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Fields of Specialization

Microcantilever-Based Chemical/Biological Sensors
Micro/Nanostructural Analysis for Mass Detection and Inertial Imaging
Mechanics of MEMS/NEMS Devices
Vibration Energy Harvesting
Elasticity
Solid/Structural Mechanics
Mechanics of Electronic Packaging

Birth Date September 25, 1958

Education

1976-1980 The Pennsylvania State University, University Park, PA
1981-1985 University of Illinois at Urbana-Champaign, Urbana-Champaign, IL

Degrees

B.S. 1980 Civil Engineering, The Pennsylvania State University, *Summa Cum Laude*
M.S. 1982 Civil Engineering, University of Illinois at Urbana-Champaign
Ph.D. 1985 Civil Engineering, University of Illinois at Urbana-Champaign

Employment History

1998 - Present Professor of Civil Engineering, Marquette University
2001 – Present Director of Graduate Studies, Dept. of Civil, Construction and Environmental Engineering, Marquette University
2002 - Present Professor of Mechanical Engineering (Joint Appointment), Marquette University
2004 - Present Professor of Electrical Engineering (Joint Appointment), Marquette University
2002 - 2003 Interim Chair, Department of Civil and Environmental Engineering
1991 - 1998 Associate Professor of Civil Engineering, Marquette University
1992 - 1993 Sabbatical Leave: Consultant, Rockwell Science Center, Rockwell International Corporation, Thousand Oaks, CA, January-August, 1993.
1985 - 1991 Assistant Professor of Civil Engineering, Marquette University
1981 - 1985 Civil Engineering RA, University of Illinois at Urbana-Champaign
Summer 1980 Bridge Inspector/Analyst, Lee-Simpson Associates, DuBois, PA
Spring 1980 Civil Engineering Teaching Assistant, The Pennsylvania State University

I. SCHOLARLY WORK

A. Books

- 2015 Brand, O., Dufour, I., Heinrich, S.M., and Josse, F. (eds.), *Resonant MEMS. Fundamentals, Implementation and Application (Advanced Micro and Nanosystems, Vol. 11)*, Wiley-VCH Verlag, Weinheim, Germany, ISBN: 978-3-527-3345-9, 2015, 483 pp.

B. Book Chapters

- 2015 Heinrich, S.M., and Dufour, I., "Fundamental Theory of Resonant MEMS Devices," Ch. 1 of *Resonant MEMS. Fundamentals, Implementation and Application (Advanced Micro and Nanosystems, Vol. 11)*, Brand et al. (eds.), Wiley-VCH Verlag, ISBN 978-3-527-3345-9, 2015, pp. 3-28.
- 1994 Heinrich, S.M., "Prediction of Solder Joint Geometry," Ch. 5 of *Mechanics of Solder Alloy Interconnects*, Frear et al. (eds.), Van Nostrand Reinhold, 1994, pp. 158-198.

C. Book Articles

- 2018 Heinrich, S.M., "Micro Scale Resonators," Benaroya, H., Nagurka, M., and Han, S., *Mechanical Vibration: Analysis, Uncertainties, and Control*, 4th ed., CRC Press, 2018, pp. 56-57.

D. Refereed Journal Publications

In Progress

Heinrich, S.M., and Dufour, I., "On the Effects of an Eccentric End Mass on a Cantilever MEMS Resonator for Sensing and Energy Harvesting -- Parametric Studies and Validation," (working title).

Heinrich, S.M., and Dufour, I., "Exact Eigensolution for the Vibration of a Tapered Bernoulli-Euler Cantilever with Eccentric End Mass of Arbitrary Shape," (working title).

Heinrich, S.M., and Dufour, I., "Influence of an Adsorbate's Rotational Adherence on the Resonant Response of Micro/Nanobeam-Based Mass Sensors," (working title).

Under Review

None

In Print or Accepted

- 2019 Beardslee, L.A., Carron, C., Demirci, K.S., Lehman, J., Schwartz, S., Dufour, I., Heinrich, S.M., Josse, F., and Brand, O., "In-Plane Vibration of Hammerhead Resonators for Chemical Sensing Applications," *ACS Sensors*, American Chemical Society, publication date: December 16, 2019, <https://doi.org/10.1021/acssensors.9b01651>, 10 pp. (article) + 6 pp. (supplementary materials).

- 2015 Heinrich, S.M., and Dufour, I., “Toward Higher-Order Mass Detection: Influence of an Adsorbate’s Rotational Inertia and Eccentricity on the Resonant Response of a Bernoulli-Euler Cantilever Beam,” *Sensors*, Vol. 15, No. 11, Feature Paper in Special Issue: Nanomechanics for Sensing and Spectrometry, DOI:10.3390/s151129209, open-access download at <http://www.mdpi.com/1424-8220/15/11/29209>, 2015, pp. 29209-29232.
- 2015 Sotoudegan, M., Heinrich, S.M., Josse, F., Nigro, N.J., Dufour, I., and Brand, O., “Analytical Modeling of a Novel High-Q Disk Resonator for Liquid-Phase Applications,” *Journal of Microelectromechanical Systems*, Vol. 24, No. 1 (Feb.), 2015, pp. 38-49; available online Nov. 2014, DOI:10.1109/JMEMS.2014.2365719. (Highlighted as one of three “JMEMS RightNow” papers in this issue by the JMEMS Editor-in-Chief due to its “excellent quality.”)
- 2015 Schultz, J.A., Heinrich, S.M., Josse, F., Dufour, I., Nigro, N.J., Beardslee, L.A., and Brand, O., “Lateral-Mode Vibration of Microcantilever-based Sensors in Viscous Fluids Using Timoshenko Beam Theory,” *Journal of Microelectromechanical Systems*, Vol. 24, No. 4 (Aug.), DOI:10.1109/JMEMS.2014.2354596, 2015, pp. 848-860.
- 2015 Boudjiet, T., Bertrand, J., Mathieu, F., Nicu, L., Mazenq, L., Leïchlé, T., Heinrich, S.M., Pellet, C., and Dufour, I., “Geometry Optimization of Uncoated Silicon Microcantilever-based Gas Density Sensors,” *Sensors and Actuators B: Chemical*, available online Nov. 21, 2014, Vol. 208, 2015, pp. 600-607.
- 2014 Dufour, I., Lemaire, E., Caillard, B., Debeda, H., Lucat, C., Heinrich, S.M., Josse, F., and Brand, O., “Effect of Hydrodynamic Force on Microcantilever Vibrations: Applications to Liquid-Phase Chemical Sensing,” *Sensors and Actuators B: Chemical*, Vol. 192, 2014, pp. 664-672; available online Nov. 12, 2013, 13 pages.
- 2014 Thuau, D., Ayela, C., Lemaire, E., Heinrich, S., Poulin, P., and Dufour, I., “Advanced Thermo-Mechanical Characterization of Organic Materials by Piezoresistive Organic Resonators,” *Materials Horizons*, DOI: 10.1039/C4MH00165F, 2014, 8 pages.
- 2013 Choren, J.A., Heinrich, S.M., and Silver-Thorn, M.B., “Review: Young’s Modulus and Volume Porosity Relationships for Additive Manufacturing Applications,” *Journal of Materials Science*, Vol. 48, Issue 15, August 2013 (DOI 10.1007/s10853-013-7237-5), pp. 5103-5112.
- 2013 Schultz, J.A., Heinrich, S.M., Josse, F., Nigro, N.J., Dufour, I., Beardslee, L.A., and Brand, O., “Timoshenko Beam Effects in Lateral-Mode Microcantilever-Based Sensors in Liquids,” *Micro and Nano Letters*, The Institution of Engineering and Technology, available online Nov. 7, 2013 (doi: 10.1049/mnl.2013.0395), 4 pp.
- 2012 Cox, R., Josse, F., Heinrich, S.M., Brand, O., and Dufour, I., “Characteristics of Laterally Vibrating Resonant Microcantilevers in Viscous Liquid Media,” *Journal of Applied Physics*, Vol. 111, Paper No. 014907, 2012, 14 pp. (Also selected for publication in the *Virtual Journal of Nanoscale Science & Technology*, Vol. 25, No. 4, January 23, 2012, <http://www.vjnano.org>.)

- 2012 Beardslee, L.A., Josse, F., Heinrich, S.M., Dufour, I., and Brand, O., "Geometrical Considerations for the Design of Liquid-Phase Biochemical Sensors Using a Cantilever's Fundamental In-Plane Mode," *Sensors and Actuators B: Chemical*, Vol. 164, No. 1, March 2012, pp. 7-14.
- 2012 Dufour, I., Josse, F., Heinrich, S.M., Lucat, C., Ayela, C., Ménil, F., and Brand, O., "Unconventional Uses of Microcantilevers as Chemical Sensors in Gas and Liquid Media," *Sensors and Actuators B: Chemical*, Vol. 170, 2012, pp. 115-121.
- 2011 Ayéla, C., Heinrich, S.M., Josse, F., and Dufour, I., "Resonant Microcantilevers for the Determination of the Loss Modulus of Thin Polymer Films," *Journal of Microelectromechanical Systems*, Vol. 20, 2011, pp. 788-790.
- 2010 Beardslee, L., Addous, A., Heinrich, S., Josse, F., Dufour, I., and Brand, O., "Thermal Excitation and Piezoresistive Detection of Cantilever In-Plane Resonance Modes for Sensing Applications," *Journal of Microelectromechanical Systems*, Vol. 19, No. 4, 2010, pp. 1015-1017.
- 2010 Beardslee, L.A., Demirci, K.S., Luzinova, Y., Mizaikoff, B., Heinrich, S.M., Josse, F., and Brand, O., "Liquid-Phase Chemical Sensing Using Lateral Mode Resonant Cantilevers," *Analytical Chemistry*, Vol. 82, 2010, pp. 7542-7549.
- 2009 Wenzel, M.J., Josse, F., and Heinrich, S.M., "Deflection of a Viscoelastic Cantilever under a Uniform Surface Stress: Applications to Static-Mode Microcantilever Sensors Undergoing Adsorption," *Journal of Applied Physics*, Vol. 105, 2009, Paper No. 064903, 10 pp.
- 2009 Heinrich, S.M., Wenzel, M.J., Josse, F., and Dufour, I., "An Analytical Model for Transient Deformation of Viscoelastically Coated Beams: Applications to Static-Mode Microcantilever Chemical Sensors," *Journal of Applied Physics*, Vol. 105, 2009, Paper No. 124903, 14 pp. (Also selected for publication in the *Virtual Journal of Nanoscale Science & Technology*, June 29, 2009, <http://www.vjnano.org> .)
- 2008 Vančura, C., Dufour, I., Heinrich, S., Josse, F., and Hierlemann, A., "Analysis of Resonating Microcantilevers Operating in a Viscous Liquid Environment," *Sensors and Actuators A*, Vol. 141, No. 1, January 2008, pp. 43-51.
- 2008 Wenzel, M.J., Josse, F., Heinrich, S.M., Yaz, E., and Datskos, P.G., "Sorption-Induced Static Bending of Microcantilevers Coated with Viscoelastic Material," *Journal of Applied Physics*, Vol. 103, Paper No. 064913, 2008, 11 pp.
- 2008 Cox, R., Josse, F., Wenzel, M., Heinrich, S.M., and Dufour, I., "A Generalized Model of Resonant Polymer-Coated Microcantilevers in Viscous Liquid Media," *Analytical Chemistry*, Vol. 80, 2008, pp. 5760-5767.
- 2007 Dufour, I., Lochon, F., Heinrich, S.M., Josse, F., and Rebière, D., "Effect of Coating Viscoelasticity on Quality Factor and Limit of Detection of Microcantilever Chemical Sensors," *IEEE Sensors Journal*, Vol. 7, No. 2, February 2007, pp. 230-236.

- 2007 Dufour, I., Heinrich, S.M., and Josse, F., "Theoretical Analysis of Strong-axis Bending Mode Vibrations for Resonant Microcantilever (Bio)chemical Sensors in Gas or Liquid Phase," *Journal of Microelectromechanical Systems*, IEEE/ASME, Vol. 16, No. 1, February 2007, pp. 44-49.
- 2006 Sampath, U., Heinrich, S.M., Josse, F., Lochon, F., Dufour, I., and Rebière, D., "Study of Viscoelastic Effect on the Frequency Shift of Microcantilever Chemical Sensors," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, Vol. 53, No. 11, November 2006, pp. 2166-2173.
- 2004 Shakya, S., Heinrich, S.M., and Lee, P.S., "An Improved Analytical Model for Time-Dependent Shearing Deformation in Area-Array Interconnects," *Journal of Electronic Packaging*, ASME, Vol. 126, No. 1, 2004, pp. 74-81.
- 2004 Liang, J., Downes, S., Dariavich, N., Shangguan, D., and Heinrich, S.M., "Effects of Load and Thermal Conditions on Pb-Free Solder Joint Reliability," *Journal of Electronic Materials*, Vol. 33, No. 12, December 2004, pp. 1507-1515.
- 2000 Heinrich, S.M., Shakya, S., Liang, J., and Lee, P.S., "An Analytical Model for Time-Dependent Shearing Deformation in Area-Array Interconnects," *Journal of Electronic Packaging*, ASME, Vol. 122, No. 4, 2000, pp. 328-334.
- 1999 Swanson, J.A., Heinrich, S.M., and Lee, P.S., "An Elastoplastic Beam Model for Column-Grid-Array Solder Interconnects," *Journal of Electronic Packaging*, ASME, Vol. 121, No. 4, 1999, pp. 303-311.
- 1998 Heinrich, S.M., Shakya, S., and Lee, P.S., "Effect of Component Heterogeneity on Global CTE Mismatch Displacement in Areal-Array Solder Interconnects," *Journal of Electronic Packaging*, ASME, Vol. 120, No. 1, 1998, pp. 12-17.
- 1998 Heinrich, S.M., Shakya, S., and Lee, P.S., "Shearing Deformation in Partial Areal Arrays: Analytical Results," *Journal of Electronic Packaging*, ASME, Vol. 120, No. 1, 1998, pp. 18-23.
- 1998 Shia, C.-Y., Stango, R.J., and Heinrich, S.M., "Analysis of Contact Mechanics for a Circular Filamentary Brush/Workpart System," *Journal of Manufacturing Science and Engineering*, ASME, Vol. 120, No. 4, 1998, pp. 715-721.
- 1997 Elkouh, A.F., Ramasubramanian, N., Hsu, T.F., Nigro, N.J., Heinrich, S.M., and Lee, P.S., "Prediction of Solder Geometry for an Axisymmetric Through-Hole Joint," *Journal of Electronic Packaging*, ASME, Vol. 119, No. 4, 1997, pp. 268-274.
- 1997 Heinrich, S.M., Shakya, S., and Lee, P.S., "Improved Analytical Estimate of Global CTE Mismatch Displacement in Areal-Array Solder Joints," *Journal of Electronic Packaging*, ASME, Vol. 119, No. 4, 1997, pp. 218-227.
- 1996 Heinrich, S.M., Shakya, S., Wang, Y., Lee, P.S., and Schroeder, S.A., "Improved Yield and Performance of Ball-Grid Array Packages: Design and Processing Guidelines for Uniform and Non-Uniform Arrays," *Trans., Components, Packaging & Manufacturing*

Technology Society, Series B, IEEE, Vol. 19, No. 2, May 1996, pp. 310-319.

- 1996 Nigro, N.J., Zhou, F.J., Elkouh, A.F., Fournelle, R.A., Heinrich, S.M., and Lee, P.S., "Parametric Finite Element Method for Predicting Shapes of Three-Dimensional Solder Joints," *Journal of Electronic Packaging*, ASME, Vol. 118, No. 3, September 1996, pp. 142-147.
- 1996 Heinrich, S.M., Schaefer, M., Schroeder, S.A., and Lee, P.S., "Prediction of Solder Joint Geometries in Array-Type Interconnects," *Journal of Electronic Packaging*, ASME, Vol. 118, No. 3, September 1996, pp. 114-121.
- 1996 Heinrich, S.M., "Membrane Analogy for Saint-Venant Torsion: New Results," *Journal of Engineering Mechanics*, ASCE, Vol. 122, No. 11, November 1996, pp. 1110-1112.
- 1995 Nambisan, B.U., Heinrich, S.M., Fournelle, R.A., Elkouh, A.F., Nigro, N.J., and Lee, P.S., "An Approximate Model for Predicting the Size and Shape of Wave-Soldered Surface-Mount Solder Joints," *Journal of Electronics Manufacturing*, Vol. 5, No. 3, September 1995, pp. 217-233.
- 1994 Karshenas, S., and Heinrich, S.M., "Dynamic Modeling of Slab Formwork During Concrete Placement," *Journal of Structural Engineering*, ASCE, Vol. 120, No. 7, July 1994, pp. 2199-2217.
- 1993 Nigro, N.J., Heinrich, S.M., Elkouh, A.F., Zou, X., Fournelle, R.A., and Lee, P.S., "Finite Element Method for Predicting Equilibrium Shapes of Solder Joints," *Journal of Electronic Packaging*, ASME, Vol. 115, No. 2, 1993, pp. 141-146.
- 1993 Heinrich, S.M., Liedtke, P.E., Nigro, N.J., Elkouh, A.F., and Lee, P.S., "Effect of Chip and Pad Geometry on Solder Joint Formation in SMT," *Journal of Electronic Packaging*, ASME, Vol. 115, No. 4, 1993, pp. 433-439.
- 1991 Heinrich, S.M., Stango, R.J., and Shia, C.-Y., "Effect of Workpart Curvature on the Stiffness Properties of Circular Filamentary Brushes," *Journal of Engineering for Industry*, ASME, Vol. 113, No. 3, 1991, pp. 276-282.
- 1991 Heinrich, S.M., "Torsional Stress Interference in Transverse Isotropy," *Journal of Engineering Mechanics*, ASCE, Vol. 117, No. 3, 1991, pp. 478-497.
- 1990 Heinrich, S.M., Elkouh, A.F., Nigro, N.J., and Lee, P.S., "Solder Joint Formation in Surface Mount Technology -- Part I: Analysis," *Journal of Electronic Packaging*, ASME, Vol. 112, No. 3, 1990, pp. 210-218.
- 1990 Heinrich, S.M., Nigro, N.J., Elkouh, A.F., and Lee, P.S., "Solder Joint Formation in Surface Mount Technology -- Part II: Design," *Journal of Electronic Packaging*, ASME, Vol. 112, No. 3, 1990, pp. 219-222.
- 1989 Heinrich, S.M., and Wang, J.-Y., "Stress Interference in a Transversely Isotropic Body Under Axisymmetric Loading," *Journal of Engineering Mechanics*, ASCE, Vol. 115, 1989, pp. 555-577.

- 1989 Stango, R.J., Heinrich, S.M., and Shia, C.-Y., “Analysis of Constrained Filament Deformation and Stiffness Properties of Brushes,” *Journal of Engineering for Industry*, ASME, Vol. 111, 1989, pp. 238-243.

E. Refereed Conference Publications

- 2016 Heinrich, S.M., Ducrot, P.-H., Ayela, C., Zhang, H., and Dufour, I., “On the Role of Adsorbate Position, Geometry, and Binding Characteristics on the Multi-Modal Response of Cantilever-Based Resonators for Higher-Order Discrete-Mass Detection,” *Proceedings and Poster Session, International Workshop on Nanomechanical Sensing (NMC 2016)*, Delft, The Netherlands, June 22-24, 2016, 2 pp.
- 2016 Getz, P., Carron, C., Heinrich, S.M., Josse, F., and Brand, O., “Transient Analysis of Analyte Desorption Due to Thermal Cycling with Varying Pulse Duration,” *Proceedings, International Workshop on Nanomechanical Sensing (NMC 2016)*, Delft, The Netherlands, June 22-24, 2016, 2 pp.
- 2015 Carron, C., Getz, P., Heinrich, S.M., Josse, F., and Brand, O., “Cantilever-based Resonant Microsensors with Integrated Temperature Modulation for Transient Chemical Analysis,” *Proc., Transducers 2015, 18th International Conference on Solid-State Sensors, Actuators and Microsystems*, Anchorage, AK, June 21-25, 2015, pp. 1511-1514.
- 2014 Heinrich, S.M., and Dufour, I., “End Mass Effects on the Frequency Response of Cantilevers: Analytical Results,” *Proceedings and Poster Session, International Workshop on Nanomechanical Sensing (NMC 2014)*, Madrid, Spain, April 30 – May 2, 2014, pp. 200-201.
- 2014 Sotoudegan, M., Heinrich, S.M., Josse, F., Dufour, I., and Brand, O., “A Multi-Modal Continuous-Systems Model of a Novel High-Q Disk Resonator in a Viscous Liquid,” *Proceedings, International Workshop on Nanomechanical Sensing (NMC 2014)*, Madrid, Spain, April 30 – May 2, 2014, pp. 98-99.
- 2014 Thuau, D., Ayela, C., Lemaire, E., Heinrich, S., Poulin, P., and Dufour, I., “Development of Low Cost Piezoresistive Organic Cantilever Resonator,” *Proceedings and Poster Session, International Workshop on Nanomechanical Sensing (NMC 2014)*, Madrid, Spain, April 30 – May 2, 2014, 2 pp.
- 2014 Zhang, J., Josse, F., Heinrich, S., Nigro, N., and Brand, O., “Laterally Vibrating Symmetric Hammerhead Microcantilevers in Viscous Liquids,” *Proceedings and Poster Session, International Workshop on Nanomechanical Sensing (NMC 2014)*, Madrid, Spain, April 30 – May 2, 2014, pp. 204-205.
- 2014 Carron, C., Getz, P., Su, J.-J., Beardslee, L.A., Heinrich, S.M., Josse, F., and Brand, O., “Cantilever-based Resonant Microsensor with Integrated Temperature Modulation,” *Proc., Hilton Head 2014: Solid-State Sensors, Actuators and Microsystems Workshop*, June 8-12, 2014, pp. 363-366.

- 2014 Heinrich, S.M., Boudjiet, M.T., Thuau, D., Poulin, P., Ayéla, C., and Dufour, I., “Development of Analytical Models of T- and U-Shaped Cantilever-Based MEMS Devices for Sensing and Energy Harvesting Applications,” *Proc., IEEE Sensors 2014 Conference*, Valencia, Spain, November 2-5, 2014, DOI: 10.1109/ICSENS.2014.-6985336, pp. 1648-1651.
- 2013 Schultz, J., Heinrich, S.M., Josse, F., Dufour, I., Nigro, N.J., Beardslee, L.A., and Brand, O., “Timoshenko Beam Model for Lateral Vibration of Liquid-Phase Microcantilever-based Sensors,” *Proc., 14th International Symposium on MEMS and Nanotechnology, SEM 2013 Annual Conference & Exposition on Experimental and Applied Mechanics*, Lombard, IL, June 3-6, 2013, Paper 155, 10 pp.; *MEMS and Nanotechnology, Volume 5, Conference Proceedings of the Society for Experimental Mechanics Series*, 2014, pp 115-124.
- 2013 Schultz, J.A., Heinrich, S.M., Josse, F., Nigro, N.J., Dufour, I., Beardslee, L.A., and Brand, O., “Timoshenko Beam Effects in Lateral-Mode Microcantilever-Based Sensors in Liquids,” *Proceedings and Poster Session, International Workshop on Nanomechanical Sensing (NMC 2013)*, Stanford, CA, May 1-3, 2013, pp. 143-144.
- 2013 Sotoudegan, M., Heinrich, S.M., Josse, F., Nigro, N.J., Dufour, I., and Brand, O., “A Simple Model for the In-Plane Rotational Response of a Disk Resonator in Liquid: Resonant Frequency, Quality Factor, and Optimal Geometry,” *Proceedings and Poster Session, International Workshop on Nanomechanical Sensing (NMC 2013)*, Stanford, CA, May 1-3, 2013, pp. 107-108.
- 2013 Dufour, I., Lemaire, E., Caillard, B., Debeda, H., Lucat, C., Heinrich, S.M., Josse, F., and Brand, O., “Influence of Fluid-Structure Interaction on Microcantilever Vibrations: Applications to Rheological Fluid Measurement and Chemical Detection,” *Proc., SPIE Microtechnologies*, Grenoble, France, Apr. 24-26, 2013, 10 pp. Smart Sensors, Actuators, and MEMS VI, edited by Ulrich Schmid, José Luis Sánchez de Rojas Aldavero, Monika Leester-Schaedel, Proc. of SPIE Vol. 8763, 87630K , © 2013 SPIE, CCC code: 0277-786X/13/\$18 (doi: 10.1117/12.2018327).
- 2013 Zhang, J., Josse, F., Heinrich, S.M., Nigro, N., Dufour, I., and Brand, O., “Resonant Characteristics of Rectangular Hammerhead Microcantilevers Vibrating Laterally in Viscous Liquid Media,” Manuscript ID 1712, *Proc., IEEE International Frequency Control Symposium*, Prague, Czech Republic, July 21-25, 2013, 4 pp.
- 2013 Carron, C., Getz, P., Su, J.-J., Gottfried, D., Heinrich, S.M., Josse, F., and Brand, O., “Cantilever-Based Resonant Gas Sensors with Integrated Recesses for Localized Sensing Layer Deposition,” *Proc., IEEE Sensors 2013 Conference*, Baltimore, MD, November 4-6, 2013, pp. 826-829.
- 2013 Sotoudegan, M., Heinrich, S.M., Josse, F., Nigro, N.J., Dufour, I., and Brand, O., “Effect of Design Parameters on the Rotational Response of a Novel Disk Resonator for Liquid-Phase Sensing: Analytical Results,” *Proc., IEEE Sensors 2013 Conference*, Baltimore, MD, November 4-6, 2013, pp. 1164-1167.

- 2012 Cai, T., Josse, F., Heinrich, S.M., Nigro, N., Dufour, I., and Brand, O., "Resonant Characteristics of Rectangular Microcantilevers Vibrating Torsionally in Viscous Liquid Media," *Proc., IEEE International Frequency Control Symposium*, Baltimore, MD, May 21-24, 2012, pp. 807-812.
- 2012 Beardslee, L.A., Aravamudhan, S., Carron, C., Joseph, P., Heinrich, S.M., Josse, F., and Brand, O., "Detection of IgG using Cantilever-Type Resonant Microsensors Vibrating in In-Plane Flexural Mode," proceedings and poster presentation, *Proceedings, IEEE Sensors 2012 Conference*, Taipei, Taiwan, October 28-31, 2012, 4 pp.
- 2011 Cox, R., Zhang, J., Beardslee, L., Josse, F., Heinrich, S.M., Brand, O., and Dufour, I., "Damping and Mass Sensitivity of Laterally Vibrating Resonant Microcantilevers in Viscous Liquid Media," *Proc., IEEE International Frequency Control Symposium*, San Francisco, CA, May 1-5, 2011, 6 pp.
- 2011 Fadel-Taris, L., Ayela, C., Josse, F., Heinrich, S.M., Brand, O., Saya, D., and Dufour, I., "Influence of Non-Ideal Clamping in Microcantilever Resonant Frequency Estimation," *Proc., IEEE International Frequency Control Symposium*, San Francisco, CA, May 1-5, 2011, 5 pp.
- 2011 Beardslee, L.A., Truax, S., Su, J.-J., Heinrich, S.M., Josse, F., Brand, O., "On the Relative Sensitivity of Mass-Sensitive Chemical Microsensors," *Proc., Transducers '11, 16th International Conference on Solid-State Sensors, Actuators and Microsystems*, Beijing, China, June 5-9, 2011, 5 pp.
- 2010 Beardslee, L.A., Demirci, K.S., Luzinova, Y., Su, J.J., Mizaikoff, B., Heinrich, S., Josse, F., and Brand, O., "In-Plane Mode Resonant Cantilevers as Liquid-Phase Chemical Sensors with PPB Range Limits of Detection," *Proc., Hilton Head Workshop 2010: A Solid-State Sensors, Actuators and Microsystems Workshop*, Hilton Head, SC, June 6-10, 2010, 4 pp.
- 2010 Heinrich, S.M., Maharjan, R., Beardslee, L., Brand, O., Dufour, I., and Josse, F., "An Analytical Model for In-Plane Flexural Vibrations of Thin Cantilever-Based Sensors in Viscous Fluids: Applications to Chemical Sensing in Liquids," *Proceedings, International Workshop on Nanomechanical Cantilever Sensors*, Banff, Canada, May 26-28, 2010, 2 pp.
- 2010 Ayela, C., Heinrich, S., Josse, F., and Dufour, I., "Analytical and Finite Element Modeling of Transient Deformation of Viscoelastically Coated Cantilevers: Static-mode Response of Chemical Sensors," Proceedings and Poster Session, *International Workshop on Nanomechanical Cantilever Sensors*, Banff, Canada, May 26-28, 2010, 2 pp.
- 2010 Cox, R., Josse, F., Heinrich, S.M., Dufour, I., and Brand, O., "Resonant Microcantilevers Vibrating Laterally in Viscous Liquid Media," *Proceedings, IEEE International Frequency Control Symposium*, Newport Beach, CA, June 2-4, 2010, 6 pp.
- 2010 Beardslee, L.A., Addous, A.M., Demirci, K.S., Heinrich, S.M., Josse, F., and Brand, O., "Geometrical Optimization of Resonant Cantilevers Vibrating in In-Plane Bending Mode," *Proceedings, IEEE Sensors 2010 Conference*, Waikoloa, Hawaii, November 1-4, 2010, pp. 1996-1999.

- 2010 Heinrich, S.M., Maharjan, R., Dufour, I., Josse, F., Beardslee, L.A., and Brand, O., "An Analytical Model of a Thermally Excited Microcantilever Vibrating Laterally in a Viscous Fluid," Proceedings and Poster Session, *IEEE Sensors 2010 Conference*, Waikoloa, Hawaii, November 1-4, 2010, pp. 1399-1404.
- 2010 Dufour, I., Josse, F., Heinrich, S., Lucat, C., Ayela, C., Ménil, F., and Brand, O., "Unconventional Uses of Cantilevers for Chemical Sensing in Gas and Liquid Environments," *Procedia Engineering: Proc., XXIV Eurosensors*, Vol. 5, Sept. 5-8, 2010, Linz, Austria, pp. 1021-1026. (doi:10.1016/j.proeng.2010.09.283)
- 2008 Heinrich, S.M., Wenzel, M.J., Josse, F., and Dufour, I., "An Analytical Model for Transient Deformation of Static-Mode Microcantilever Sensors with Viscoelastic Coatings," *Proceedings, International Workshop on Nanomechanical Cantilever Sensors 2008*, Mainz, Germany, May 19-21, 2008, 2 pp.
- 2008 Wenzel, M.J., Josse, F., and Heinrich, S.M., "Modeling the Transient Response of Polymer-based Microcantilever Sensors Operating in Static-mode Undergoing Analyte Adsorption," *Proceedings, International Workshop on Nanomechanical Cantilever Sensors 2008*, Mainz, Germany, May 19-21, 2008, 2 pp.
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- 2007 Wenzel, M.J., Josse, F., Yaz, E., Heinrich, S.M., and Datskos, P.G., "Rapid Detection of Analytes with Improved Selectivity Using Coated Microcantilever Chemical Sensors and Estimation Theory," *Proceedings, IEEE Sensors Conference*, Atlanta, GA, October 28-31, 2007, pp 91-94.
- 2007 Wenzel, M.J., Josse, F., Heinrich, S.M., Yaz, E., and Datskos, P., "Analysis of Sorption-Induced Bending of Polymer-Coated Microcantilever Chemical Sensors," *Proc., International Workshop on Nanomechanical Sensors*, McGill University, Montréal, Canada, May 27-30, 2007, 2 pp.
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- 2005 Sampath, U., Heinrich, S.M., Josse, F., Lochon, F., Dufour, I., and Rebière, D., “Study of Viscoelastic Effect on the Frequency Shift of Microcantilever Chemical Sensors,” *Proceedings, 2005 IEEE International Frequency Control Symposium*, Vancouver, BC, Canada, Aug. 29-31, 2005, pp. 455-462.
- 2004 Dufour, I., Heinrich, S.M., and Josse, F., “Strong-Axis Bending Mode Vibrations for Resonant Microcantilever (Bio)Chemical Sensors in Gas or Liquid Phase,” *Proceedings, 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control 50th Anniversary Joint Conference*, Montreal, Canada, August 24-27, 2004, pp. 193-199.
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- 1999 Heinrich, S.M., Shakya, S., Liang, J., and Lee, P.S., “An Analytical Model for Time-Dependent Shearing Deformation in Area-Array Interconnects,” *Advances in Electronic Packaging 1999*, Vol. 1, ASME-EEP Vol. 26-1, 1999, pp. 43-53 (presented at *InterPACK '99*, Lahaina, HI, June 1999).
- 1997 Liang, J., Lee, P.S., Schroeder, S., and Heinrich, S., “An Integrated Fatigue Life Prediction Methodology for Optimum Design and Reliability Assessment of Solder Interconnections,” *Advances in Electronic Packaging 1997*, Vol. 2, ASME-EEP Vol. 19-2, 1997, pp. 1583-1592 (presented at *InterPACK '97*, Mauna Lani, HI, June 1997).
- 1997 Swanson, J.A., Heinrich, S.M., and Lee, P.S., “An Elastoplastic Beam Model for Column-Grid-Array Solder Interconnects,” *Design and Reliability of Solders and Solder Interconnections*, Mahidhara et al. (eds.); *Proceedings, 1997 TMS Annual Meeting*, Orlando, FL, February 1997, pp. 295-303.
- 1997 Shakya, S., Heinrich, S.M., Liang, J., and Lee, P.S., “Assessment of an Axisymmetric Analytical Model of a Square Areal-Array Assembly,” *Structural Analysis in Microelectronics and Fiber Optics -- 1997*, ASME-EEP Vol. 21, 1997, pp. 55-63; presented at the 1997 ASME International Mechanical Engineering Congress and Exposition, Dallas, TX, November 16-21, 1997.
- 1997 Heinrich, S.M., Shakya, S., and Lee, P.S., “Shearing Deformation in Partial Areal Arrays: Analytical Results,” *Application of Fracture Mechanics in Electronic Packaging*, ASME-AMD Vol. 222, ASME-EEP Vol. 20, 1997, pp. 51-59; presented at the 1997 ASME International Mechanical Engineering Congress and Exposition, Dallas, TX, November 16-21, 1997.

- 1996 Heinrich, S.M., Shakya, S., and Lee, P.S., "Improved Analytical Estimate of Global CTE Mismatch Displacement in Areal-Array Solder Joints," *Structural Analysis in Microelectronics and Fiber Optics 1996*, E. Suhir (ed.), ASME Publ. EEP-Vol. 16, 1996, pp. 155-167; presented at the ASME International Mechanical Engineering Congress and Exposition, Atlanta, GA, November 17-22, 1996.
- 1995 Nigro, N.J., Zhou, F.J., Elkouh, A.F., Fournelle, R.A., Heinrich, S.M., and Lee, P.S., "Parametric Finite Element Method for Predicting Shapes of Three-Dimensional Solder Joints," *Advances in Electronic Packaging: Toward Failure-Free, Low-Cost Packaging*, Vol. 1, ASME-EEP Vol. 10-1, 1995, pp. 435-449; presented at *InterPACK '95*, Lahaina, HI, March 1995.
- 1995 Heinrich, S.M., Wang, Y., Shakya, S., Schroeder, S.A., and Lee, P.S., "Selection of Design and Process Parameters for Non-Uniform Ball-Grid Arrays," *Advances in Electronic Packaging: Toward Failure-Free, Low-Cost Packaging*, Vol. 1, ASME-EEP Vol. 10-1, 1995, pp. 273-288; presented at *InterPACK '95*, Lahaina, HI, March 1995.
- 1995 Heinrich, S.M., Shakya, S., Wang, Y., Lee, P.S., and Schroeder, S.A., "Improved Yield and Performance of Ball-Grid Array Packages: Design and Processing Guidelines for Uniform and Non-Uniform Arrays," *Proc., 45th Electronic Components and Technology Conference*, Las Vegas, NV, May 1995, pp.793-803. (*Selected for "Outstanding Paper Award," 2nd Place, Poster Session.*)
- 1994 Heinrich, S.M., Schroeder, S.A., and Lee, P.S., "Prediction of Solder Joint Geometries in Multiple-Bump Arrays," *Mechanics and Materials for Electronic Packaging: Volume 1, Design and Process Issues in Electronic Packaging*, Chen, Nguyen, and Winterbottom (eds.), ASME AMD-Vol. 195, 1994, pp. 11-22; presented at the 1994 International Mechanical Engineering Congress and Exposition, Chicago, IL, November 1994.
- 1993 Nambisan, B.U., Heinrich, S.M., Fournelle, R.A., Elkouh, A.F., Nigro, N.J., and Lee, P.S., "An Appropriate Model for Predicting the Size and Shape of Wave-Soldered Surface-Mount Solder Joints," *Advances in Electronic Packaging 1993*, Vol. 2, ASME Publ. EEP-Vol. 4-2, 1993, pp. 1079-1093; presented at the 1993 ASME International Electronics Packaging Conference, Binghamton, NY., September 1993.
- 1993 Shia, C.-Y., Stango, R.J., and Heinrich, S.M., "Analysis of Contact Mechanics for Circular Filamentary Brush/Workpart System -- Part II: Solution Method and Numerical Study," *Proc., Symposium on Contact Problems and Surface Interactions in Manufacturing and Tribological Systems*, ASME Winter Annual Meeting, New Orleans, LA, 1993, pp. 181-190.
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- 1992 Karshenas, S., and Heinrich, S.M., "Concrete Impact Loads on Slab Formworks," *Proc.*,

ASCE Structures Congress, San Antonio, TX, April 1992, pp. 812-816.

- 1992 Heinrich, S.M., Liedtke, P.E., Nigro, N.J., Elkouh, A.F., and Lee, P.S., "Effect of Chip and Pad Geometry on Solder Joint Formation in SMT," *Proc., ASME/JSME Joint Conference on Electronic Packaging: Advances in Electronic Packaging 1992*, ASME-EEP Vol. 1-2, San Jose, CA, April 1992, pp. 603-611. (Selected as "Best Paper in Materials and Processes" and "Best ASME Conference Paper.")
- 1992 Wang, J.-Y., and Heinrich, S.M., "An Elasticity Solution for a Transversely Isotropic Material Containing a Spherical Shell Under Arbitrary Axisymmetric Loading," *Proc., Ninth ASCE Engineering Mechanics Specialty Conference*, L.D. Lutes and J.M. Niedzwecki (eds.), College Station, Texas, May 1992, pp. 1020-1023.
- 1991 Liedtke, P.E., Heinrich, S.M., Elkouh, A.F., Nigro, N.J., and Lee, P.S., "Prediction of Wave-Soldered Fillet Geometry in SMT Applications," *Manufacturing Processes and Materials Challenges in Microelectronic Packaging*, ASME Applied Mechanics Division, Vol. 131; Electrical and Electronic Packaging Division, Vol. 1; 1991, pp. 65-72; presented at the ASME Winter Annual Meeting, Atlanta, GA, December 1991.
- 1990 Yoganandan, N., Almusallam, A., Heinrich, S.M., and Myklebust, J.B., "Dynamic Forces in the Human Cervical Spine During an Automobile Rollover," *Mathematical Modelling in Science and Technology*, Vol. 2, 1990, 7 pp.; presented at the International Conference on Mathematical Modelling in Science and Technology, Indian Institute of Technology, Madras, India, 1988.
- 1989 Shia, C.-Y., Stango, R.J., and Heinrich, S.M., "Theoretical Analysis of Frictional Effect on Circular Brush Stiffness Properties," *Proceedings, SME Deburring and Surface Conditioning Conference*, Paper No. MR89-143, San Diego, CA, 1989, 18 pp.
- 1989 Heinrich, S.M., Stango, R.J., and Shia, C.-Y., "Effect of Workpart Curvature on the Stiffness Properties of Circular Filamentary Brushes," *Mechanics of Deburring and Surface Finishing Processes*, ASME Production Engineering Division, Vol. 38, 1989, pp. 27-40; presented at the 1989 ASME Winter Annual Meeting, San Francisco, CA.
- 1988 Stango, R.J., Heinrich, S.M., and Shia, C.-Y., "Analysis of Constrained Filament Deformation and Stiffness Properties of Brushes," *Computer-Aided Design and Manufacture of Dies and Molds*, ASME Production Engineering Division, Vol. 32, 1988, pp. 91-103; presented at the 1988 ASME Winter Annual Meeting, Chicago, IL.
- 1987 Almusallam, A., Sances, A., Myklebust, J.B., Yoganandan, N., and Heinrich, S.M., "A Lumped Parameter Analysis of a Rollover Accident," *Symposium on Vehicle Crashworthiness Including Impact Biomechanics*, ASME Applied Mechanics Division, Vol. 79, 1987, pp. 155-158; presented at the ASME Winter Annual Meeting, Anaheim, CA, 1986.

F. Other Conference Publications

- 1997 Heinrich, S.M., and Lee, P.S., "Solder Geometry Prediction in Electronic Packaging: An Overview," *Advances in Electronic Packaging 1997*, Vol. 2, ASME-EEP Vol. 19-2, 1997,

pp. 1371-1381.

- 1992 Lee, P.S., Roth, M., Nigro, N.J., Fournelle, R.A., Elkouh, A.F., and Heinrich, S.M., "A New Program for University/Industry Interaction," *Proc., 54th Annual Meeting of the North Midwest Section of the American Society for Engineering Education*, Milwaukee, WI, October 8-10, 1992.
- 1987 Heinrich, S.M., and Wang, J.-Y., "Stress Interference in a Transversely Isotropic Body Under Axisymmetric Loading," (abstract), *Proc., Sixth ASCE Engineering Mechanics Specialty Conference*, Buffalo, NY, 1987, p. 241.
- 1987 Almusallam, A., Yoganandan, N., Myklebust, J.B., Heinrich, S.M., and Sances, A., "Dynamic Forces on an Occupant During an Automobile Rollover," (abstract), *Proc., Sixth ASCE Engineering Mechanics Specialty Conference*, Buffalo, NY, 1987, p. 6.

G. Refereed Conference Presentations

- 2004 Liang, J., Shangguan, D., Dariavach, N., Downes, S., and Heinrich, S.M., "Effects of Load and Thermal Conditions on Pb-Free Solder Joint Reliability," *Proceedings, TMS Annual Meeting*, March 2004.
- 1992 Nigro, N.J., Heinrich, S.M., Elkouh, A.F., Zou, X., Fournelle, R.A., and Lee, P.S., "Finite Element Method for Predicting Equilibrium Shapes of Solder Joints," *ASME Winter Annual Meeting*, Anaheim, CA, 1992.
- 1990 Heinrich, S.M., Elkouh, A.F., Nigro, N.J., and Lee, P.S., "Solder Joint Formation in Surface Mount Technology -- Part I: Analysis," *ASME Winter Annual Meeting*, Dallas, TX, 1990.
- 1990 Heinrich, S.M., Nigro, N.J., Elkouh, A.F., and Lee, P.S., "Solder Joint Formation in Surface Mount Technology -- Part II: Design," *ASME Winter Annual Meeting*, Dallas, TX, 1990.

H. Other Conference Presentations

- 2015 Thuau, D., Ayela, C., Lemaire, E., Heinrich, S., Poulin, P., and Dufour, I., "Piezoresistive Organic Resonators Used for the Thermo-mechanical Characterization of Organic Materials," Poster Session, *Réunion de Printemps du Club Micro-Capteurs Chimiques (CMC2)*, CMC2 LIII, Talence, France, May 28, 2015.
- 2010 Josse, F., Heinrich, S.M., and Brand, O., "Use of Novel Excitation Schemes for Resonant Microcantilevers in Liquid-Phase Sensing Applications," *ECCS Grantee's Conference, National Science Foundation*, Hawaii, Dec. 2010.
- 2005 Lochon, F., Dufour, I., Rebière, D., Heinrich, S.M., and Josse, F., "*Microcapteurs chimiques à base de micropoutres : étude de la viscoélasticité de la couche sensible*," *Réunion d'automne du CMC2 (Club MicroCapteurs Chimiques)*, CMC2 XXXIV, Lyon-Villeurbanne, France, Nov. 2005.

- 1993 Heinrich, S.M., "Prediction of Solder Joint Geometry," *TMS Annual Meeting*, Denver, CO, February 1993.
- 1992 Pichumani, S., Whang, C.P., Fournelle, R.A., Heinrich, S.M., Nigro, N.J., Elkouh, A.F., and Lee, P.S., "Cross-Sectional Shape of Solder Joints Formed in Rectangular Corners During Reflow Soldering," *TMS/ASM 1992 Materials Week*, Chicago, IL, November 1992.
- 1991 Nigro, N.J., Elkouh, A.F., Heinrich, S.M., Chang, P., and Lee, P.S., "Computer Aided Design of Solder Joints," *IPC 34th Annual Meeting*, Phoenix, Arizona, April 14-19, 1991.
- 1987 Almusallam, A., Heinrich, S.M., Yoganandan, N., Myklebust, J.B., and Sances, A., "Dynamics of an Automobile Rollover," *24th Annual Meeting of the Society of Engineering Science*, Salt Lake City, UT, 1987.

I. Invited Lectures

- 2018 Heinrich, S.M., "Analytical Modeling of Cantilever-Beam Resonators Supporting Masses of Arbitrary Geometry: MEMS/NEMS Applications in Vibration Energy Harvesting, Chemical/Biosensing, and Higher-Order Mass Detection," invited lecture, *LabEx AMADEus Professeur Invité, Laboratoire de l'Intégration du Matériau au Système (IMS), Université de Bordeaux*, Pessac, France, June 6, 2018.
- 2015 Heinrich, S.M., "Recent Developments in Analytical Modeling of Cantilever-Based MEMS Devices for Sensing and Energy Harvesting Applications," invited lecture, *Laboratoire de l'Intégration du Matériau au Système (IMS), Université de Bordeaux*, Pessac, France, July 22, 2015.
- 2013 Heinrich, S.M., "Fundamental Theory of Resonant MEMS Devices," invited lecture, *Journée du Groupe Organique, Laboratoire de l'Intégration du Matériau au Système (IMS), Université de Bordeaux*, Pessac, France, Oct. 15, 2013.
- 2013 Heinrich, S.M., "Analytical Modeling of Cantilever-Based MEMS Devices for Mass-Sensing Applications," invited lecture, *Laboratoire de Mécanique Appliquée Raymond Chaléat (LMARC), FEMTO-ST, Université de Franche-Comté*, Besançon, France, Nov. 21, 2013.
- 2013 Heinrich, S.M., "Analytical Modeling of Cantilever-Based MEMS Devices for Chemical Detection and Biosensing Applications," invited lecture, *Laboratoire de l'Intégration du Matériau au Système (IMS), Université de Bordeaux*, Pessac, France, Nov. 25, 2013.
- 2013 Heinrich, S.M., "Recent Developments in Analytical Modeling of Cantilever-Based MEMS Devices for Sensing and Energy Harvesting Applications," invited lecture, *Laboratoire de l'Intégration du Matériau au Système (IMS), Université de Bordeaux*, Pessac, France, Nov. 27, 2013.
- 2006 Heinrich, S.M., "*La mécanique des structures appliquée aux systèmes microélectroniques*," Fulbright Research Scholar lecture, *Laboratoire IXL, Université Bordeaux I*, Bordeaux, France, November 14, 2006

- 2002 Heinrich, S.M., "Panel Discussion on Failure Modeling in Electronic Packaging," invited panel member, *ASME International Mechanical Engineering Congress and Exposition*, New Orleans, LA, November 17-22, 2002.
- 2001 Heinrich, S.M., "Modeling of Soldered Electronic Assemblies: Analytical and Numerical Approaches," a presentation to EMC Corporation, Franklin, MA, February 20, 2001.
- 2001 Heinrich, S.M., "Fundamentals of Undergraduate Teaching: One Professor's Perspective," *Teaching Strategies Colloquy, Preparing Future Faculty Series*, Marquette University, September 27, 2001.
- 2000 Heinrich, S.M., "The Teaching/Research Link: One Professor's Perspective," presented as part of the *Mission Awareness Week*, session entitled "Faculty on Faculty: Fulfilling the Mission," Marquette University, October 25, 2000.
- 1998 Heinrich, S.M., "Viscoelastic Beam Analysis: Applications in Microelectronics," *MEEN/INEN Seminar Series*, Department of Mechanical and Industrial Engineering, Marquette University, February 20, 1998.
- 1997 Heinrich, S.M., "Solder Geometry Prediction in Electronic Packaging: An Overview," presented at *InterPACK '97*, Mauna Lani, HI, June 1997.
- 1997 Heinrich, S.M., "An Elastoplastic Beam Model for Column-Grid-Array Solder Interconnects," *Symposium on Reliability of Solders and Solder Joints, 1997 TMS Annual Meeting*, Orlando, FL, February 1997.
- 1996 Heinrich, S.M., "Recent Developments in Solder Technology in Microelectronics Applications," *1996 Spring Colloquium*, Department of Mechanical and Industrial Engineering, Marquette University, May 2, 1996.
- 1995 Heinrich, S.M., "Improvement of Process Yield and In-Service Reliability of Solder Joints in Microelectronics Applications," *Kimberly-Clark Technical Conference*, Oconomowoc, WI, September 12, 1995.
- 1995 Heinrich, S.M., "Solder Joint Geometry Models: an Overview," *NIST Solder Interconnect Design Team Meeting*, National Institute of Standards and Technology, Center for Theoretical and Computational Materials Science, Gaithersburg, MD, June 12-14, 1995.
- 1994 Heinrich, S.M., "Prediction of Solder Joint Geometry," *Workshop on Solder Joint Design*, sponsored by the National Institute of Standards and Technology, held at the National Science Foundation Geometry Center, Minneapolis, MN, May 31-June 2, 1994.
- 1992 Heinrich, S.M., "Prediction of Solder Joint Geometry," *Third International Workshop on Materials and Mechanics Issues of Solder Alloy Applications*, sponsored by U.S. Army Harry Diamond Laboratories, Sandia National Laboratories, and ASM International (Albuquerque Chapter), Santa Fe, NM, September 9-11, 1992.
- 1992 Heinrich, S.M., "Prediction of Solder Joint Geometry in Surface Mount Technology," *EECE Colloquium Series*, Marquette University, January 28, 1992.

- 1991 Heinrich, S.M., "Modeling of Solder Joint Formation in Electronic Packaging, with Applications in Surface Mount Technology," *MEIE Colloquium Series*, Marquette University, October 24, 1991.
- 1990 Heinrich, S.M., "Prediction of Solder Fillet Geometry in Surface Mount Technology," *Allen-Bradley Science Club*, Milwaukee, WI, February 8, 1990.
- 1989 Heinrich, S.M., "Boundary Element Analysis and BEASY," *Wisconsin Chapter of the National Computer Graphics Association*, Milwaukee, WI, May 3, 1989.

J. Trade Journal Articles

- 1991 Nigro, N.J., Elkouh, A.F., Heinrich, S.M., Chang, P., and Lee, P.S., "Computer Aided Design of Solder Joints," *Surface Mount Technology*, Vol. 5, No. 4, 1991, pp. 59-61.

K. Published Book Reviews

- 1993 Heinrich, S.M., Book Review of *Variational Methods in Mechanics*, by T. Mura and T. Koya, in *Journal of Pressure Vessel Technology*, ASME, Vol.115, 1993, pp. 102-103.

L. Forewords to Refereed Journals

- 1996 Heinrich, S.M., "Special Issue on Solder Geometry," Foreword, *Journal of Electronic Packaging*, ASME, Vol. 118, No. 3, September 1996, p. 113.

M. Technical Reports

- 2018 Heinrich, S.M., "Analytical Model to Investigate the Effect of Width Taper on the Energy Harvesting Potential of a Trapezoidal Cantilever Excited by Wind Loading," research report submitted to *Laboratoire IMS, Université de Bordeaux*, Pessac, France, June 13, 2018, 11 pp.
- 2017 Heinrich, S.M., and Lee, C. H., "Toward Higher-Order Micro/Nanobeam-Based Mass Detection Methods in Biological and Chemical Sensing," research report submitted to Marquette University Office of Research and Innovation, Summer Faculty Fellowship/Regular Research Grant Program, submitted April 14, 2017, 6 pp.
- 2014 Heinrich, S.M., "Development of Analytical Models of Cantilever-Based MEMS Devices for Sensing and Energy Harvesting Applications," research report submitted to *Laboratoire IMS, Université de Bordeaux*, Pessac, France, Jan. 4, 2014, 45 pp.
- 2014 Heinrich, S.M., "Analytical Modeling for Determination of Optimal Width Taper in a Microcantilever-Based Energy Harvester," research report submitted to *Laboratoire IMS, Université de Bordeaux*, Pessac, France, Jan. 6, 2014, 20 pp.
- 2014 Heinrich, S.M., "Incorporation of Rotational Inertia and Eccentricity of End Mass into Analytical Models of a Vibrating Cantilever with a Point Mass at the Tip: Applications to T- and U-Shaped Cantilevers," research report submitted to *Laboratoire IMS, Université*

de Bordeaux, Pessac, France, Jan. 13, 2014, 18 pp.

- 2002 Heinrich, S.M., "Dynamic Modeling of Electric Shovels for Improvement of LoadWeigh System: Preliminary Investigation," submitted to P&H Mining Equipment, Milwaukee, WI, 2002, 41 pp.
- 2001 Heinrich, S.M., "Evaluation of Solder Joint Failures on SYM5 Board," submitted to EMC Corporation, Hopkinton, MA, May 2001, 48 pp.
- 1985 Heinrich, S.M., and Eubanks, R.A., "Stress Interference in Axisymmetric Torsion of a Transversely Isotropic Body," *Civil Engineering Studies, Structural Research Series*, No. 518, University of Illinois at Urbana-Champaign, Urbana, IL, 1985.

N. Dissertation

- 1985 Heinrich, S.M., *Stress Interference in Axisymmetric Torsion of a Transversely Isotropic Body*, Ph.D. Dissertation, 1985, University of Illinois at Urbana-Champaign.

II. TEACHING

A. Courses Taught (G=Grad., U=Undergrad.)

| | |
|--------------------|---|
| CEEN 2110 (U): | Statics |
| CEEN 2120 (U): | Dynamics |
| CEEN 022 (U): | Statics and Dynamics |
| CEEN 2130 (U): | Mechanics of Materials |
| CEEN 111 (U/G): | Structural Analysis 2 |
| CEEN 4710 (U): | Engineering Fundamentals Review |
| CEEN 4/5145 (U/G): | Advanced Strength and Applied Stress Analysis |
| CEEN 210 (G): | Advanced Structural Analysis |
| CEEN 6410 (G): | Numerical Analysis with Structural Applications |
| CEEN 216 (G): | Theory of Shells |
| CEEN 6435 (G): | Dynamic Behavior of Structures |
| CEEN 6110 (G): | Theory of Elasticity |
| CEEN 244 (G): | Theory of Plates |
| CEEN 6120 (G): | Introduction to the Finite Element Method |
| CEEN 6121 (G): | Applied Finite Element Analysis and Modeling |
| MEEN 150* (U/G): | Applied Stress Analysis 1 |
| MEEN 190* (U): | Engineering Fundamentals Review |
| MEEN 203* (G): | Approximate Methods in Engineering Analysis |
| MEEN 222* (G): | Advanced Vibrations |
| MEEN 270* (G): | Advanced Topics in Engineering Mechanics: The Finite Element Method |
| MEEN 270* (G): | Advanced Topics in Engineering Mechanics: Elasticity |
| BIEN 232* (G): | Applied Finite Element Analysis in Biomechanics 1 |

* cross-listed with CEEN courses

B. Independent Study Courses Taught

| | |
|----------------|---|
| CEEN 195 (U): | Boundary Element Analysis |
| MEEN 195 (U): | Design, Construction, and Analysis of Catapult |
| CEEN 295 (G): | Boundary Element Analysis |
| CEEN 295 (G): | Elasticity 2 |
| CEEN 295 (G): | Elasticity 3 |
| CEEN 295 (G): | Indeterminate Structural Analysis |
| CEEN 295 (G): | Advanced Stress Analysis |
| CEEN 295 (G): | Numerical Implementation of Solder Joint Stress Analysis Model |
| CEEN 295 (G): | Elastoplastic Analysis of an Axisymmetric Solder Joint under Thermal Loading |
| CEEN 295 (G): | Theory of Plasticity |
| CEEN 295 (G): | Nonlinear Structural Analysis |
| CEEN 295 (G): | Numerical Verification of Analytical Solder Joint Stiffness Results |
| CEEN 295 (G): | Introduction to the Finite Element Method |
| CEEN 295 (G): | Applied Plate Theory |
| CEEN 295 (G): | Advanced Stress Analysis Using ANSYS ⁷ |
| CEEN 295 (G): | Viscoelasticity: Beam Applications |
| CEEN 295 (G): | Beam Vibrations |
| CEEN 4995 (U): | Seismic Test Design: Reduced-Beam-Section Fuse in Steel Frames |
| CEEN 6995 (G): | Modeling of Cantilever Beams Vibrating in Fluids |
| CEEN 6995 (G): | Advanced Modeling of Cantilever Beams Vibrating in Fluids |
| CEEN 6995 (G): | Analytical/Finite Element Modeling of Beam-Fluid Interaction |
| CEEN 6995 (G): | Analytical Modeling of a Novel High-Q Liquid-Phase Resonant Sensor |
| CEEN 6995 (G): | Modal Analysis of a Cantilever-Based Resonator for Higher-Order Discrete-Mass Sensing |
| CEEN 6995 (G): | Extended-End-Plate/Reduced-Beam-Section Fuse in Steel Buildings 1 |
| CEEN 6995 (G): | Extended-End-Plate/Reduced-Beam-Section Fuse in Steel Buildings 2 |
| CEEN 6995 (G): | Seismic Testing: Reduced-Beam-Section Fuse in Steel Frames |
| CEEN 6995 (G): | Analysis of Test Data: Reduced-Beam-Section Fuse in Steel Frames |
| CEEN 6995 (G): | Structural Dynamics |
| CEEN 8995 (G): | Support Compliance Effects in Microcantilever-Based Sensors |
| CEEN 8995 (G): | Modal Analysis of a Novel Disk Resonator using Finite Element Analysis |
| CEEN 8995 (G): | Modeling of Liquid-Phase Disk Resonator 1, 2 |

C. Dissertations/Theses/Essays Directed

- 2016 Sotoudegan, Mohamad, *Analytical Modeling of a Novel Microdisk Resonator for Liquid-Phase Sensing: an All-Shear Interaction Device (ASID)*, Ph.D. Dissertation, Marquette University, August 2016.
- 2013 Maharjan, Rabin, *Effect of Support Compliance on the Resonant Behavior of Microcantilever-Based Sensors in Viscous Fluids*, Ph.D. Dissertation, Marquette University, May 2013.
- 2012 Schultz, Joshua, *Lateral-Mode Vibration of Microcantilever-Based Sensors in Viscous Fluids Using Timoshenko Beam Theory*, Ph.D. Dissertation, Marquette University, December 2012.

- 2008 Fischer, Mark, *Analytical Modeling of Microcantilever-Based Resonant Sensors in Lateral Flexural Mode*, M.S. Thesis, Marquette University, May 2008. (Selected by the Marquette University Graduate School as Marquette's entry into the 2009 Midwestern Association of Graduate Schools Distinguished Master's Thesis Competition.)
- 2005 Sampath, Uttara, *Analytical Modeling of Polymer-Coated Microcantilever Dynamic Microsensors*, M.S. Thesis, Marquette University, December 2005 (co-advisors F. Josse and S.M. Heinrich).
- 2000 Shakya, S., *Stress Analysis of Bonded Axisymmetric Assemblies under Thermal Loading: Applications in Microelectronics*, Ph.D. Dissertation, Marquette University, 2000.
- 2000 Saad, H., *Calculation of Solder Joint Stiffness Using Three-Dimensional Finite Element Analysis: Comparison with Short-Beam Analytical Estimates*, M.S. Thesis, Marquette University, 2000.
- 1995 Shakya, S., *Simplified Stress Analysis of Axisymmetric Solder Joint under Thermal Loading*, M.S. Thesis, Marquette University, 1995.
- 1995 Swanson, J., *Elasto-Plastic Analysis of Column-Grid-Array Solder Joints*, M.S. Thesis, Marquette University, 1995.
- 1993 Liedtke, P.E., *Prediction of Solder Joint Geometry in Surface Mount Technology -- An Analytical Approach*, Ph. D. Dissertation, Marquette University, 1993.
- 1992 Pagedar, G., *Finite Element Stress Analysis of a Surface Mount Solder Joint with Automatic Mesh Generation,*" M.S. Thesis, Marquette University, 1992.
- 1992 Nambisan, B.U., *An Approximate Model for Predicting Wave-Soldered Fillet Geometry for Surface Mounted Electronic Components*, M.S. Thesis, Marquette University, 1992.
- 1991 Wang, J.-Y., *An Elasticity Solution for a Transversely Isotropic Material Containing a Spherical Shell Under Axisymmetric Loading*, Ph. D. Dissertation, Marquette University, 1991.
- 1990 Ganapathy, V., *Finite Element Analysis of an Automobile Radiator*, M.S. Thesis, Marquette University, 1990.
- 1990 Yang, L., *Stress Analysis of a Surface-Mount Solder Joint Using BEASY*, M.S. Essay, Marquette University, 1990.
- 1987 Wang, J.-Y., *A Numerical Study of Stress Interference in a Transversely Isotropic Body under Axisymmetric Loading*, M.S. Thesis, Marquette University, 1987.
- 1986 Gettu, R., *Study of Stress Concentration and Stress Interference in a Transversely Isotropic Body under Uniaxial Tension -- a Finite Element Approach*, M.S. Thesis, Marquette University, 1986.

D. Participation in Teaching Seminars

- 1987 ASEE New Engineering Educators Program, American Society for Engineering Education, 95th ASEE Annual Conference, Reno, NV.
- 1986 ASEE Regional Effective Teaching Institute, American Society for Engineering Education, Iowa State University.

III. MARQUETTE SERVICE

A. University

Sabbatical Review Committee (*ad hoc*), 2017-2018.
Raynor Fellowship Selection Committee, 2017.
Schmitt Fellowship Selection Committee, 2005-2006, 2012-2013.
Fulbright Scholar Panel Member, Brown Bag Lunch series, Office of Research and Sponsored Programs, Marquette University, March 28, 2012.
Burke Scholar Advisor, 2005-2009.
Fulbright Scholar Panel Member, Brown Bag Lunch series, Office of Research and Sponsored Programs, Marquette University, April 11, 2007.
MU Subcommittee for Composition of Doctoral Programs (*ad hoc*), 2006-2007.
MU Board of Graduate Studies, 2003-2006.
MU Promotion and Tenure Committee, 2003-2006.
Session Organizer and Moderator, Plenary Session on “Preparing for Tenure,” First Annual Institute for Faculty: Career and Time Management, January 12, 2005.
Search Panel for the position of Vice Provost for Research and Graduate Programs, 2005.
MU Teaching Excellence Award Review Committee, 2002, 2004.
Executive Committee Member, Core Curriculum Review Committee, 2000-2003.
MU Preview Parent Lunch/Dinner Program, 1994, 2003.
Search Committee for Provost Position, Marquette University, 2001-2002.
Liaison to Core Curriculum Assessment Committee, 2000-2002.
Master of Ceremonies, 43rd Annual Père Marquette Dinner, May 3, 2001.
Renewal Task Force, 1998-2001.
Guest Speaker for “Faculty on Faculty: Fulfilling the Mission,” Marquette University Mission Week, October 25, 2000.
Subcommittee on Academic Affairs, 1998-1999.
Committee on Faculty, 1995-1998; Secretary, 1996-1998.
MU Library Board, 1991-1994.
MU Information Day, 1991.

B. College

Chair, Search Committee for Lafferty Endowed Chair in Electrical Engineering, Sensor Devices and Smart Sensor Systems, Opus College of Engineering, 2015-2016.
Search Committee for Professor of Practice, Mechanics, Opus College of Engineering, 2016-2017.
Library Committee Member, MU College of Engineering, 1986-present.
Chair, Promotion and Tenure Committee, MU College of Engineering, 2003-2006; Member, 1998-2006, 2008-2013.

Chair, Committee on Emeritus Faculty Appointment (*ad hoc*), 2012-13.
 Materials Science and Technology Center, Executive Board Member, 1987-2008.
 Academic Dishonesty Committee (*ad hoc*), 2004.
 Search Committee for Dean of Engineering, MU College of Engineering, 2002-2003.
 Chair, Core Curriculum Committee, College of Engineering, 2001-2002.
 Physics Committee, MU College of Engineering, 1998-2002.
 Chair, Mechanics Committee, MU College of Engineering, 2001-2002; Member, 1986-2000.
 MU Open House for High School Sophomores and Juniors, 1995, 1998, 2000.
 Committee on Enrollment Management -- Marketing, MU College of Engineering, 1997-1999.
 Search Committee for Dean of Engineering, MU College of Engineering, 1998-1999.
 Search Committee for Associate Dean for Research, MU College of Engineering, 1994.
 MU Gateway to Engineering Program, 1994.
 EIT Review Session Lecturer, College of Engineering, 1989-1994.
 Search Committee for Department Chairman Position, MU Dept. of Mechanical and Industrial Engineering, 1991.

C. Department

Chair, Search Committee for CCEE Professor of Structural Engineering, 2018-20.
 Chair, Search Committee for CCEE Assistant Professor of Structural Engineering, 2019-20.
 Chair, Promotion and Tenure Committee, MU Dept. of Civil, Constr. and Env. Engineering, 2017-present.
 Dossier Preparer (for promotion/tenure cases), MU Dept. of Civil, Constr. and Env. Engineering, 2017, 2018.
 Chair, Search Committee for CCEE Department Chair, 2017-18.
 Director of Graduate Studies, 2001-present.
 Member, Promotion and Tenure Committee, MU Dept. of Civil, Constr. and Env. Engineering, 1998-present.
 Chair, Graduate Committee, MU Dept. of Civil and Env. Engineering, 2000-present; Member, 1993-present.
 Executive Committee Member, MU Dept. of Civil, Constr., and Env. Engineering, 2012-present.
 Chair, Structural Committee, MU Dept. of Civil and Env. Engineering, 2000-2001; Member, 1985-present.
 Peer Reviewer for Faculty Teaching, 2003-present.
 Search Committee for Structural Engineering/Structural Mechanics Faculty Position, MU Dept. of Civil, Constr., and Env. Engineering, 2012-13.
 Search Committee for Environmental Faculty Position, MU Dept. of Civil, Constr., and Env. Engineering, 2011-12.
 Curriculum Committee Member, MU Dept. of Civil and Env. Engineering, 1986-1989, 2005-2008.
 Chair, *Ad Hoc* Committee on Mechanics/Structural Analysis Course Sequence, MU Dept. of Civil and Env. Engineering, 2004-2005.
 WebSite Committee, MU Dept. of Civil and Env. Engineering, 2003-2005.
 Assessment Committee, MU Dept. of Civil and Env. Engineering, 2000-2002, 2004-2005.
 Search Committee for Structures Faculty Position, MU Dept. of Civil and Env. Engineering, 2003.
 Five-Year Goals Committee, MU Dept. of Civil and Env. Engineering, 2003.
 Lecturer for Marquette University Engineering "Hands-On Mini-Course," 1990-2002.
 Graduate Student Orientation Moderator, MU Dept. of Civil and Env. Engineering, 1994-2000.
 Faculty Advisor, MU Chapter of Chi Epsilon Honor Society, 1989, 1993-1999.

Long-Term Planning Committee, MU Dept. of Civil and Env. Engineering, 1994-1998.
Search Committee for Structures Faculty Position, MU Dept. of Civil and Env. Engineering, 1995.

Organized MU Structural Engineering Colloquium, entitled "Forensic Engineering in Structures," presented by Prof. Narbey Khachaturian, Professor Emeritus of Civil Engineering, University of Illinois at Urbana-Champaign, April 10, 1990.

Publications Committee Member, MU Dept. of Civil and Env. Engineering, 1988-1989.

IV. PROFESSIONAL SERVICE

A. Professional Society, Committee, and Editor Activities

Review Editorial Board Member, Micro- and Nanoelectromechanical Systems, *Frontiers in Mechanical Engineering*, 2015-present.

Book Co-Editor, *Resonant MEMS: Fundamentals, Implementation and Application*, Wiley-VCH Verlag, 2012-15.

Associate Editor, *IEEE Transactions on Advanced Packaging*, 2003-2007.

American Society of Mechanical Engineers, Member, 1985-2005.

Associate Technical Editor, *Journal of Electronic Packaging*, ASME, 1995-2001.

Elasticity Committee Member, ASCE Engineering Mechanics Division (National), 1990-2000;

American Academy of Mechanics, Member, 1985-2000.

Control Group Member, 1992-1996. Organizing Committee, Program Chair, Reliability Track, *InterPACK '99*, Maui, HI, June 13-19, 1999.

Session Chairman and Discussion Leader, "Reliability of Area Array Packages - I," *InterPACK '99*, Maui, HI, June 12-19, 1999.

Editorial Board Member, *International Journal of Microelectronic Packaging*, 1995-1998.

American Society of Civil Engineers, Member, 1980-1998.

Session Chairman and Discussion Leader, "Solder Geometry Modeling," *InterPACK '97*, Mauna Lani, HI, June 15-19, 1997.

Editor, Special Issue on Solder Geometry, *Journal of Electronic Packaging*, ASME, September 1996.

Society of Engineering Science, Member, 1985-1995.

Session Vice-Chairman, "Solder Technology: Fatigue, Crack, and Failure I," *ASME International Electronics Packaging Conference*, Binghamton, NY, September 29 - October 2, 1993.

Scholarship Committee Member, ASCE Wisconsin Section, Southeast Branch, 1989-1992; Chairman, 1990-1992.

Session Chairman and Discussion Leader, "Anisotropic Elasticity and Composites," *ASCE Engineering Mechanics Specialty Conference*, College Station, Texas, May 1992.

American Concrete Institute, Member, 1984-1990.

American Society for Engineering Education, Member, 1988-1990.

B. Review Activities

Research Proposal Reviewer for the Following Government Agencies and Foundations:

National Science Foundation (U.S.), Panel Member and Reviewer, Civil, Mechanical and Manufacturing Innovation (CMMI), Sensors and Sensing Systems Program
Engineering and Physical Sciences Research Council (U.K.)

Fulbright Scholar Program, Council for International Exchange of Scholars
Kentucky Science and Engineering Foundation

Technical Paper Reviewer for the Following Journals/Proceedings:

Journal of Applied Mechanics (ASME)
Journal of Engineering Mechanics (ASCE)
Journal of Structural Engineering (ASCE)
Journal of Applied Physics (American Institute of Physics)
Journal of Electronic Packaging (ASME)
Journal of Engineering for Industry (ASME)
Journal of Pressure Vessel Technology (ASME)
Journal of Spacecraft and Rockets (AIAA)
Journal of Sound and Vibration
Microfluidics and Nanofluidics
Micromachines
Applied Physics Letters
Sensors and Actuators A: Physical
Physica E
European Journal of Mechanics - A/Solids
IEEE Trans. on Components, Packaging, and Manufacturing Technology, Part A
IEEE Transactions on Advanced Packaging
Journal of Physical Chemistry
Chemical Physics Letters
International Journal of Damage Mechanics
Metallurgical Transactions
IBM Journal of Research and Development
Structural Engineering and Mechanics
International Journal of Microelectronic Packaging
Transactions, NAMRI
Welding Journal, American Welding Society
IEEE Transactions on Components and Packaging Technologies
Journal of Micromechanics and Microengineering
Microelectronics Reliability
IEEE Transactions on Robotics
Advances in Engineering Software
Proceedings, InterPACK 1997, 1999, 2005 (ASME)
Frontiers in Mechanical Engineering
Microsystem Technologies
IEEE Sensors Journal
Applied Biochemistry and Biotechnology
Scientific Reports
Beilstein Journal of Nanotechnology

Book Reviewer for the Following Journals and Publishers:

Journal of Pressure Vessel Technology (ASME)
Van Nostrand Reinhold Publishers
PWS Kent Publishing Company

Irwin Publishing Company
Chapman & Hall Publishers
Gordon and Breach Publishers
John Wiley & Sons, Inc.
Wiley-VCH Verlag
McGraw-Hill
Oxford University Press

Dissertation Reporter: *Resonating sensor principles for measuring the physical properties of liquids*, by Martin Heinisch, Johannes Kepler University of Linz, Austria, and *Université de Bordeaux*, France, 2015. (One of two external *rapporteurs*, required by the French educational system, who must submit formal reviews of the dissertation to the dissertation committee.)

C. Other Non-University Service Activities

Career Guidance Program Volunteer, Engineers and Scientists of Milwaukee, 1995.

V. HONORS AND AWARDS

Professeur Invité, *Analytical Modeling of Printable/Flexible Organic MEMS for Vibration Energy Harvesting*, LabEx AMADEus program, *Université de Bordeaux*, May 14 – June 13, 2018.

Outstanding Researcher Award, Opus College of Engineering, Marquette University, 2015.

Visiting Research Scholar, *Initiative d'Excellence de l'Université de Bordeaux (IdEx Bordeaux)*, *Laboratoire de l'Intégration du Matériau au Système (IMS)*, *Université de Bordeaux*, Pessac, France, May 15 – July 15, 2015.

Summer Faculty Fellowship, Marquette University, 1986, 1988, 1999, 2002, 2016.

“JMEMS RightNow” designation for the journal article, “Analytical Modeling of a Novel High-Q Disk Resonator for Liquid-Phase Applications,” by Sotoudegan, M., Heinrich, S.M., Josse, F., Nigro, N.J., Dufour, I., and Brand, O., *Journal of Microelectromechanical Systems*, Vol. 24, No. 1 (Feb.), 2015, pp. 38-49. Each JMEMS issue includes three papers of “excellent quality” that are highlighted by the Editor-in-Chief and made available to a large community of readers who are granted open access for a limited time.

Invited Professorship, *Laboratoire de l'Intégration du Matériau au Système (IMS)*, *Université de Bordeaux*, Pessac, France, October 1 – November 30, 2013.

Fulbright Research Scholar, 2006-2007 Fulbright-Aquitaine Regional Council Award, France/Aquitaine Regional Program #6281, Host and Host Institution: Dr. Isabelle Dufour, *Université Bordeaux I*, Bordeaux, France, September 1 - November 30, 2006.

Invited Professorship, *Laboratoire IXL*, *Université Bordeaux I*, Bordeaux, France, July 2006.

Reverend John P. Raynor Faculty Award for Teaching Excellence, Marquette University, 2000 (Marquette University’s highest teaching honor).

“**Outstanding Paper Award**,” 2nd Place, Poster Session, 45th Electronic Components and Technology Conference, IEEE, Las Vegas, NV, 1995.

“**Best ASME Conference Paper**” Award, ASME/JSME Joint Conference on Electronic Packaging, Milpitas, CA, 1992.

“**Best Paper in Materials and Processes**” Award, ASME/JSME Joint Conference on Electronic Packaging, Milpitas, CA, 1992.

Summa Cum Laude Graduate, The Pennsylvania State University, 1980.

Chi Epsilon Honor Society (Civil Engineering), 1980-present.
Tau Beta Pi Honor Society (Engineering), 1979-present.

VI. FUNDED RESEARCH/EDUCATIONAL PROJECTS

- 2019 \$600,972 *GAANN: Enhanced Civil Engineering Training and Research to Rebuild America's Water Infrastructure*, Graduate Assistance in Areas of National Need (GAANN) Program, U.S. Department of Education, D.H. Zitomer (PI), Parolari, A.J. (co-PI), Heinrich, S.M. (co-PI), Mayer, B.K. (co-PI), McDonald, W.M. (key personnel), McNamara, P.J. (key personnel), 2019-2022.
- 2017 \$5,000 Heinrich, S.M., *Professeur Invité*, Research Project Title: *Analytical Modeling of Printable/Flexible Organic MEMS for Vibration Energy Harvesting*, LabEx AMADEus program, *Université de Bordeaux*, May 14 – June 13, 2018.
- 2016 \$18,800 (€16,800) Heinrich, S.M., Scientific Partner, Comet K2 Center for Symbiotic Mechatronics, Linz Centre of Mechatronics, funded by FFG (Austrian Research Promotion Agency), Funding Period: 2018-2021.
- 2016 \$154,844 *Maskless Lithography*, equipment proposal funded by Research Equipment Legacy Initiative Program, Opus College of Engineering, Marquette University, Lee, C.H. (PI), Heinrich, S.M. (co-PI), Josse, F. (co-PI), Richie, J. (co-PI), Borg, J. (co-PI), LaDisa, J. (co-PI), Allen, C. (co-PI), Rice, J. (co-PI), Beardsley, S. (co-PI), Schimmels, J. (co-PI), and Fournelle, R. (co-PI), 2016.
- 2016 \$11,000 *Collaborative Project: Toward Higher-Order Micro/Nanobeam-Based Mass Detection Methods in Biological and Chemical Sensing*, funded by the Marquette University Summer Faculty Fellowship Program, Heinrich, S.M. (PI), Lee, C.H. (PI), 2016.
- 2016 \$9,998 *Collaborative Project: Toward Higher-Order Micro/Nanobeam-Based Mass Detection Methods in Biological and Chemical Sensing*, funded by the Marquette University Regular Research Grant Program, Heinrich, S.M. (PI), Lee, C.H. (PI).
- 2015 \$16,000 (€11,940) Heinrich, S.M., Visiting Research Scholar, *Initiative d'Excellence de l'Université de Bordeaux (IdEx Bordeaux)*, *Laboratoire de l'Intégration du Matériau au Système (IMS)*, *Université de Bordeaux*, Pessac, France, May 15 – July 15, 2015.
- 2013 \$14,100 (€10,760) Heinrich, S.M., *Professeur Invité*, *Laboratoire de l'Intégration du Matériau au Système (IMS)*, *Université de Bordeaux*, Bordeaux, France, October 1 – November 30, 2013.

- 2012 \$20,000 (€15,000) *Development of portable microstructure-based chemical sensors with high performance characteristics in liquid environments*, funded by *Projet PICS, France/USA*, I. Dufour (PI), O. Brand (co-PI), International Collaborators: S.M. Heinrich and F. Josse, 2012 – 2014. (Three-year travel grant for international collaboration among *Université de Bordeaux*, Georgia Tech, and Marquette University.)
- 2011 \$500,000 *Collaborative Research: Micromachined In-Plane Resonator Arrays with Integrated Temperature Modulation: A Systems Approach to Liquid-Phase Chemical Sensing*, three-year project funded by the National Science Foundation, Project Period: Sept. 1, 2011 – Aug. 31, 2015; Josse, F. (PI), Heinrich, S.M. (co-PI), Brand, O. (PI, Georgia Tech), NSF Project ECCS-1128992.
- 2011 \$6,250 *Supplemental Award for Use of Novel Excitation Schemes for Resonant Microcantilevers in Liquid-Phase Sensing Applications*, three-year project funded by the National Science Foundation, Project Period: Sept. 1, 2009 – Aug. 31, 2011; Josse, F. (PI), Heinrich, S.M. (co-PI), Brand, O. (co-PI, Georgia Tech), NSF Project ECCS-1128554.
- 2008 \$659,975 *Use of Novel Excitation Schemes for Resonant Microcantilevers in Liquid-Phase Sensing Applications*, three-year project funded by the National Science Foundation, Project Period: Sept. 1, 2008 – Aug. 31, 2012; Josse, F. (PI), Heinrich, S.M. (co-PI), Brand, O. (co-PI, Georgia Tech), NSF Project ECCS-0824017.
- 2007 \$25,000 “Novel Smart Sensor Systems for Rapid Field Deployment Detection and Monitoring of Toxic Industrial Compounds,” funded by the College of Engineering, Marquette University; Josse, F. (Group Leader), Johnson, Povinelli, Schneider, Yaz, Jeutter, Heinrich, Koch, Hossenlopp, Rathore (Group Members).
- 2006 \$10,600 (7,950 €) Heinrich, S.M., *Fulbright Research Scholar Award*, funded by the Fulbright-Aquitaine Regional Council, France/Aquitaine Regional Program #6281, Host Institution: *Université Bordeaux I*, Bordeaux, France, September 1 – November 30, 2006.
- 2006 \$4,900 (3,686 €) Heinrich, S.M., *Professeur Invité, Laboratoire IXL, Université Bordeaux I*, Bordeaux, France, July 2006.
- 2002 \$5,000 *An Analytical Model for Predicting Solder Joint Deformation Caused by Thermally Induced Bending in Electronic Assemblies*, funded by the Marquette University Summer Faculty Fellowship Program, PI: Heinrich, S.M., 2002.
- 2002 \$1,000 *An Analytical Model for Predicting Solder Joint Deformation Caused by Thermally Induced Bending in Electronic Assemblies*, funded by the Marquette University Regular Research Grant Program, PI: Heinrich, S.M., 2002.

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| 1999 | \$30,000 | <i>Improved Design and Manufacture of Electronic Assemblies</i> , funded by Rockwell Automation, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1999. |
| 1999 | \$4,800 | <i>An Analytical Viscoplastic Model for Solder Joint Deformation in Microelectronics</i> , funded by the Marquette University Summer Faculty Fellowship Program, PI: Heinrich, S.M., 1999. |
| 1998 | \$90,000 | <i>Improved Design and Manufacture of Electronic Assemblies</i> , funded by Rockwell Automation, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1998. |
| 1997 | \$90,000 | <i>Improved Design and Manufacture of Electronic Assemblies</i> , funded by Rockwell Automation, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1997. |
| 1997 | \$49,179 | <i>Design of Solder Joints for Electronic Assembly</i> , funded by Ford Motor Co., Dearborn, MI, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1997. |
| 1996 | \$89,996 | <i>Improved Design and Manufacture of Electronic Assemblies</i> , funded by Rockwell Automation, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1996. |
| 1995 | \$44,278 | <i>Design of Solder Joints for Electronic Assembly</i> , funded by Ford Motor Co., Dearborn, MI, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1995. |
| 1995 | \$89,997 | <i>Design of Solder Joints for Electronic Packaging</i> , funded by Allen-Bradley Co., co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1995. |
| 1994 | \$88,697 | <i>Design of Solder Joints for Electronic Packaging</i> , funded by Allen-Bradley Co., co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1994. |
| 1994 | \$39,731 | <i>Design of Solder Joints for Electronic Packaging</i> , funded by Ford Motor Co., Dearborn, MI, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1994. |
| 1993 | \$88,013 | <i>Design of Solder Joints for Electronic Packaging</i> , funded by Allen-Bradley Company, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1993. |
| 1992 | \$86,418 | <i>Design of Solder Joints for Surface Mount Technology</i> , funded by Allen-Bradley Co., co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1992. |

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| 1991 | \$84,876 | <i>Design of Solder Joints for Surface Mount Technology</i> , funded by Allen-Bradley Co., co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1991. |
| 1990 | \$49,984 | <i>Design of Solder Joints for Surface Mount Technology</i> , funded by Allen-Bradley Co., co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1990. |
| 1990 | \$4,963 | <i>Mechanical and Thermal Stress Analysis of an Automobile Radiator System,</i> funded by Modine Manufacturing Company, co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1990. |
| 1989 | \$38,601 | <i>Formation of Ideal Solder Joints for Surface Mount Technology</i> , funded by Allen-Bradley Co., co-PIs: A.F. Elkouh, R.A. Fournelle, S.M. Heinrich, and N.J. Nigro, 1989. |
| 1988 | \$3,900 | <i>An Alternative Boundary Element Formulation for Half-Plane and Half-Space Problems in Anisotropic Elasticity</i> , funded by the Marquette University Summer Faculty Fellowship Program and Regular Research Grant Program, PI: Heinrich, S.M., 1988. |
| 1986 | \$3,550 | <i>Stress Interference in Anisotropic Media</i> , funded by the Marquette University Summer Faculty Fellowship Program and Regular Research Grant Program, PI: Heinrich, S.M., 1986. |

VII. TRAVEL GRANTS AND HONORARIA

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| 2005 | \$500 | Honorarium for Book Review, Oxford University Press, Intermediate Mechanics of Materials by M. Vable, 2005. |
| 2001 | \$400 | Honorarium for Book Review, McGraw-Hill, Introduction to the Finite Element Method by J.N. Reddy, Third Edition, July 2001. |
| 1995 | \$600 | Travel grant from the National Institute of Standards and Technology to present invited lecture entitled "Solder Joint Geometry Models: an Overview," at the NIST Solder Interconnect Design Team Meeting, NIST Center for Theoretical and Computational Materials Science, Gaithersburg, MD, June 12-14, 1995. |
| 1995 | \$800 | Honorarium from Kimberly-Clark to present invited lecture, entitled "Improvement of Process Yield and In-Service Reliability of Solder Joints in Microelectronics Applications," at the Kimberly-Clark Technical Conference, Oconomowoc, WI, September 12, 1995. |
| 1994 | \$600 | Travel grant from the National Institute of Standards and Technology to present invited lecture entitled "Prediction of Solder Joint Geometry," at the NIST Workshop on Solder Joint Design, NSF Geometry Center, Minneapolis, MN, May 31-June 2, 1994. |

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| 1993 | \$260 | Travel grant from ASCE to attend the ASCE/ASME/SES Engineering Mechanics Specialty Conference, Charlottesville, VA, June 1993. |
| 1992 | \$680 | Travel grant from MicroFab Technologies, Inc., to attend Solder Jet Consortium Meeting, Plano, TX, December 1992. |
| 1992 | \$1,000 | Travel grant from Sandia National Laboratories, to attend Third International Workshop on Materials and Mechanics Issues of Solder Alloy Applications, Santa Fe, NM, September 1992. |
| 1992 | \$480 | Travel grant from Sandia National Laboratories, to attend authors meeting in Albuquerque, NM, June 1992. |

VIII. OTHER PROFESSIONAL ACTIVITIES

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| 1994 | Attended Ball-Grid Array/Flip-Chip Workshop, Institute of Electrical and Electronics Engineers, Binghamton, NY, October 19-21, 1994. |
| 1993 | Attended the ASCE/ASME/SES Engineering Mechanics Specialty Conference, Charlottesville, VA, June 1993. |
| 1992 | Attended Solder-Jet Consortium Meeting (invitation-only), MicroFab Technologies, Inc., Plano, TX, December 16, 1992. |
| 1992 | Attended one-day workshop entitled "Tech Notes in Fine Pitch Manufacturing," sponsored by Electronics Manufacturing Productivity Facility, Indianapolis, IN, November 4, 1992. |
| 1990 | Attended one-day workshop entitled "Understanding Modal Analysis," Milwaukee, WI, April 19, 1990. |
| 1990 | Attended three-day short course entitled "Fundamentals for Implementing Surface Mount Technology for Highest Yields and Product Reliability," Milwaukee, WI, April 4-6, 1990. |
| 1987 | Attended a one-week short course entitled "Wind Engineering," sponsored by Federal Emergency Management Agency, Emmitsburg, MD, 1987. |
| 1987 | Attended Ronald S. Rivlin Symposium and ASME Winter Annual Meeting, Boston, MA, 1987. |
| 1986 | Attended the Georgia Institute of Technology Centennial Colloquium, School of Civil Engineering, 1986. |
| 1985 | Attended the 22nd Annual Meeting of the Society of Engineering Science, University Park, PA, 1985. |

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