invited Speaker*, “Advances in Mechanized Tree Fruit Harvesting,” Tree-Fruit Architecture and Orchard Fruit Mechanization, American Society of Horticultural Science, 2018 Annual Conference, July 30 – Aug 3, Washington, DC, 2018.

- Karri, N. and Mo, C., “Reliable Thermoelectric Module Design under Opposing Requirements from Structural and Thermoelectric Considerations,” 2017 International Conference on Thermoelectrics (ICT), Pasadena, CA, July 31– August 3, 2017.
- Almahfoodh, A., Mo, C., and Hohimer, C., “Wind Energy Harvesting for Temperature Monitoring in an Industrial Cooling Unit,” ASME Early Career Technical Conference (ECTC), Richland, WA, May 2, 2015.
- Alshams, Z., Mo, C., and Hohimer, C., “Piezoelectric Wind Energy Harvester for Low-Power Sensors to Monitor Industrial Exhaust Fan,” ASME Early Career Technical Conference (ECTC), Richland, WA, May 2, 2015.
- Naji, S., Hohimer, C., and Mo, C., “Energy harvesting for refrigeration system monitoring in a food industry,” ASME District D Early Career Technical Conference (ECTC), Richland, WA, 3 May, 2014.
- Davidson, J. and Mo, C., “Energy Harvesting with piezoelectric circular membrane under pressure loading,” ASME District D Early Career Technical Conference (ECTC), Richland, WA, 3 May, 2014.
- Bankston, S. and Mo, C., “Geometry modification of flywheels and its effect on energy storage,” ASME District D Early Career Technical Conference (ECTC), Richland, WA, 3 May, 2014.
- David, H, Mo, C., Kinsel, M., and Kinsel, W., “Monitoring and Characterization of Cattle Motion using 3-axis Acceleration and GPS Data,” ASME District D Early Career Technical Conference (ECTC), Lacey, WA, 20 April, 2013.
- Davidson, J. and Mo, C., “Unimorph Piezoelectric Energy Harvesters with Frequency Tuning,” ASME District D Early Career Technical Conference (ECTC), Lacey, WA, 20 April, 2013.

**Presentation including Poster:**

- Alhamid, J., Mo, C., Zhang, X., Wang, P., Whiting, M., and Zhang, Q., “Cellulose Nanocrystals (CNC) for Preventing Cold Damage in Tree Fruit and Grapes,” WSU SHOWCASE 2018, Pullman, WA, 2018.
- Mo, C., Zhang, X., Zhang, Q., and Whiting, M., “Spray-on Nanocrystalline Cellulose (NCC) Coating for Frost Damage Protection of Tree Fruit,” 2016 Research News Flash, 112<sup>th</sup> Annual Meeting & NW Hort Expo, Wenatchee, WA, Dec 5-7, 2016.
- Silwal, A., Davidson, J., Karkee, M., Mo, C., Zhang, Q., “Robotic Apple Harvesting. Poster Presented at 2016 Precision Farming Expo, January 7-8, Kennewick, WA, 2016.
- Silwal, A., Davidson, J., Karkee, M., Mo, C., and Zhang, Q., “Robotic Apple Harvesting,” Poster Presented at 2015 Annual Meeting of Washington State Tree Fruit Association, December 8, Yakima, WA, 2015.

**Memberships in Professional Societies:**

ASME, IEEE and SAE

**Professional Services:**

Editorial Board Member for

Journal of Current Smart Materials, Bentham Science Publishers.

Proposal reviewer for

DOE EERE (Energy Efficiency and Renewable Energy) SBIR-STTR

NSF SSS

Chair and Host for

ASME District D Early Career and Technical Conference (ECTC) 2014 (May 3, 2014 at WSU Tri-Cities)

Session co-organizer for

ASME SMASIS2012 conference in the area of energy harvesting with piezoelectric materials

Reviewer for

ASME Journal of Vibration and Acoustics

ASME Journal of Dynamics Systems, Measurement and Control

Computers and Electronics in Agriculture

IEEE Journal of Microelectromechanical Systems

IEEE Trans. on Ultrasonics, Ferroelectrics, and Frequency Control

Journal of Intelligent Material Systems and Structures

Journal of Micromechanics and Microengineering



Proceedings of ASME IMECE  
Proceedings of the IMechE Part C, Journal of Mechanical Engineering Science  
Proceedings of the IMechE Part L, Journal of Materials: Design and Application  
Sensors (MDPI)  
Sensors and Actuators: A. Physical  
Smart Materials and Structures

### **Synergistic Activities:**

- Served as a co-chair for 2014 ASME District D Early Career Technical Conference (ECTC) held at Washington State University Tri-Cities, Richland, WA.
- Established Dynamics and Controls Lab with new equipment, devoted to energy harvesting systems, vibration control, and fruit picking robot research, which has involved many graduate and undergraduate students
- Established two senior undergraduate courses in Mechatronics and Control Systems including hands-on lab works at WSU Tri-Cities.
- Actively participated in FIRST Lego League (FLL) competition in Tri-Cities as a judge
- Actively participated in American Society of Mechanical Engineers (ASME) local section (Columbia Basin Section) as student advisor and faculty advisor for WSU Tri-Cities student section

### **Course Taught:**

#### Undergraduate Courses:

- ME 220 Materials Lab, ME 306 Thermal and Fluid Lab, ME 348 Dynamics Systems, ME 401 Mechatronics, ME 481 Control Systems

#### Graduate Courses:

- ME 540 Advanced Dynamics of Physical Systems, ME 581 Control Systems

### **Recent Collaborators and Other Affiliations:**

#### Collaborators and Co-Editors (Total: 23)

Ameli, A. (WSU Tri-Cities), Crawford, G. (Atkins), Denslow, K. (PNNL), Fifield, Leo (PNNL), Glass, B. (PNNL), Han, F. (John Deere), Hossain, A. (WSU Tri-Cities), Hudson, S. (WSU Tri-Cities), Iannelli, J. (WSU Tri-Cities), Kantor, G. (CMU), Karkee, M. (CPAAS, WSU Prosser), Kayle, B. (WRPS), Kessler, M. (North Dakota State University), Kelly, Steven (WRPS), Lewis, K. (WSU Extension), Miller, J. (WSU Tri-Cities), Osman, M. (WSU Tri-Cities), Saad, M. (WSU Tri-Cities), Taylor, M. (WSU Pullman), Vitali, J. (WRPS), Wellman, D. (PNNL), Whiting, M. (CPAAS, WSU Prosser), Zhang, Q. (CPAAS, WSU Prosser), Zhang, X. (BSEL, WSU Tri-Cities)

#### Graduate Advisors and Postdoctoral Sponsors:

The late Dr. William Patten, University of Oklahoma

#### Graduate Students

##### MS:

Advised: Ali Alimahfoodh (Tyson Foods, Inc.), Zainab Alshams (N/A), Daniel Arnold (Boise Cascade Paper Mill), Aditya Bagade (Bechtel), David Bankston (Bechtel), Shenel Bankston (Bechtel), Joseph Davidson (Oregon State University), David Hanson (Framatome), Carolyn John (Bend Research, OR), Sami Naji (Boeing), Joshua Snyder (WRPS), and Wade Wilcox (Bechtel): Total: 12.

Advising: Seth Farrar, Eric Loeffler, Robert Lutes, Andrew Porter, Jacob Ulbricht, and Jonathon Walker: Total: 6.

##### PhD:

Advised: Olaniyi Balogun (LM, TN), Joseph Davidson (Assistant Professor, Oregon State University), Cameron Hohimer (Postdoctoral Research Fellow at Harvard), and Naveen Karri (PNNL): Total: 4.

Advising: Jassim Alhamid, Jaime Lue, Ammar Mohammed, and Gabe Ortega: Total: 4.

Publications and Citations on Google Scholar

<https://scholar.google.com/citations?user=CSH2t2kAAAAJ&hl=en>

Publications and Citations on ResearchGate

[https://www.researchgate.net/profile/Changki\\_Mo](https://www.researchgate.net/profile/Changki_Mo)