Thomas W. Kenny

Department of Mechanical Engineering, Stanford University, Stanford, CA 94305-4021
Home : 2820 Greenwich St #2, San Francisco, CA 94123
(415) 725-3805 kenny@cdr.stanford.edu

Education

- University of California, Berkeley
  Ph D Physics June 1989
- University of Minnesota, Minneapolis
  BS Physics March 1983

Experience

Senior Associate Dean of Engineering for Student Affairs, Stanford. 7/15-present.

Director, Founder, recent CEO, BoD Member, Applaud Medical 11/14-present.

- Non-invasive therapy for Kidney Stones using unfocused energy and Acoustic Enhancer
- Appointed as CEO 2/2020, leading effort to launch Pivotal FDA Clinical Trial.

Founder, Member, Board of Directors, Chair of Technical Advisory Board, SiTime 8/04-11/14

- CMOS-Compatible MEMS Resonators for Electronic Products.
- SITM on Nasdaq, >$2B Market Cap, World-leading supplier of MEMS-based oscillators

CTO and Founder Cooligy, 6/02-3/05

- Liquid cooling of microprocessors and other high power-density electronic devices.

Program Manager, DARPA Microsystems Technology Office, 10/06-10/10

- Launched $250M program on Nanotechnology, Thermal Management and Nanomanufacturing.

Professor, Department of Mechanical Engineering, Stanford University, 1/94-Present

- Leading Micromechanical Systems Research Group, with emphasis on development of high-performance microsensors, and measurements of fundamental properties of microstructures.
- Active research in Micromechanical Resonators for Time References, Encapsulated Inertial Sensors, Optimal Design of MEMS Structures, Wafer-Scale Packaging of MEMS Devices.
- Teaching Mechatronics, Sensors and Measurement, and others

Staff Scientist, Technical Group Leader, Jet Propulsion Laboratory, 7/89-1/94.

- Led the design, construction, and characterization of novel micromachined Si infrared detectors magnetometers and accelerometers based on a novel displacement transducer.
- Participated in development of meterological instrumentation (pressure, wind, temperature, humidity,...), seismological instrumentation, deformable optical elements, instrumented neurological probes, soil chemistry apparatus, calibration parts for space telescopes,...

Research Assistant, Physics Department, University of California, Berkeley. 1/84-7/89.

- Measured of the heat capacity of ^{4}He submonolayers on metallic films, showing them to be in a 2-dimensional Bose gas phase, in contradiction to similar measurements on other substrates.

Honors

• Recipient	Elected to the National Academy of Engineering	2/22
• Recipient	Stanford Presidential Award for Excellence in Diversity	6/19
• Recipient	Tau Beta Pi Teaching Honor Roll	6/19
• Recipient	IEEE Daniel Noble Award for Emerging Technologies	9/18
• Recipient	IEEE Sensors Council Technical Achievement Award	9/11
• Winner	Coed Ultimate Frisbee National and World Champion	11/98, 11/99
• Recipient	NSF CAREER Award	7/95
• Recipient	R+D 100 Award	5/93
• Recipient	Distinguished Teaching Award	6/89
• Recipient	AT&T Bell Laboratories Fellowship	8/86-6/89

APPLE 2002
AliveCor v. Apple
IPR2023-00950

Litigation Experiences

- 2022 retained as Expert Witness by Apple to prepare IPR responses and declarations for patents related to noise cancellation. Two of these cases has been instituted for IPR, and others are pending decision. There have been reports, settlements and joinders involving multiple parties, with the current clients being Sony, Meta and LG.

- 2021 retained as Expert Witness by Apple for IPR challenge of a pair of patents describing use of inertial sensors for monitoring of posture and movement of humans for diagnostics and training. Reports were prepared, and the board recently ruled all claims of both patents invalid.

- 2020 retained as Expert Witness by Apple in multiple patents related to design of optical physiological monitors. IPRs were initially instituted against all thirteen challenged patents. Subsequent work included preparation and submission of reports and responses, and numerous depositions. In a string of final written decisions that issued from February through May 2022, the patent board invalidated all but one challenged claim of the thirteen patents, subsequent appeals were recently resolved. There is ongoing work here related to more recent patent challenges by both sides.

- 2019 retained as Expert witness in case related to wearable baby monitors, including motion and temperature sensors. Case settled during drafting of expert infringement report.

- 2018, retained as Expert witness by attorneys representing Apple in a case related to algorithms for sensing motion and other physiological parameters in wearable devices,. Case settled after going on hold for IPR evaluation of IP.

- 2016, Expert Witness in case involving optical proximity sensors in smartphones. I was retained by HTC America and Capella, who were defendants in the case. I was compensated by defendants for work involving Invalidity and Non-Infringement reports, and was deposed after expert reports on invalidity and non-infringement. This case settled just a few weeks before trial in march 2017. This was Case Action No. 2:15-cv-1524-JRG in Marshall Texas.

- 2015, Expert Witness in Mayfonk –vs- Nike patent infringement suit brought by Mayfonk. I prepared expert reports on validity and non-infringement. The case settled just before depositions were taken. I was compensated by Nike for this work. This was case # Civil No.3:14-cv-00423-MO in the District of Oregon.

- 2013-2014, Expert Witness in ST Microelectronics –vs- Invensense patent infringement suit brought in the ITC by ST. I assisted in claim construction, prepared expert reports on claim construction, validity and infringement, and provided deposition testimony. This case settled after opening statements. I was compensated by Invensense for this work. This was ITC Investigation # 337-TA-876.

- 2011-2012, Expert Witness in St. Jude Medical-vs-Volcano Corp patent infringement suit and counter suit. Assisted in claim construction, prepared expert reports, provided deposition testimony and trial testimony. I was compensated by Volcano Corporation for this work.

- 2011, Retained by Maxim Integrated Systems to examine documents and prepare opinions as to the value of certain documents in the possession of former employees of ST Microelectronics. I was compensated by Maxim for this work. This was Italian proceeding Rg. 50253/2011.

Books :

J.E. Carryer, M.Ohline and T.W. Kenny, "Introduction to Mechatronic Design", Pearson (2011).

Refereed Journal Publications:

1. J. Sun, S. Yu, H. Zhang, D. Chen, X. Zhou, C. Zhao, **D.D. Gerrard, H-K Kwon, G. Vukasin**, D. Xiao, T.W. Kenny, X. Wu, A. Seshia, "Generation and Evolution of Phononic Frequency Combs via Coherent Energy Transfer Between Mechanical Modes", Physical Review Applied 19, 014031 (2023)

2. G. Margiani, S. Guerrero, T.L Heugel, C. Marty, R. Pachlatko, T. Gisler, **G.D. Vukasin, H-K. Kwon, J.M.L. Miller, N.E. Bousse,** T.W. Kenny, O. Zilberberg, D. Sabonis, A. Eichler, "Extracting the Lifetime of a Synthetic 2-Level System", Applied Physics Letters 121, 164101 (2022).

3. **N.E. Bousse,** S.E. Kuenstner, **J.M.L. Miller, H-K. Kwon, G.D. Vukasin,** J.D. Teufel, and T.W. Kenny, "Dispersive Readout of a High-Q Micromecanical Resonator", Applied Physics Letters 121, 73503 (2022).

4. **J.M.L. Miller, G.D. Vukasin,** Z. Zhang, **H-K. Kwon**, A. Majumdar, T.W. Kenny, and S.W. Shaw, "Effect of Remote Boundary Conditions on Clamping Loss in Micromechanical Resonators", JMEMS 3, 204 (2022).

5. **J.M.L. Miller, A. Gomez-Franco, D.D. Shin, H-K Kwon**, and T.W. Kenny, "Amplitude stabilization of micromechanical oscillators using engineered nonlinearity" Physical Review Research 3, 033268 (2021).

6. S. Shin, **H-K Kwon, G.D. Vukasin**, T.W.Kenny and F. Ayazi, "A temperature compensated biaxial eFM accelerometer in Epi-seal process" Sensors and Actuators A 330, 112860 (2021).

7. Y. Wang, Y.W. Lin, **J. Glaze, G.D. Vukasin, D.D. Shin, Hyun-Keun Kwon, D.B. Heinz, Y. Chen, D.D. Gerrard**, T.W. Kenny, Andrei M Shkel, "Quantification of Energy Dissipation Mechanisms in Toroidal Ring Gyroscope", JMEMS 30, 193 (2021).

8. J.S. Katz, C. Zhang, M.T. Barako, **H.J.K. Kim**, M. Asheghi, T.W. Kenny, and K.E. Goodson, "Bicontinuous Mesoporous Metal Foams with Enhanced Conductivity and Tunable Pore Size and Porosity via Electrodeposition for Electrochemical and Thermal Systems", ACS Appl. Nano Mater. 2020, 3, 12, 12408 (2020)

9. V. Zega, G. Gattere, **S. Koppaka, A. Alter, G.D. Vukasin**, A. Frangi, and T.W. Kenny, "Numerical Modelling of Non-Linearities in MEMS Resonators", JMEMS 29, 1443 (2020).

10. **A.L. Alter, I.B. Flader, Y. Chen, L.C. Ortiz, D.D. Shin**, and T.W. Kenny, "Characterization of Accelerated Fatigue in Thick Epi-Polysilicon Vacuum Encapsulated MEMS Resonators", JMEMS 29, 1483 (2020).

11. J.S. Katz, C. Zhang, M.T. Barako, **H.J.K. Kim**, M. Asheghi, T.W. Kenny, and K.E. Goodson, "Bicontinuous Mesoporous Metal Foams with Enhanced Conductivity and Tunable Pore Size and Porosity via Electrodeposition for Electrochemical and Thermal Systems", ACS Appl. Nano Mater. 2020, 3, 12, 12408 (2020)

12. V. Zega, G. Gattere, **S. Koppaka, A. Alter, G.D. Vukasin**, A. Frangi, and T.W. Kenny, "Numerical Modelling of Non-Linearities in MEMS Resonators", JMEMS 29, 1443 (2020).

13. **A.L. Alter, I.B. Flader, Y. Chen, L.C. Ortiz, D.D. Shin**, and T.W. Kenny, "Characterization of Accelerated Fatigue in Thick Epi-Polysilicon Vacuum Encapsulated MEMS Resonators", JMEMS 29, 1483 (2020).

14. **J.M.L. Miller**, H. Zhu, S. Sundaram, **G.D. Vukasin, Y. Chen, I.B. Flader, D.D. Shin**, and T.W. Kenny, "Limits to Thermal-Piezoresistive Cooling in Silicon Micromechanical Resonators", JMEMS 29, 677 (2020).

15. **H.K. Kwon, G.D. Vukasin, N.E. Bousse,** and T.W. Kenny, "Crystal Orientation Dependent Dual Frequency Ovenized MEMS Resonator With Temperature Stability and Shock Robustness", JMEMS 29, 1130 (2020).

16. **G.D. Vukasin, V.K. Sanchez, J. Glaze, N.E. Bousse**, N. Bissel, **D.D. Shin, H.K Kwon, D. Heinz,** E.T-T Yen, and T.W. Kenny, "Anchor Design Affects Dominant Energy Loss Mechanism in a Lamé Mode MEM Resonator", JMEMS 29, 860 (2020).

17. **J.M.L. Miller, D.D. Shin, H.K. Kwon**, S.W. Shaw, and T.W. Kenny, "Spectral narrowing of parametrically pumped thermomechanical noise", Applied Physics Letters 117, 033504 (2020).

18. **A.L. Alter, I.B. Flader, Y. Chen, D.D. Shin**, and T.W. Kenny, "Nonlinear Dissipation in Epitaxial SCS and Polysilicon MEMS Driven at Large Amplitudes", JMEMS 29, 1118 (2020).

19. **N.E. Bousse, J.M.L Miller, A.L. Alter, C.P. Cameron, H.K. Kwon, G.D. Vukasin**, and T.W. Kenny, "Negative Nonlinear Dissipation in Microelectromechanical Beams", JMEMS 29, 954 (2020).

20. **A.L. Alter, D.D. Gerrard, H.K. Kwon, G.D. Vukasin**, and T.W. Kenny, "Quality Factor Extraction and Enhancement Across Temperature in Ring Resonators", JMEMS 29, 1124 (2020).

21. Z. Mohammadi, T.L. Heugel, **J.M.L. Miller, D.D. Shin, H.K. Kwon**, T.W. Kenny, R. Chitra, Oded Zilberberg, and L.G. Villanueva, "On the effect of linear feedback and parametric pumping on a resonators frequency stability", arXiv preprint arXiv:2006.00650 (2020).

22. **L.C. Ortiz, H.K. Kwon, J. Rodriguez, Y. Chen, G.D. Vukasin, D.B. Heinz, D.D. Shin**, and T.W. Kenny, "Low-Power Dual Mode MEMS Resonators With PPB Stability Over Temperature", JMEMS 29, 190 (2020).

23. **N.E. Bousse, J.M.L. Miller, H.K. Kwon, G.D. Vukasin**, and T.W. Kenny, "Quality factor tuning of micromechanical resonators via electrical dissipation", Applied Physics Letters 116, 023506 (2020).

24. X. Zhou, C. Zhao, D. Xiao, J. Sun, G. Sobreviela, **D.D. Gerrard, Y. Chen, I. Flader**, T.W. Kenny, X. Wu, and A.A. Seshia, "Dynamic modulation of modal coupling in microelectromechanical gyroscopic ring resonators", Nature Communications 10, 1 (2019).

25. **J.M.L. Miller, D.D. Shin, H.K. Kwon**, S.W. Shaw, and T.W. Kenny, "Phase Control of Self-Excited Parametric Resonators", Physical Review Applied 12 (4), 044053 (2019).

26. **J.M.L. Miller, N.E. Bousse, D.B. Heinz, H.J. Kim, H.K. Kwon, G.D. Vukasin** and T.W. Kenny, "Thermomechanical-Noise-Limited Capacitive Transduction of Encapsulated MEM Resonators", JMEMS 28, 965 (2019).

27. Y. A. Pishchalnikov, W. M. Behnke-Parks, K. Schmidmayer, K. Maeda, T. Colonius, T.W. Kenny, D.J. Laser, "High-speed video microscopy and numerical modeling of bubble dynamics near a surface of urinary stone", The Journal of the Acoustical Society of America 146, 516 (2019).

28. **I.B. Flader, Y. Chen, Y. Yang, E.J. Ng, D.D. Shin, D.B. Heinz, L. Comenencia Ortiz, A.L Alter**, W. Park, K.E. Goodson, T.W. Kenny, "Micro-Tethering for Fabrication of Encapsulated Inertial Sensors with High Sensitivity", JMEMS 28, 372 (2019).

29. **H.J. Kim, K. Kaplan**, P. Schindler, S. Xu, **M.M. Winterkorn, D. Heinz, T. English**, J, Provine, F.B. Prinz, T. Kenny, "Electrical Properties of Ultrathin Platinum Films by Plasma Enhanced Atomic Layer Deposition", ACS Applied Materials and Interfaces, 11, 9594 (2019).

30. **J. Rodriguez**, S.A.Chandorkar, C.A. Watson, G.M, Glaze, **C.H. Ahn, E.J. Ng, Y. Yang**, T.W. Kenny, "Direct Detection of Akhiezer Damping in a Silicon MEMS Resonators", Scientific Reports 9, 2244 (2019).

31. **J.M.L. Miller**, A. Ansari, **D.B. Heinz, Y. Chen, I.B. Flader, D.D. Shin**, L.G. Villanueva and T.W. Kenny, "Effective Quality Factor Tuning Mechanisms in Micromechanical Resonators", Applied Physics Reviews 5, 041307 (2018).

32. **J.M.L. Miller**, H. Zhu, **D.B. Heinz, Y. Chen, I.B. Flader, D.D. Shin**, J.E-Y. Lee, T.W. Kenny, "Thermal-Piezoresistive Tuning of the Effective Quality Factor of a MicroMechanical Resonator", Physical Review Applied, 10, 044055 (2018).

33. **J. Rodriguez**, S.A.Chandorkar, G.M, Glaze, **D.D. Gerrard, Y. Chen, D.B. Heinz, I.B. Flader**, T.W. Kenny, "Direct Detection of Anchor Damping in MEMS Tuning Fork Resonators", JMEMS 27, 1 (2018).

34. M. Mellema, W. Behnke-Parks, A. Luong, M. Hopcroft, Claire Mills, S. Ho, R. Hsi, D. Laser, T. Kenny, R. Grubbs, M. Stoller, "Absence of Ureteral/Renal Injury Following Low-Intensty Extracorporeal Acoustic Energy Lithotripsy with Stone-Targeting Microbubbles in an in-vivo Swine Model", The Journal of Urology 199,4 pe479, (2018).

35. **L. Comenencia Ortiz, D.B. Heinz, I.B. Flader, A.L. Alter, D.D. Shin, Y. Chen** and T.W. Kenny, "Assessing failure in epitaxially encapsulated micro-scale sensors using micro and nano x-ray computed tomography", MRS Communications 8, 275 (2018).

36. M.T. Barako, **T.S. English**, S. Roy-Panzer, T.W. Kenny and Kenneth E Goodson, "Dielectric barrier layers by low-temperature plasma-enhanced atomic layer deposition of silicon dioxide", Thin Solid Films 649, 24 (2018).

37. **Y. Chen, I.B. Flader, D.D. Shin, C.H. Ahn, J. Rodriguez** and T.W. Kenny, "Robust Method of Fabricating Epitaxially Encapsulated MEMS Devices with Large Gaps", JMEMS 26, 1235 (2017).

38. W. Park, **D.D. Shin**, S.J. Kim, J.S. Katz, J. Park, **C.H. Ahn**, T. Kodama, M. Asheghi, T.W. Kenny, K.E. Goodson, "Phonon Conduction in Silicon Nanobeams", Appl, Phys. Lett. 110, 213102 (2017).

39. F. Purkl, A.Daus, **T. English**, J Provine, A. Feyh, G. Urban, T. Kenny, "Measurement of Young's modulus and residual stress of atomic layer deposited Al2O3 and Pt thin films", J. Micromech. Microeng. 27, 085008 (2017)

40. G.Agarwal, T. Kazior, T. Kenny, D. Weinstein, "Modeling and analysis for thermal management in Gallium Nitride HEMTs using microfluidic cooling", Journal of Electronic Packaging 139, 11001 (2017).

41. J. Atalaya, T.W. Kenny, M.L Roukes, M.I Dykman, "Nonlinear damping and dephasing in nanomechanical systems", Physical Review B, 94, 15440 (2016).

42. O. Shoshani, **D. Heywood, Y. Yang**, T.W. Kenny, and S.W. Shaw, "Phase Noise Reduction in an MEMS Oscillator Using a Nonlinearly Enhanced Synchronization Domain", JMEMS 25 (2016).

43. **Y. Yang, E.J. Ng,** P.M. Polunin, **Y.Chen, I.B. Flader**, S.W. Shaw, M.I. Dykman, and T.W. Kenny, "Nonlinearity of Degenerately Doped Bulk-Mode Silicon MEMS Resonators", JMEMS 25, 859 (2016).

44. **T.S. English**, J Provine, A.F. Marshall, A.L. Koh, T.W. Kenny, "Parallel preparation of plan-view transmission electron microscopy specimens by vapor-phase etching with integrated etch stops", Ultramicroscopy 166, 39 (2016).

45. **Y. Yang, E.J. Ng, Y. Chen, I.B. Flader**, T.W. Kenny, "A Unified Epi-Seal Process for Fabrication of High-Stability Microelectromechanical Devices", JMEMS 25, 489 (2016).

46. **D.B. Heinz, V.A. Hong, C.H. Ahn, E.J. Ng, Y. Yang**, and T.W. Kenny, "Experimental Investigation into Stiction Forces and Dynamic Mechanical Anti-Stiction Solutions in Ultra-Clean Encapsulated MEMS Devices", JMEMS 25, 469 (2016)

47. P.M. Polunin, **Y. Yang**, M.I. Dykman, T.W. Kenny, and S.W. Shaw, "Characterization of MEMS Resonator Nonlinearities Using the Ringdown Response", JMEMS 25, 297 (2016).

48. **C.H. Ahn, E.J Ng, V.A Hong, J. Huynh, S. Wang**, and T.W. Kenny, "Characterization of Oxide-Coated Polysilicon Disk Resonator Gyroscope Within a Wafer-Scale Encapsulation Process", JMEMS 24, 1687 (2015).

49. B.W. Soon, Y. Qian, **E.J. Ng, V.A. Hong, Y. Yang, C.H. Ahn**, T.W. Kenny, and C. Lee, "Investigation of a Vacuum Encapsulated Si-to-Si Contact Microswitch Operated From− 60° C to 400° C", JMEMS 24 1906, (2015).

50. **Y. Won**, Y. Gao, R. Guzman de Villoria, B.L. Wardle, R. Xiang, S. Maruyama, T.W. Kenny, and K.E. Goodson, "Nonhomogeneous morphology and the elastic modulus of aligned carbon nanotube films", Journal of Micromechanics and Microengineering 25, 115023 (2015).

51. M.T Barako, S. Roy-Panzer, T.S. English, T. Kodama, M. Asheghi, T.W. Kenny, and K.E. Goodson, "Thermal Conduction in Vertically Aligned Copper Nanowire Arrays and Composites", ACS Applied Materials and Interfaces, 34, 19251 (2015).

52. V. Zega, S.H. Nitzan, M. Li, **C.H. Ahn, E. Ng, V. Hong, Y.Yang**, T.W. Kenny, A. Corigliano, and D.A. Horsley, "Predicting the closed-loop stability and oscillation amplitude of nonlinear parametrically amplified oscillators", Appl. Phys. Lett. 106, 233111 (2015).

53. S.H. Nitzan, V. Zega, M. Li, **C.H. Ahn**, A. Corigliano, T.W. Kenny and D.A. Horsley, "Self-Induced Parametric Amplification arising from Nonlinear Elastic Coupling in a Micromechanical Resonating Disk Gyroscope", Scientific Reports 5:9036 (2015)

54. **C.H. Ahn, E.J. Ng, V.A. Hong, Y.Yang, B. Lee, I. Flader** and T.W. Kenny, "Mode-Matching of Wineglass-Mode Disk Resonator Gyroscope in (100) Single Crystal Silicon", JMEMS 24, 343 (2015).

55. **V.A. Hong, S. Yoneoka, M.W. Messana, A.B. Graham, J.C. Salvia, T.T. Branchflower, E.J. Ng** and T.W. Kenny, "Fatigue Experiments on Single-Crystal Silicon in an Oxygen-Free Environment", JMEMS 24, 351 (2015).

56. **E.J. Ng, V.A. Hong, Y. Yang, C.H. Ahn, C.L.M. Everhart** and T.W. Kenny, "Temperature Dependence of the Elastic Constants of Doped Silicon", JMEMS 24 730, (2015)

57. C.L. Roozeboom, B.E. Hill, **V.A. Hong, C.H. Ahn, E.J. Ng, Y. Yang**, T.W. Kenny, M.A. Hopcroft and B.L. Pruitt, "Multifunctional Integrated Sensors for MultiParameter Monitoring Applications", JMEMS 24, (2015).

58. **S. Ghaffari, E.J. Ng, C.H. Ahn, Y.Yang, S. Wang, V.A. Hong**, and T.W. Kenny, "Accurate Modeling of Quality Factor Behavior of Complex MEMS Resonators", JMEMS 24, 276 (2015)

59. **C.H. Ahn**, S. Nitzan, **E.J. Ng, V.A. Hong, Y. Yang, T. Kimbrell**, D.A. Horsley, and T.W. Kenny, "Encapsulated High Frequency (235 kHz), High-Q (100k) Disk Resonator Gyroscope with Electrostatic Parametric Pump", Applied Physics Letters, 105, 243504 (2014).

60. B.W. Soon, **E.J. Ng, V.A. Hong, Y. Yang, C.H. Ahn**. Y. Quan, T.W. Kenny and C. Lee, "Fabrication and Characterization of a Vacuum-Encapsulated Curved Beam Switch for Harsh Environment Application", JMEMS 23, 1121 (2014).

61. Y.Won, Y. Gao, M.A. Panzer, R.Xiang, S. Maruyama, T.W. Kenny, W. Cai, and K.E. Goodson, "Zipping, entanglement, and the Elastic Modulus of Aligned Single-Walled Carbon Nanotube Films", Proceedings of the National Academy of Sciences, 110, 20426 (2013).

62. **M.A. Philippine**, H. Zareie, O. Sigmund, G.M. Rebeiz, and T.W. Kenny, "Experimental Validation of Topology Optimization for RF MEMS Capacitive Switch Design", JMEMS 22, 1296 (2013).

63. **S. Ghaffari, S.A. Chandorkar, S. Wang, E.J. Ng, C.H Ahn, V. Hong, Y. Yang**, and T.W. Kenny, "Quantum Limit of Quality Factor in Silicon Micro and Nano Mechanical Resonators", Scientific Reports, 3:3244 (2013).

64. M. Li, **E.J. Ng, V.A. Hong, C.H. Ahn, Y. Yang**, T.W. Kenny and D.A. Horsley, "Lorentz Force Magnetometer using a Micromechanical Oscillator", Appl. Phys. Lett 103, (2013)

65. **H.K. Lee, R. Melamud, B. Kim, S. Chandorkar, J.C. Salvia** and T.W. Kenny, "The effect of Temperature-Dependent Nonlinearities on the Temperature Stability of Micromechanical Resonators", J. Appl. Phys. 114, (2013)

66. R.G. Hennessy, M.M. Shulaker, **M. Messana, A.B. Graham**, N. Klewa, J. Provine, T.W. Kenny and R.T. Howe, "Vacuum Encapsulated Resonators for Humidity Measurement", Sensors and Actuators B-Chemical 185, 575 (2013)

67. **S. Ghaffari, C.H. Ahn, E.J. Ng, S. Wang** and T.W. Kenny, "Crystallographic Effects in Modeling Fundamental behavior in MEMS Silicon Resonators", Microelectronics Journal 44, 586 (2013)

68. **E. Ng, H-K Lee, C-H Ahn, R. Melamud** and T.W. Kenny, "Stability of Silicon Microelectromechanical Systems Resonant Thermometers", IEEE Sensors 13, (2013).

69. **M.A. Philippine**, O. Sigmund, G.M Rebeiz, and T.W. Kenny, "Topology Optimization of Stressed Capacitive RF MEMS Switches," JMEMS 22, 206 (2013).

70. J.C. Duda, **T.S. English**. E.S. Piekos, T.E. Beechem, T.W. Kenny and P.E. Hopkins, "Bidirectionality tuning Kapitza conductance through the inclusion of Substitutional Impurities", J. Appl. Phys 112, (2012).

71. **S. Yoneoka**, J. Lee, M. Liger, G. Yama, T. Kodama, M. Gunji, R.T. Howe, K.E. Goodson and T.W. Kenny, "Electrical and Thermal Conduction in Atomic Layer Deposition Nanobridges down to 7nm Thickness", NanoLett, 12 (2) 683 (2012).

72. **Y. Won**, J.Lee, M. Asheghi, T.W. Kenny, and K.E. Goodson "Phase and thickness dependent modulus of $Ge_2Sb_2Te_5$ films down to 25 nm thickness", Appl. Phys. Lett 100, 161905 (2012).

73. **Y. Won**, Y. Gao. M.A. Panzer, S. Dogbe, L. Pan, T.W. Kenny, and K.E. Goodson, "Mechanical Characterization of Aligned Milti-Walled Carbon Nanotube Films using Microfabricated Resonators", Carbon 50, 347 (2012)

74. **H.K. Lee, R. Melamud, S. Chandorkar, J.G. Salvia, S. Yoneoka** and T.W. Kenny, "Stable Operation of MEMS Oscillators Far Abve the Critical Vibration Amplitude in the Nonlinear Regime", JMEMS Letters 20,1228 (2011).

75. K.P. Bloschock, A.R. Schofield, and T.W Kenny, "Tip-Based Nanofabrication : An Approach to True Nanotechnology", Proceedings of the SPIE 8031, 803102 (2011).

76. **H.K. Lee, R. Melamud, B. Kim, M.A. Hopcroft, J.G. Salvia**, and T.W. Kenny, "Electrostatic Tuning to Achieve Higher Stability Micromechanical Composite Resonators", JMEMS 20, 1355 (2011).

77. **G. Bahl, S. Wang, J.C. Salvia, R. Melamud**, R.T. Howe and T.W. Kenny, "AC Polarization for Charge-Drift Elimination in Resonant Electrostatic MEMS and Oscillators", IEEE JMEMS 20, 355-364 (2011).

78. **H.K. Lee, B. Kim, R. Melamud, M.A. Hopcroft, J.C. Salvia and T.W. Kenny, "**Influence of the Temperature-Dependent Nonlinearities on the Performance of Micromechanical Resonators", Appl. Phys. Lett 99, 194102 (2011).

79. **Y. Won, E.N. Wang,** K.E. Goodson and T.W. Kenny, "3-D Visualization of Flow in Microscale Jet Impingement Systems", International Journal of Thermal Sciences, 50, 325 (2011).

80. **K-L. Chen, S. Wang, J.C. Salvia. R. Melamud** R.T. Howe and T.W. Kenny, "Wafer-Level Epitaxial Silicon Packaging for Out-of Plane RF MEMS Resonators with Integrated Actuation Electrodes", IEEE Transactions on Components, Packaging and Manufacturing Technology Vol 1, 310-317 (2011).

81. **G. Hill, D. Soto**, A. Peattie, R.J. Full, T.W. Kenny, "Orientation angle and the adhesion of single gecko setae", Journal of the Royal Society Interface, Vol 8 926-933 (2011).

82. **S. Yoneoka, J.C. Salvia, G. Bahl, R. Melamud, S.A, Chandorkar**, and T.W. Kenny, "Active Electrostatic Compensation of Micromechanical Resonators under Random Vibrations", IEEE JMEMS 19, 1270 (2010).

83. A.R. Schofield, K,P, Bloschock, and T.W Kenny, "Tip-Based Nanofabrication : An Approach to True Nanotechnology", Proceedings of the SPIE 7637, 76371 (2010).

84. **D. Soto, G. Hill**, A. Parness, N. Esparza, M. Cutkosky, and T. Kenny, "Effect of Fibril Shape on Adhesive Properties", Appl. Phys Lett 97, 153701 (2010).

85. **M.A. Hopcroft**, W.D. Nix, T.W. Kenny, "What is the Young's Modulus of Silicon?", IEEE JMEMS 19, 229 (2010).

86. **S. Yoneoka,** C.S. Roper**, R.N. Candler, S.A. Candorkar, A.B. Graham**, J. Provine, R. Maboudian, R.T. Howe, and T.W. Kenny, "Characterization of Encapsulated Micromechanical Resonators Sealed and Coated with Polycrystalline SiC", IEEE JMEMS 19, 357 (2010).

87. **A.B. Graham, M.W. Messana**, P.G. Hartwell, J. Provine, **S. Yoneoka, R. Melamud, B. Kim**, R.T. Howe and T.W. Kenny, "A Method for Wafer-Scale Encapsulation of Large Lateral-Deflection MEMS Devices", IEEE JMEMS 19, 28 (2010).

88. **G. Bahl, R. Melamud, B. Kim, S.A. Chandorkar, J.C. Salvia, M.A. Hopcroft**, D. Elata, R.G. Hennessy, R.N. Candler, R.T. Howe and T.W. Kenny, "Model and Observations of Dielectric Charge in Thermally-Oxidized Silicon Resonators", IEEE JMEMS 19, 162, (2010).

89. **J.C. Salvia, R. Melamud, S.A. Chandorkar, S.F. Lord** and T.W. Kenny, "Real-Time Temperature Compensation of MEMS Oscillators using an Integrated Micro-Oven and a Phase-Locked Loop", IEEE JMEMS 19, 192 (2010).

90. **R. Melamud, S.A. Chandorkar, B. Kim, HK Lee, J. Salvia, G. Bahl, MA Hopcroft**, and TW Kenny, "Temperature-Insensitive Composite Micromechanical Resonators", IEEE JMEMS 18, 1409 (2009).

91. **V. Ayanoor-Vitikkate, K-L Chen, W.T. Park,** T.W. Kenny, "Development of Wafer-Scale Encapsulation Process for Large Displacement Piezoresistive MEMS Device", Sensors and Actuators A 156, 275 (2009).

92. **K-L Chen, J. Salvia,** R. Potter, R.T. Howe, and T.W. Kenny, "Performance evaluation and equivalent model of silicon interconnects for fully-encapsulated RF MEMS devices", IEEE Transactions on Advanced Packaging 32, p. 402-9 (2009).

93. **S.A. Chandorkar, R.N Candler, A. Duwel, R. Melamud, M. Agarwal**, K.E. Goodson, T.W. Kenny, "Multimode thermoelastic dissipation", Journal of Applied Physics105, P 043505 (13 pp.) **(**2009).

94. **B. Kim, R.N. Candler, R. Melamud, M.A. Hopcroft, S. Yoneoka, H-K Lee, M. Agarwal, S.A. Chandorkar,** G. Yama, and T.W. Kenny, "Hermeticity and diffusion investigation in polysilicon film encapsulation for microelectromechanical systems", Journal of Applied Physics105 pp. 013514 (10 pp.), (2009).

95. **C.M. Jha, J. Salvia, S.A. Chandorkar, R. Melamud**, E. Kuhl, T.W. Kenny, "Acceleration insensitive encapsulated silicon microresonator", Applied Physics Letters 93 P. 234103 (3 pp.) (2008)

96. **B. Kim, M.A. Hopcroft, R.N. Candler, C.M. Jha, M. Agarwal, R. Melamud, S.A. Chandorkar**, G. Yama, T.W. Kenny, "Temperature Dependence of Quality Factor in MEMS Resonators", JMEMS 17, 755 (2008).

97. **M. Agarwal, SA Chandorkar, H. Mehta, RN Candler, B, Kim, MA Hopcroft, R. Melamud**, TW Kenny, and B. Muhrmann, "A Study of Electrostatic Force nonlinearities in Resonant Microstructures", Appl. Phys Lett. 92, 104 (2008).

98. **M. Swartwout**, C Kitts, R. Twiggs, T.W. Kenny, B.R. Smith, R. Lu, K. Stattenfield, F. Pranajaya, "Mission Results for a Student-Built Satellite", ACTA Astronautica 62, 521 (2008).

99. **C.M. Jha, M.A. Hopcroft, S.A. Chandorkar, J.C. Salvia, M. Agarwal, R.N Candler, R. Melamud, B. Kim,** and T.W. Kenny, "Thermal Isolation of Encapsulated MEMS Resonators", JMEMS 17, 175 (2008).

100. **W.T. Park**, K.N. O'Connor**, K.L. Chen,** J.R. Mallon, T. Maetani**, P. Dalal, R.N. Candler, V. Ayanoor-Vitikkate**, J.B. Roberson, S. Puria, and T.W. Kenny**, "**Ultraminiature Encapsulated Accelerometers as a Fully-Implantable Sensors for Implantable Hearing Aids", Biomedical MicroDevices 9, 939 (2007).

101. **M. Bartsch**, W. Federle, R.J. Full and T.W. Kenny, "A Multi-Axis Force Sensor for the Study of Insect Biomechanics", JMEMS 16, 709 (2007).

102. **M.Agarwal, H.Mehta, R.N. Candler, S.A. Chandorkar, B. Kim, M.A. Hopcroft, R.Melamud, G. Bahl,** G. Yama[2], T. W. Kenny and B. Murmann, "Scaling of A-f nonlinearities in electrostatically transduced microresonators", Journal of Applied Physics 102, 74903 (2007).

103. **B. Kim, R.N. Candler, M.A. Hopcroft; M. Agarwal, WT Park**, T.W. Kenny, "Frequency stability of wafer-scale film encapsulated silicon based MEMS resonators " Sensors and Actuators A (Physical), 136, 125 (2007).

104. **M.A. Hopcroft, B. Kim, S. Chandorkar, R. Melamud, M. Agarwal, C.M. Jha, G. Bahl, J.Salvia, H.Mehta, H.K.Lee, R.N.Candler,** T.W.Kenny, "Using the Temperature Dependence of Resonator Quality Factor as a Thermometer", Appl. Phys. Lett. **91**, 13505 (2007).

105. **J. Bower,** C. Mehls, N. Vora, R. Torii, and T Kenny, "Effect of Surface Roughness on Thin Film Niobium Coatings", IEEE Transactions on Applied Superconductivity 2, 768 (2007).

106. **O. Ajakaiye, J. Grade, C. Shin**, and T. Kenny, "Wafer-Scale Fabrication of Infrared Detectors based on Tunneling Displacement Transducers", Sensors and Actuators A (Physical) 134, 575 (2007).

107. **C. M. Jha, G. Bahl, R. Melamud, S. A. Chandorkar, M. A. Hopcroft, B. Kim, M. Agarwal, J. Salvia, H. Mehta**, and T. W. Kenny, "High Resolution microresonator-based digital temperature sensor", Appl. Phys. Lett 91, 74101 (2007).

108. **R. Melamud, B. Kim, S.A. Chandorkar, M.A. Hopcroft, M. Agarwal, C.M. Jha** and T.W. Kenny, "Temperature Compensated High-Stability Silicon Resonators", Appl. Phys. Lett. **90**, 244107 (2007).

109. **C.M. Jha, M.A. Hopcroft, S.A. Chandorkar, J.Salvia, M.Agarwal,R.N. Candler, R.Melamud, B.Kim**, and Thomas W. Kenny, "Thermal Isolation of Encapsulated MEMS Resonators" Accepted with Minor Revision JMEMS (2007).

110. **M. Agarwal, K.K. Park, S.A. Chandorkar, R.N. Candler, B. Kim, M.A. Hopcroft, R. Melamud,** T.W. Kenny, and B. Murmann**,** "Acceleration sensitivity in beam-type electrostatic microresonators", Appl. Phys. Lett. 90, 14103 (2007).

111. **M. Agarwal, S.A. Chandorkar, R.N. Candler, B. Kim, M.A. Hopcroft, R. Melamud, C.M. Jha,** T.W. Kenny and B. Murmann "Optimal drive condition for nonlinearity reduction in electrostatic MEMS resonators", Appl. Phys. Lett., 89, (2006)

112. **R.N. Candler, M.A. Hopcroft, B. Kim, W.-T. Park, R. Melamud, M. Agarwal,** G. Yama, A. Partridge, M. Lutz, and T.W. Kenny, "Long-Term and Accelerated Life Testing of a Novel Single-Wafer Vacuum Encapsulation for MEMS Resonators", JMEMS 15, 1446 (2006).

113. **E.N. Wang**, S. Devasenathipathy, H. Lin, C.H. Hidrovo, J.G. Santiago, K.E. Goodson, and T.W. Kenny, "A Hybrid Method for Bubble Geometry Reconstruction in Two-Phase Microchannels", Experiments in Fluids 40, 847 (2006).

114. C.H. Hidrovo, T.A. Kramer, **E.N. Wang,** S.Vigneron, **J.E. Steinbrenner**, J.M. Koo, F.M. Wang, **D.W. Fogg, R.D. Flynn**, E.S. Lee, C.H. Cheng, T.W. Kenny, J.K. Eaton, and K.E. Goodson, "Two-Phase Microfluidics for Semiconductor Circuits and Fuel Cells," Heat Transfer Engineering, 27, 53 (2006).

115. T.W. Kenny, K.E. Goodson, J.G Santiago, **E.N.Wang,** J-M Koo, L. Jiang, E. Pop, S. Sinha**, L. Zhang,** D. Fogg, S. Yao, R. Flynn, CH Chang, C.H. Hidrovo, "Advanced Cooling Technologies for Microprocessors", International Journal of High Speed Electronics and Systems, 15, 301 (2006).

116. A**.** Duwel, **R.N. Candler**, T.W. Kenny, M. Varghese, "Engineering MEMS Resonators with Low Thermoelastic Damping", IEEE JMEMS 15, 1437 (2006).

117. **R.N. Candler**, A. Duwel, M. Varghese, **S. Chandorkar, M. Hopcroft, W.T. Park, B. Kim**, G. Yama, A. Partridge, M. Lutz, and T.W. Kenny, "Impact of Geometry on Thermoelastic Dissipation in Micromechanical Resonant Beams", IEEE JMEMS 15, 927 (2006).

118. **W.T. Park,** A. Partridge, **R.N. Candler, V. Ayanoor-Vitikkate,** G. Yama, M. Lutz, and T.W. Kenny, "Encapsulated Sub-Millimeter Piezoresistive Accelerometers", JMEMS 15, 507 (2006).

119. **E.N. Wang,** S. Devasenathipathy, J.G. Santiago, K.E. Goodson, and T.W. Kenny, "Nucleation and Growth of Vapor Bubbles in a Heated Silicon Microchannel," ASME *Journal of Heat Transfer*, Vol. 128, p. 497. (2004)

120. B.W. King, T.W. Kenny, and K.E Goodson, "Comparison of Thermal and Piezoresistive Sensing Approaches for Atomic Force Microscopy Topography Measurements", Appl. Phys. Lett. 85, 2086 (2004).

121. **E.N. Wang, L. Zhang,** L. Jiang, J.M. Koo, J.G. Maveety, E.A. Sanchez, K.E. Goodson, and T.W. Kenny, "Micromachined Jets for Liquid Impingement Cooling of VLSI Chips", JMEMS 13, 833 (2004).

122. **L. Zhang, E.N. Wang**, K.E. Goodson, and T.W. Kenny, "Phase Change Phenomena in Silicon Microchannels", International Journal of Heat and Mass Transfer 48, 1572 (2005).

123. E.N. Renuart, **A.M. Fitzgerald**, T.W. Kenny, R. H. Dauskardt, "Fatigue Crack Growth in Micromachined Silngle Crystal Silicon", Journal of Materials Research 19, 2635 (2004).

124. J.P. Lynch, A. Sundararajan, K.H. Law, A.S. Kiremidjian, T. Kenny and S. Carryer, "Embedment of structural monitoring algorithms in a wireless sensing unit", Structural Engineering and Mechanics, 15, 285-97 (2003).

125. **R.N. Candler, W.T. Park, H.M. Li**, G. Yama, A. Partridge, M. Lutz, and T.W. Kenny, "Single Wafer Encapsulation of MEMS Devices", IEEE Transactions on Advanced packaging 26, 227 (2003).

126. **J.P. Lynch, A. Partridge**, K.H. Law, T.W. Kenny, A.S. Kiremidjian,E. Carryer, "Design of Piezoresistive MEMS-based Accelerometer for Integration with Wireless Sensing Unit for Structural Monitoring", Journal of AeroSpace Engineering, 16, 108 (2003).

127. **Y. Hishinuma**, T. Geballe, B. Moyzhes, and T.W. Kenny, "Measurements of Cooling by Room-Temperature Thermionic Emission across a Nanometer Gap" Journal of Applied Physics 94,4690 (2003).

128. **E.M. Chow, A. Partridge,** V. Chandrasekaran**,** M. Sheplak, C.F. Quate, and T.W. Kenny, "Process-Compatible Polysilicon-Based Through-Wafer Interconnects in Silicon Substrates", JMEMS, 11,631 (2002).

129. K. Autumn, M. Sitti, **Y.A. Liang**, A.M. Peattie, W.R. Hansen, S. Sponberg, T.W. Kenny, R. Fearing, J.N. Israelachvili, and R.J. Full, "Evidence for van der Waals adhesion in gecko setae", Proceedings of the National Academy of Science, 99, 12252 (2002).

130. K.E. Goodson, J.G. Santiago, T.W. Kenny, L. Jiang,, S. Zeng, J.M. Koo**, L. Zhang,** S. Yao, and **E.N. Wang,** "Electroosmotic Microchannel Cooling System for Microprocessors," *Electronics Cooling*, Vol. 8, No. 4, pp. 46-47. (2002)

131. **A.M. Fitzgerald**, T.W. Kenny, and R.H Dauskardt, "Stress wave interference effects during fracture of silicon micromachined specimens," IEEE Special Issue on Experimental Mechanics 43,317, (2003).

132. **B.L. Pruitt, W.-T. Park**, T. Kenny. Measurement System for Low Force and Small Displacement Contacts." *Journal of Micro-electro-mechanical Systems*. 13, 220 (2004).

133. W.P. King, T.W. Kenny, K.E. Goodson, G.L.W. Cross, M. Despont, U.T. Dürig, H. Rothuizen, G.K. Binnig, and P. Vettiger, "Design of Atomic Force Microscope Cantilevers For Combined Thermomechanical Writing and Thermal Reading in Array Operation," *Journal of MicroElectroMechanical Systems* 11, 765 (2002).

134. **A.E. Herr, J.I. Molho**, K.A. Drouvalakis, J.C. Mikkelsen, P.J. Utz, J.G. Santiago, and T.W. Kenny, "On-Chip Coupling of Isoelectric Focusing and Free Solution Electrophoresis for Multi-Dimensional Separations", Analytical Chemistry 75, 1180 (2003)

135. Jiang, L., Mikkelsen J., Koo J.-M., Huber D., Yao S., **Zhang L.,** Zhou P., Maveety J.G., Prasher R., Santiago J.G., Kenny T.W., & Goodson K.E., "Closed-loop electroosmotic microchannel cooling system for VLSI circuits", IEEE Transactions on Components & Packaging Technologies 25, 347 (2002).

136. **Y. Hishinuma**, B.Y. Moyzhes, T.H. Geballe, and T.W. Kenny, "Vacuum Thermionic Refrigeration with a Semiconductor Heterojunction Structure", Appl. Phys. Lett. 81, 4242 (2002).

137. **B.L. Pruitt**, T. Kenny. "Piezoresistive Cantilevers and Measurement System for Low Force Electrical Contact Measurements." *Sensors and Actuators, A* 104, 68 (2003).

138. J.Grade, H. Jerman, and T.W. Kenny, Design and Characterization of Large Displacement Electrostatic Actuators, JMEMS, 12, 335 (2003).

139. **E.M. Chow**, G. Yaralioglu, C.F. Quate, and T.W. Kenny, Characterization of a Two-Dimensional Cantilever Array with Through-Wafer Electrical Interconnects, Appl. Phys Lett. 80, 664 (2002).

140. B.C. Stipe, H.J. Mamin, C.S. Yannoni**, T.D. Stowe**, T.W. Kenny and D. Rugar "Electron Spin Relaxation near a Micron-Sized Ferromagnet", Phys. Rev. Lett. 87, 2776 (2001).

141. B.C. Stipe, H.J. Mamin**, T.D. Stowe**, T.W. Kenny and D. Rugar, Non-contact friction and force fluctuations between closely spaced bodies, Phys. Lett. Rev. 8709, 6801 (2001).

142. Rugar, B.C. Stipe, H.J. Mamin, C.S. Yannoni, **T.D. Stowe, K.Y. Yasumura** and T.W. Kenny Adventures in Attonewton Force Detection, Applied Physics A 72 [Suppl] S3-S10 (2001).

143. B. C. Stipe, H.J. Mamin, **T.D.Stowe**, T.W. Kenny and D. Rugar, Magnetic dissipation and fluctuations in individual nanomagnets measured by ultrasensitive cantilever magnetometry, Phys. Rev. Lett. 86 2874 (2001)

144. **L. Zhang,** J.M. Koo, L. Jiang, K.E. Goodson, J.G. Santiago, and T.W. Kenny, Measurements and Modeling of Two-Phase Flow in Microchannels with Nearly-Constant Heat Flux Boundary Conditions, JMEMS 11,12 (2002).

145. B.W. King, T.W. Kenny, K.E. Goodson, G. Cross, M. Despont, U. Durig, H. Rothuizen, G.K. Binnig, and P. Vettiger, Atomic Force Microscope Cantilevers for Combined Thermomechanical Data Writing and Reading, Appl. Phys. Lett. 78, 1300 (2001).

146. T.W. Kenny, Nanometer-Scale Force Sensing with MEMS Devices, Invited Review , IEEE Sensors 1,148 (2001).

147. **J.A. Harley** and T.W. Kenny, A High-Stiffness Axial Resonant Probe for Atomic Force Microscopy, JMEMS 10, 434 (2001)

148. **Y. Hisunuma**, T.H. Geballe , B.Y. Moyzhes, , and T.W Kenny, Refrigeration by Combined Tunneling and Thermionic Emission in Vacuum: Use of Nanometer Scale Design", Appl. Phys. Lett. 78, 2572 (2001).

149. **J.I. Molho, A.E. Herr,** B.P. Mosier, J.G. Santiago, T.W. Kenny, R.A Brennen, G.B. Gordon, B. Mohammadi, Optimization of Turn Geometries for On-Chip Electrophoresis, Analytical Chemistry 73, 1350 (2001).

150. **A.M. Fitzgerald**, R.S. Iyer, R.H. Dauskardt, and T.W. Kenny, Sub-Critical Crack Growth in Single Crystal Silicon Using Micromachined Specimens, Journal of Materials Research 17, 683 (2002).

151. **C.H. Liu**, and T.W. Kenny, A High-Precision, Wide-Bandwidth Micromachined Tunneling Accelerometer, JMEMS, 10,425 (2001)

152. K. Autumn, **Y. Liang**, W.P. Chan, T. Hsieh, R. Fearing, T.W. Kenny, and R. Full, Dry Adhesive Force of a Single Gecko Foot-Hair, Nature. 405: 681-685 (2000).

153. **A.E. Herr, J.I. Molho**, J.G. Santiago, M.G. Mungal, T.W. Kenny, and M.G. Garguilo, Electroosmotic Capillary Flow with Non-Uniform Surface Potential, Analytical Chemistry 72, 1053-1057 (2000).

154. **E.M. Chow**, H.T. Soh, H.C. Lee, J.D. Adams, S.C. Minne, G. Yaralioglu, A. Atalar, C.F. Quate, and T.W. Kenny, Integration of Through-Wafer Interconnects with a Two-Dimensional Cantilever Array, Sensors and Actuators 83, 118-123 (2000).

155. **K.Y. Yasumura, T.D. Stowe, E.M. Chow**, T.E. Pfafman, T.W. Kenny, B. Stipe, and D. Rugar, Quality Factors in Micron- and Submicron-Thick Cantilevers, JMEMS 9, 117-125 (2000).

156. **J.K. Reynolds**, D.C. Catling, R.C. Blue, N. Maluf, T.W. Kenny, Packaging a piezoresistive pressure sensor for pressure and temperature stability in a Martian environment, Sensors and Actuators 83, 142-149 (2000).

157. **R. G. Rudnitsky, E.M. Chow**, and T.W. Kenny, High-Speed Biological Screening with Magnetic Force Microscope Cantilever Arrays, Sensors and Actuators 83, 256-262 (2000).

158. **A.M. Fitzgerald**, T.W. Kenny, S.Iyer, R. Dauskard, Fracture Toughness and Crack-Growth Phenomena of Plasma-Etched Single Crystal Silicon, Sensors and Actuators 83, 194-199 (2000)

159. **J.A. Harley** and T.W. Kenny, Design and Process Optimization of Piezoresistive Cantilevers, JMEMS 9, 226-235 (2000).

160. T.D. Stowe, T.W. Kenny, D.J. Thompson, and D. Rugar, Silicon Dopant Imaging by Dissipation Force Microscopy, Appl. Phys Lett, 75, 2785-2787 (1999).

161. **A. Partridge, J.K. Reynolds, B.W. Chui, E.M. Chow, A.M. Fitzgerald, L. Zhang**, N.I. Maluf, and T.W. Kenny, A High-Performance Planar Piezoresistive Accelerometer JMEMS 9, 58-66 (2000).

162. **J.A. Harley**, and T.W. Kenny, High Sensitivity Piezoresistive Cantilevers under 1000Å Thick, Appl. Phys. Lett. 75, 289-291 (1999).

163. **B.W. Chui, M. Asheghi, Y.S. Ju**, K.E. Goodson, T.W. Kenny and H.J. Mamin, Intrinsic-Carrier Thermal Runaway in Silicon Microcantilevers, Microscale Thermophysical Engineering 3, 217-228 (1999).

164. G. Binnig, M. Despont, U. Drechsler, W. Haberle, M. Lutwyche, P. Vettiger, H.J. Mamin, **B.W. Chui**, and T.W. Kenny, High-Density Data Read, Write, and Erase using Heated Atomic Force Microscopy Cantilevers, Appl. Phys Lett, 74 1329-1331 (1999)

165. **A. Partridge, J.K. Reynolds, J.D. Grade,** B.J. Kane, N.I. Maluf, G.T.A. Kovacs, and T.W. Kenny, An Integrated Controller for Tunnel Sensors, J. Solid State Circuits 34, 1099-1107 (1999).

166. T.E. Pfafman, **A.M. Fitzgerald** and T.W. Kenny, A Micromachined Calorimeter for Spacecraft Exposure Monitoring, J. Vac. Sci. Technol., In review (8/99).

167. **B.W. Chui**, T.W. Kenny, H.J. Mamin, B.D. Terris, and D. Rugar, Independent Detection of Vertical and Lateral Forces with a Sidewall-Implanted Dual-Axis Piezoresistive Cantilever, Appl. Phys Lett. 72, 1388-1390 (1998).

168. **C.H. Liu, A.M. Barzilai, J.K. Reynolds, A. Partridge**, T.W. Kenny, **J.D. Grade** and H.K. Rockstad, Characterization of a High-Sensitivity Micromachined Tunneling Accelerometer with Micro-g Resolution, J. MicroElectroMechanical Systems 7, 235-244 (1998).

169. **A.M. Barzilai**, T.R. VanZandt, T. Kenny, Measurement of the Noise of a Geophone in the Presence of Large Background Signals, Rev. Sci. Instrum. 69, 2767-2772 (1998).

170. **B.W. Chui, T.D. Stowe,** Y.S. Ju, K.E. Goodson, T.W. Kenny, H.J. Mamin, B.D. Terris, R.P.Ried, and D. Rugar, Low-stiffness Silicon Cantilevers with Integrated Heaters and Piezoresistive Sensors for High-Density AFM Thermomechanical Data Storage, IEEE Journal of MicroElectroMechanical Systems, 7, 69-78 (1998).

171. **T.D. Stowe, K. Yasumura**, T. Pfafman, T. Kenny, D. Botkin, and D. Rugar, Attonewton Force Detection using Ultrathin Silicon Cantilevers, Appl. Phys. Lett. 71, 288-290 (1997).

172. R.A. Brennen, M.H. Hecht, D.V. Wiberg, S.J. Manion, W.D. Bonivert, J.M. Hruby**, M.L. Scholz, T.D. Stowe**, T.W. Kenny, K.H. Jackson, and C.K. Malek, Fabrication of Collimating Grids for an X-Ray Solar Telescope using LIGA Methods, Microsystem Technologies 3, 91-96 (1997).

173. D.Dilella, L.J. Whitman, R.J. Colton, T.W. Kenny, W.J. Kaiser, E.C. Vote, J.A. Podosek, and L.M. Miller, A Micromachined Magnetic-Field Sensor based on an Electron Tunneling Displacement Transducer, Sensors and Actuators A, 86, 8 (2000).

174. **B.W. Chui, T.D. Stowe**, T.W. Kenny, H.J., Mamin, B.D. Terris, and D.Rugar, Low-Stiffness Silicon Cantilevers for Thermal Writing and Piezoresistive Readback with the Atomic Force Microscope, Appl. Phys Lett., 69, 2767-2769 (1996).

175. H.K. Rockstad, T.K.Tang, **J.K. Reynolds**, T.W. Kenny, W.J. Kaiser, and T.B. Gabrielson, A Miniature, High-Sensitivity, Electron Tunneling Accelerometer, Sensors and Actuators A53, 227-231 (1996).

176. T.W. Kenny**, J.K. Reynolds**, J.A. Podosek, E.C. Vote, L.M. Miller, H.K. Rockstad, and W.J. Kaiser, Micromachined Infrared Sensors using Tunneling Displacement Transducers, Rev. Sci. Instrum. 67, 112-128 (1996).

177. T.W. Kenny, W.J. Kaiser, H.K. Rockstad, J.K. Reynolds, J.A. Podosek, and E.C. Vote, Wide-Bandwidth Mechanical Elements for Tunneling Transducers, J. MicroElectroMechanical Systems 3, 97-104 (1994).

178. R.E. Stalder, S. Boumsellek, T.R. VanZandt, T.W. Kenny, M.H. Hecht and F.E Grunthaner, Micromachined Array of Electrostatic Energy Analyzers for Charged Particles, J. Vac. Sci. Technol. A12, 2554-2558 (1994).

179. H.K. Rockstad, T.W. Kenny, J.K. Reynolds, W.J. Kaiser, and T.B. Gabrielson, A Miniature High-Sensitivity Broad-Band Accelerometer Based on Electron Tunneling Transducers, Sensors and Actuators A 43, 107-114 (1994).

180. T.W. Kenny, W.J. Kaiser, J.A. Podosek, H.K. Rockstad, J.K. Reynolds, and E.C. Vote, Micromachined Tunneling Displacement Transducers for Physical Sensors, J. Vac. Sci. Technol. A11, 797-803 (1993).

181. T.W. Kenny, W.J. Kaiser, J.K. Reynolds, J.A. Podosek, H.K. Rockstad, E.C. Vote, and S.B. Waltman, Electron Tunnel Sensors, J. Vac. Sci. Technol. A 10(4), 2114-2118 (1992)

182. T.W. Kenny, W.J. Kaiser, S.B. Waltman, J.K. Reynolds, A Novel Infrared Detector Based on a Tunneling Displacement Transducer, Appl. Phys. Lett. 59, 1820-1822 (1991).

183. T.W. Kenny, S.B. Waltman, J.K. Reynolds, and W.J. Kaiser, A Micromachined Silicon Tunnel Sensor for Motion Detection, Appl. Phys. Lett. 58, 100-102 (1991).

184. T.W. Kenny and P.L. Richards, Heat Capacity and Sticking Probability Measurements of ^{4}He Submonolayers Adsorbed on Evaporated Ag Films: Bose Statistics in Two Dimensions, Phys. Rev. Lett. 64, 2386-2389 (1990).

185. T.W. Kenny and P.L. Richards, AC Calorimeter for Measurements of Adsorbed Gases on Metal Films at ^{4}He Temperatures, Rev. Sci. Instr. 61, 822-829 (1990).

186. T.W. Kenny, P.L. Richards, I.S. Park, E.E. Haller, and J.W. Beeman, Bias Induced Nonlinearities in Neutron Transmutation Doped Germanium at ^{4}He Temperatures, Phys. Rev. B 39, 8476-8482 (1989)

187. M. Berg, C.B. Harris, T.W. Kenny, and P.L. Richards, Generation of Intense Tunable Picosecond Pulses in the Far-Infrared, Appl. Phys. Lett. 47, 206-208 (1985).

188. U. Frick, T.W. Kenny, R.O. Pepin, "The Irradiation History of Lunar Breccia 79035", Meteoritics 17, 216 (1982).

Refereed Symposia and Conference Proceedings:

1. C.H. Hidrovo, T.A. Kramer, **E.N. Wang**, S. Vigneron, J.E. Steinbrenner, J.-M. Koo, F.-M. Wang, D. Fogg, R. Flynn, E.S. Lee, C.-H. Cheng, T.W. Kenny, J.K. Eaton, K.E. Goodson, "Two-phase Microfluidics for Semiconductor Circuits and Fuel Cells," 3rd International Conference on Microchannels & Minichannels, Toronto, Canada, June 13-15, ICMM2005-75085. 2005

2. **E.N. Wang,** J.G. Santiago, K.E. Goodson, T.W. Kenny. "Microjet Impingement Cooling with Phase Change," ASME International Mechanical Engineering Congress & Exposition, November 13-19, Anaheim, CA, USA, IMECE2004-62176. 2004.

3. **E.N. Wang,** S. Devasenathipathy, C.H. Hidrovo, D.W. Fogg, J.-M. Koo**,** J.G. Santiago, K.E. Goodson, T.W. Kenny. "Liquid Velocity Fields in Two-Phase Microchannel Convection," 3rd International Symposium on Two-Phase Flow Modelling and Experimentation, September 22-24, 2004, Pisa, Italy.

4. **E.N. Wang,** S. Devasenathipathy, J.G. Santiago, K.E. Goodson, T.W. Kenny. "Nucleation and Growth of Vapor Bubbles in a Heated Silicon Microchannel," ASME International Mechanical Engineering Congress & Exposition, Washington, D.C., USA, Nov. 15-21, 2003.

5. Koo, J.-M., Jiang, L., Bari, A., **Zhang, L., Wang, E**., Kenny, W., Goodson, K.E., and Santiago, J.G., "Convective Boiling in Microchanenl Heat Sinks with Spatially-varying Heat Flux", *ITHERM 2002*, San Diego, CA, USA, May, 2002.

6. Jiang, L**.**, Koo, J.-M., Bari, A.**, Wang, E**., Prasher, R.S., Maveety, J., Kenny, T.W., Goodson, K.E., and Santiago J.G., "Cross-linked Microchannels for VLSI Hotspot Cooling", *2002 ASME International Mechanical Engineering Congress & Exposition*, New Orleans, USA, Nov.17-22, 2002.

7. Koo, J.-M., Im, S., Goodson, K.E., Cho, E., Prashe,r R.S., **Wang, E**., Jiang, L., Bari, A., Campion, D., Fogg, D., Kim, M., Kenny, T.W., and Santiago, J.G., "VLSI Hotspot Cooling Using Two-phase Microchannel Convection", *2002 ASME International Mechanical Engineering Congress & Exposition*, New Orleans, USA, Nov. 17-22, 2002.

8. Jiang, L., Mikkelsen, J., Koo, J-M**, Zhang, L.,** Huber, D., Yao, S., Bari, A., Zhou, P**.,** Santiago, J., and Kenny, T.W. and Goodson, K.E., "Transient and Sub-atmospheric Performance of A Closed-loop Electroosmotic Microchannel Cooling System", Proceeding of Thermal Challenges in Next Generation Electronic Systems, THERMES 2002, Santa Fe, New Mexico, USA, pp. 133-139, Jan. 13-16, 2002.

9. J.M. Koo**,** S. Im., S.S. Banerjee, D. Fogg**, E.N. Wang, L. Zhang,** L. Jiang, A. Bari, T.W. Kenny, K.E. Goodson, and J.G. Santiago, "Two-phase Microchannel Heat Sinks for Sub-100nm High Performance VLSI," Proc. ISLPED. 2002.

10. L. Jiang, J.M. Koo S. **L. Zhang., S. Banerjee,** P. Zhou. J.G, T.W. Kenny, K.E. Goodson,, "An Electrokinetic Closed-Loop Micro Cooler for High-Power VLSI Chips," presented at SEMI-THERM, San Jose, CA, USA, March. 2001.

11. R.M. Zeighami**, D. Laser**, P. Zhou**,** M. Asheghi., S. Devasenathipathy, T.W. Kenny, J.G. Santiago and K.E. Goodson, "Experimental Investigation of Flow Transition in Microchannels using Micron Resolution Particle Image Velocimetry," Proc. ITherm, Las Vegas, Nevada, May. 2000.

12. **C.H.Liu**, T.W. Kenny and H.K. Rockstad, Robust Controller Design via μ-synthesis for High-Performance Micromachined Tunneling Accelerometers, 1999 American Controls Conference Digest (1999)

13. W.P. King, J.G. Santiago, T.W. Kenny, and K.E. Goodson, "Modeling and Simulation of Sub-Micrometer Heat Transfer in AFM Thermomechanical Data Storage," ASME MEMS-Vol. 1, pp. 583-588. 1999.

14. **J.I. Molho, A.E. Herr,** T.W. Kenny, M.G. Mungal, M.G. Garguilo, P.H. Paul, M. Desphande, J.R. Gilbert, P.M. St.John, T.M. Woudenberg, and C. Connell, Fluid Transport Mechanisms in MicroFluidic Devices, Proceedings 1998 ASME Winter Meeting DSC Vol 66, 69 (1998).

15. S.M. Kumar, W.C. Reynolds, and T.W. Kenny, MEMS Based Actuators for Boundary Layer Control, Proceedings 1998 ASME Winter Meeting DSC Vol 66, 103 (1998).

16. **J.A. Harley, E.M Chow**, and T.W. Kenny Design of Resonant Beam Force Transducers; An Axial Force Probe for Atomic Force Microscopy, Proceedings 1998 ASME Winter Meeting DSC Vol 66, 247 (1998).

17. **Y. Liang** and T.W. Kenny, Mechanical Optimization of a Dual-Axis Piezoresistive Force Sensor, Proceedings 1998 ASME Winter Meeting DSC Vol 66, 389 (1998).

18. **A.M. Fitzgerald**, R.S. Iyer, R.H. Dauskardt, and T.W. Kenny, Fracture and Sub-Critical Crack Growth Behavior of Micromachined Single Crystal Silicon Structures, Proceedings 1998 ASME Winter Meeting DSC Vol 66, 395 (1998).

19. **J.K. Reynolds**, D.C Catling, R.C. Blue, N.I. Maluf, and T.W. Kenny Packaging and Instrumentation of a Commercial Pressure Sensor for a High-G Impact and the Martian Environment, Proceedings 1998 ASME Winter Meeting DSC Vol 66, 401 (1998).

20. **B.W. Chui,** T.W. Kenny, H.J. Mamin, B.D. Terris, and D. Rugar, A Novel AFM Cantilever with Independent Piezoresistive Sensors for Simultaneous Lateral and Vertical Force Detection, ASME Winter Exposition 1997.

21. **C.H. Liu, A. Barzilai, J.K. Reynolds, J.Grade**, H.K.Rockstad, T.W. Kenny, Feedback Control Strategies for High-Sensitivity Micromachined Tunneling Accelerometer, ASME Winter Exposition 1997.

Non-Refereed Symposia and Conference Publications:

1. **C.P. Cameron, T. Imamura, C. Devmalya, G. Vukasin, A. Alter**, T.W. Kenny, "Design Comparison and Survivability of Epitaxially Encapsulated MEMS Disc Resonating Gyroscopes at High Shock (>27,000g)", Proceedings 2019 International Symposium on Inertial Sensors and Systems, (2020).

2. **K.E. Kaplan**, M.W. Winterkorn, **H.J.K Kim, C.L.M. Everhart**, F.B. Prinz, and T.W. Kenny, "Thermal Accelerometer Performance Enhancements through AC Biasing Schemes", Proceedings 2020 IEEE MEMS (2020).

3. J. Yu, H.**K. Kwon, G.D. Vukasin**, T.W. Kenny, and Hanna Cho, "Frequency Stabilization in an Encapsulated High-Q Micromechanical Resonator via Internal Resonance", Proceedings 2020 IEEE MEMS (2020).

4. V. Zega, A. Opreni, G. Mussi, H.**K. Kwon, G. Vukasin**, G. Gattere, G. Langfelder, A. Frangi, and T.W. Kenny, "Thermal Stability of DETF MEMS Resonators: Numerical Modelling and Experimental Validation", Proceedings 2020 IEEE MEMS (2020).

5. J. Sun, H. Zhang, D. Chen, M. Pandit, G. Sobreviela, D. Xiao, M. Zhuo, **D.D. Gerrard, R. Kwon, G. Vukasin**, T.W. Kenny, and Ashwin Seshia, "Nonlinear Modal Interactions and Internal Resonance in a Micromachined Disk Resonator", Proceedings 2020 IEEE MEMS (2020).

6. D.A. Kassie, **I.B. Flader**, S. Shmulevich, **H.K. Kwon**, T.W. Kenny, and D. Elata, "An Epi-Seal Encapsulated Franklin Oscillator Sustaining More Than 200,000,000 Electric Switching Cycles", Proceedings 2020 IEEE MEMS (2020).

7. **J.M.L. Miller**, Z. Zhang, **N.E. Bousse**, D. Coso, S. Sadat, **H.K. Kwon, G.D. Vukasin**, A. Majumdar, and T.W. Kenny, "Temperature Hysteresis in Piezoresistive Microcantilevers", Proceedings 2020 IEEE MEMS (2020).

8. S. Shin, H. Wen, **H.K. Kwon, G.D. Vukasin**, T.W. Kenny, and F. Ayazi, "A Dual-Axis Resonant Accelerometer Based on Electrostatic Stiffness Modulation in Epi-Seal Process", Proceedings 2019 IEEE Sensors (2019).

9. J**.M.L. Miller, N.E. Bousse, D.D. Shin, H.K. Kwon**, and T.W. Kenny, "Signal Enhancement in MEM Resonant Sensors Using Parametric Suppression", 2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems and Eurosensors XXXIII, (2019).

10. **S. Koppaka, A.L. Alter, G.D. Vukasin, D.D. Shin, I.B. Flader, Y. Chen,** and T.W. Kenny, "Nonlinearity of Degenerately Doped Flexural Mode Silicon Micromechanical Resonators", 2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems and Eurosensors XXXIII, (2019).

11. **H.K. Kwon, L.C. Ortiz, G.D. Vukasin, Y.Chen, D.D. Shin**, and T.W. Kenny, "An Oven-Controlled MEMS Oscillator (OCMO) With Sub 10mw, ± 1.5 PPB Stability Over Temperature", 2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems and Eurosensors XXXIII, (2019).

12. **G.D. Vukasin, V.K. Sanchez, C.P. Cameron, H.K. Kwon, J. Rodriguez, I.B. Flader, Y. Chen**, and T.W. Kenny, "Effect of Substrate Thickness on Anchor Damping in MEMS Devices", 2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems and Eurosensors XXXIII, (2019).

13. **A.L. Alter, G.D. Vukasin, I.B. Flader, H.J. Kim, Y. Chen, D.D. Shin**, and T.W. Kenny, "Experimentally Observed Nonlinear Dissipation Linked to Contributions from Gas Damping and TED in Mems Flexural Mode Resonators", 2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems and Eurosensors XXXIII, (2019).

14. I.P. Prikhodko, J.A. Gregory, **D. Shin, R. Kwon**, T.W. Kenny, and M.W. Judy, "Pseudo-Extensional Mode MEMS Ring Gyroscope", 2019 International Symposium on Inertial Sensors and Systems, (2019).

15. Y.A. Pishchalnikov, W. Behnke-Parks, K. Maeda, T. Colonius, M. Mellema, M. Hopcroft, A. Luong, S. Wiener, M.L. Stoller, T. Kenny, D.J. Laser, "Experimental observations and numerical modeling of lipid-shell microbubbles with calcium-adhering moieties for minimally-invasive treatment of urinary stones", Proceedings Meetings on Acoustics. 35, 020008 (2018).

16. M.H. Asadian, S. Askari, **I.B. Flader, Y. Chen, D.D. Gerrard, D.D. Shin, H.K. Kwon,** T.W. Kenny, and A.M. Shkel, "High Quality Factor Mode Ordered Dual Foucault Pendulum Gyroscope", 2018 IEEE Inertial Sensors (2018).

17. **J. Rodriguez, G.D. Vukasin**, G.M. Glaze, M.A. Hopcroft, **L.C. Ortiz, C.H. Ahn, E. Ng**, W. Park, T.W. Kenny, and C.A. Watson, "Investigation of Orientation Dependence of the Thermal Expansion Coefficient in Silicon MEMS Resonators" 2018 International Frequency Control Symposium, Olympic Valley, CA. Pg 1-4. (2018).

18. **L.C. Ortiz, H-K. Kwon, J. Rodriguez, D.B. Heinz, Y. Chen, G.D. Vukasin, D.D. Shin** and T.W. Kenny, "A New Low-Power MEMS Dual-Mode Clock with PPB Stability over Temperature", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

19. **A.L. Alter, I.B. Flader, Y. Chen, L.C. Ortiz, D.D. Shin, D.B. Heinz** and T.W. Kenny, "First Fatigue Measurements on Thick Epi-Polysilicon MEMS in Ultra-Clean Environment", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

20. **L.C. Ortiz, D.D. Gerrard, I.B. Flader, G.D. Vukasin, D.B. Heinz, J. Rodriguez, S. Koppaka, D.D. Shin, H-K Kwon**, S. Chandorkar, and T.W. Kenny, "Enhancing Micro-Oven Power and Stiffness in Encapsulated Devices for Timing Reference Applications", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

21. **J.M.L. Miller**, A. Ansari, **D.B. Heinz, Y. Chen, I.B. Flader, D.D. Shin**, L.G. Villanueva, and T.W. Kenny, "What is Effective Quality Factor?", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

22. Y. Wang, Y-W, Lin, **J. Rodriguez, G.D. Vukasin, D.D. Shin, H-K. Kwon, D.B. Heinz, Y. Chen, D.D. Gerrard**, T.W. Kenny and A.M. Shkel, "On Decoupled Quantification of Energy Dissipation Mechanisms in Toroidal Ring Gyroscopes", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

23. **H-K. Kwon, D.B. Heinz, D.D. Shin, Y. Chen, L.C. Ortiz, G.D. Vukasin** and T.W. Kenny, "Precise Local Temperature Measurement of Fully-Encapsulated Ovenized MEMS Devices", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

24. E. Cook, M. Tomaino-Iannucci, J. Bernstein, M. Weinberg, J. Choy, K. Hobart, L. Luna, M. Tadjer, R. Myers-Ward, F. Kub, **Y. Yang, E. Ng, I. Flader, Y. Chen**, and T. Kenny, "A High-Mass, Eight-Fold Symmetric Silicon Carbide MEMS Gyroscope", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

25. **G.D. Vukasin, J. Rodriguez, L.C. Ortiz**, G.M. Glaze, **D.D. Gerrard, C.H. Ahn, Y. Yang**, J. Lake, R.N. Candler and T.W. Kenny, "Direct Measurement of Anchor Damping in Pressure-Limited Ring Resonators", Proceedings 2018 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2018).

26. **D.D. Shin, D.B. Heinz, K-K. Kwon, Y. Chen**, and T.W. Kenny, "Lateral Diffusion Doping of Silicon for Temperature Compensation of MEMS Resonators", 2018 IEEE International Symposium on Inertial Sensors and Systems, (2018).

27. **K.E. Kaplan, M.W. Winterkorn, C.L.M. Everhart, D.D. Shin**, G.J, O'Brien, F.B. Prinz and T.W. Kenny, "Active Temperature Compensation of Thermal Accelerometer for Improved Stability", 2018 IEEE International Symposium on Inertial Sensors and Systems (2018).

28. **J. Rodriguez, D.D. Gerrard**, G.M. Glaze, S. Chandorkar, **L. Comenecia, Y. Chen, I.B. Flader**, T.W. Kenny, "Direct Measurement of Anchor Damping in MEMS Resonators", Proceedings IEEE Sensors P.1, October 29, 2017, Glasgow, Scotland (2017).

29. **I.B. Flader, Y. Chen, C.C. Shin, A.L. Alter, J. Rodriguez**, and T.W. Kenny, "Epitaxial Encapsulation of Fully-Differential Electrodes and Large Transduction Gaps for MEMS Resonant Structures", IEEE MEMS Glasgow 483 (2018).

30. V. Maiwald, **I.B. Flader**, M. Muller, **Y. Chen**, S. Lluss, **D.D. Shin**, C. Roman, **D.B. Heinz**, T.W. Kenny and C. Hierold, "Experimental Fractal-Like Instability Bands in Resonant Silicon-Silicon Contact Pull-In Vibration Detector", IEEE MEMS Glasgow 984 (2018).

31. **L.C. Ortiz, I.B. Flader, G.D. Vukasin, D.D. Gerrard**, S.A. Chandorkar, **J. Rodriguez, D.D. Shin, R. Kwon, D.B. Heinz, Y. Chen**, W. Park, K.E. Goodson and T.W. Kenny, "Thermal Effects of Ovenized Clocks on Episeal Encapsulated Inertial Measurement Units", IEEE MEMS Glasgow 980 (2018).

32. **J. Rodriguez, D.D. Gerrard**, G.M. Glaze, S. Chandorkar, **Y. Chen, I.B. Flader, D.D. Shin** and T.W. Kenny, "Unanticipated Results in the First Direct Measurements of Anchor Damping in MEMS Resonators", IEEE MEMS Glasgow 543 (2018).

33. C.L.M. Everhart, K.E. Kaplan, M.W. Winterkorn, H. Kwon, J. Provine, M. Asheghi, K.E. Goodson, F.B. Prinz, and T.W. Kenny, "High-Stability Thermal Accelerometer based on UltraThin Platinum ALD Nanostructures", IEEE MEMS Glasgow 976 (2018).

34. **D.D. Shin, Y. Chen, I.B. Flader** and T.W. Kenny, "Temperature Compensation of Resonant Accelerometer via Nonlinear Operation", IEEE MEMS Glasgow 1012 (2018).

35. M. Bauer, T. Ebefors, M.M. Visser Taklo, S. Moe, P. Pickering, C, Twanow, D. Spicer, S. Nasiri, S. Winkler, R. Ramadoss, A. Luque, C. Aracil**, J. Rodriguez**, T.W. Kenny, M. Esashi, S. Tanaka, Y-C. Su, H-A. Yang, C-W. Lin, W. Fang, Y.T. Cheng, Y.C. Su, L.Lin, E.M. Chow, C.L. Chua, C-M. Huang, A. Sai S. Vasan, Y. Huang, R. Doraiswami, M. Osterman, M. Pecht, Y.C. Lee, Y-T. Cheng, "Silex's TSV Technology: Overview of Processes and MEMS Applications", MEMS Packaging 5, 31 (2018).

36. **J. Rodriguez, D.D. Gerrard**, G.M. Glaze, S. Chandorkar, **L.C. Ortiz, Y. Chen, I.B. Flader** and T.W. Kenny, "Direct Measurements of Anchor Damping in MEMS Resonators", IEEE Sensors Belfast (2017).

37. S.Sonmezoglu, **I.B. Flader, Y. Chen, D. D Shin**, T.W. Kenny, and D.A. Horsley, "Dual-resonator MEMS magnetic sensor with differential amplitude modulation", Proceedings, 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 814 (2017).

38. **I.B. Flader, Y. Chen, D.D. Gerrard**, and T.W. Kenny, "Wafer-scale encapsulation of fully differential electrodes for mutli-axis inertial sensing", Proceedings, 2017 International

Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 591 (2017).

39. **J.M.L. Miller, D.B. Heinz, I.B. Flader, Y. Chen, D.D. Shin**, T.W. Kenny, "Effective quality factor and temperature dependence of self-oscillations in a thermal-piezoresistively pumped resonator", 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 1907 (2017).

40. **D.D. Gerrard, Y. Chen, S.A. Chandorkar, G.Yu, J.Rodriguez, I.B. Flader, D.D. Shin**, C.D. Meinhart, O.Sigmund, T.W Kenny, "Topology optimization for reduction of thermo-elastic dissipation in MEMS resonators", 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 794 (2017).

41. **D.B.Heinz, I.B. Flader, Y. Chen, G.D. Vukasin, L.C. Ortiz,** T.W. Kenny, "Direct comparison of stiction properties of oxide coated polysilicon and smooth single crystal silicon", 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 1203 (2017).

42. **J. Rodriguez, D.D. Gerrard, S. Chandorkar, Y. Chen**, G.M. Glaze, **I.B. Flader, C.H. Ahn, E.J. Ng**, T.W. Kenny, "Wide-range temperature dependence studies for devices limited by thermoelastic dissipation and anchor damping", 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 1100 (2017).

43. **D.D. Shin, Y. Chen, I.B. Flader,** T.W. Kenny, "Epitaxially encapsulated resonant accelerometer with an on-chip micro-oven", 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 595 (2017).

44. V. Maiwald, **Y. Chen**, M. Müller, **I.B. Flader**, C. Roman, **D.B. Heinz, D.D. Shin**, T.W. Kenny, C. Hierold, "Transfer function tuning of a broadband shoaling mechanical amplifier near the electrostatic instability", 2017 International Conference on Solid-State Sensors, Actuators and Microsystems, June 18-22, 2017, Kaohsiung, Taiwan, P. 802 (2017).

45. **D.D. Shin, C.H. Ahn, Y. Chen, V.A. Hong, E.J. Ng, Y. Yang**, T.W. Kenny, "Electrostatic tuning of temperature coefficient of frequency of anisotropic disk-shaped resonators", 2017 IEEE International Symposium on Inertial Sensors and Systems (INERTIAL), Kauai, Hawaii, P. 264 (2017).

46. A. Efimovskaya, **Y. Yang, E. Ng, Y, Chen, I. Flader, T.W. Kenny**, A.M. Shkel, "Compact roll-pitch-yaw gyroscope implemented in wafer-level Epitaxial Silicon Encapsulation process", 2017 IEEE International Symposium on Inertial Sensors and Systems (INERTIAL), Kauai, Hawaii, P. 1 (2017).

47. S.Sonmezoglu, **I.B. Flader, Y. Chen, D.D. Shin**, T.W. Kenny, D.A. Horsley, "Dual-resonator MEMS Lorentz force magnetometer based on differential frequency modulation", 2017 IEEE International Symposium on Inertial Sensors and Systems (INERTIAL), Kauai, Hawaii, P. 160 (2017).

48. **Y.Chen, I.B. Flader, D.D. Shin, C.H. Ahn, L.C. Ortiz**, T.W. Kenny, "Fabrication of wide and deep cavities for silicon MEMS devices without wafer bonding", 2017 IEEE International Symposium on Inertial Sensors and Systems (INERTIAL), Kauai, Hawaii, P. 113 (2017).

49. P.Taheri-Tehrani, M.Defoort, **Y. Chen, I. Flader, D.D. Shin**, T.W. Kenny, D.A. Horsley, "Epitaxially-encapsulated quad mass resonator with shaped comb fingers for frequency tuning", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 1111. (2017).

50. **D.B. Heinz, V.A. Hong, Y. Yang, C.H. Ahn**, T.W. Kenny, "High-G (> 20,000 g) inertial shock survivability of epitaxially encapsulated silicon MEMS devices", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 1122. (2017).

51. **D.D. Shin, C.H. Ahn, Y. Chen, D.L. Christensen, I.B. Flader**, T.W. Kenny, "Environmentally robust differential resonant accelerometer in a wafer-scale encapsulation process", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 17. (2017).

52. **I.B Flader, Y. Chen, Dongsuk D. Shin, D.B. Heinz, L.C. Ortiz, A.L. Alter,** W. Park, K.E. Goodson, T.W. Kenny, "Micro-tethering for in-process stiction mitigation of highly compliant structures", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 675. (2017).

53. **Y. Chen, D.D. Shin, I.B. Flader**, T.W. Kenny, "Tri-mode operation of highly doped silicon resonators for temperature compensated timing references", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 1158. (2017).

54. A. Efimovskaya, Y.W. Lin, **Y. Yang, E. Ng, Y. Chen, I. Flader, C.H. Ahn, V. Hong,** T.W. Kenny, A.M. Shkel, "On cross-talk between gyroscopes integrated on a folded MEMS IMU Cube", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 1142. (2017).

55. **D.D. Gerrard, J. Rodriguez, L.C. Ortiz, S.A. Chandorkar, I.B. Flader, Y. Chen, D.D. Shin,** T.W. Kenny, "Manipulation of heat flux paths in thermo-elastically damped resonators for Q optimization", Proceedings 2017 IEEE MEMS, January 22-25, 2017, Las Vegas, NV, P 1130. (2017).

56. **C.H Ahn, D.L Christensen, D.B Heinz, V.A Hong, E.J Ng, J. Rodriguez, Y. Yang,** G. O'Brien, T.W. Kenny, "Encapsulated Inertial Systems", 2016 IEEE International Electron Devices Meeting (IEDM), San Francisco, CA (2016).

57. **D.B. Heinz, V.A. Hong, C.H. Ahn. Y. Yang** and T.W. Kenny, "Stiction at High Temperature (>205C) in Encapsulated MEMS Devices for Harsh Environment Applications", Proceedings 2016 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2016).

58. P. Polunin, **Y. Yang**, S. Shaw, T.W. Kenny and M. Dykman, "Revealing and Characterizing Noise Sources in MEMS Resonators", Proceedings 2016 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2016).

59. O. Shoshani, **D. Heywood, Y. Yang**, T.W. Kenny and S. Shaw, "Phase Noise Reduction in a MEMS Oscillator usinf a Nonlinearity-Enhanced Synchronization Domain", Proceedings 2016 Hilton Head Workshop on Solid State Sensors and Actuators, Hilton Head (2016).

60. **I.B. Flader, C.H. Ahn, D.D. Gerrard, E.J. Ng, Y Yang, V.A. Hong**, M. Pavone, T.W. Kenny, "Autonomous calibration of MEMS disk resonating gyroscope for improved sensor

performance", 2016 American Control Conference, P. 5803 (2016).

61. I.P. Prikhodko, J.A. Gregory, W.A. Clark, J.A. Geen, M.W. Judy, **C.H. Ahn**, and T.W. Kenny, "Mode-matched MEMS Coriolis vibratory gyroscopes: Myth or reality?", 2016 Position, Location and Navigation Symposium (PLANS) (2016).

62. **V.A. Hong, D.B. Heinz, D.L. Christensen, D.D. Shin, Y. Chen , C.H. Ahn, Y. Yang, E.J. Ng, I.B. Flader**, and T.W. Kenny, "Overcoming Stiction Forces with Resonant Over-Travel Stops", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 47-50.

63. **Y. Chen, E.J. Ng, D.D. Shin, C.H. Ahn, Y. Yang, I.B. Flader, V.A. Hong** and T.W. Kenny, "Ovenized Dual-Mode Clock (ODMC) based on Highly-Doped Single-Crystal Silicon Resonators", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 91-94.

64. S. Wisher, P. Shao, A. Norouzpour-Shirazi, **Y. Yang, E. Ng, I. Flader, Y. Chen, D. Heinz**, T. Kenny, and F. Ayazi, "A High-Frequency Epitaxially-Encapsulated Single-Drive Quad-Mass Tri-Axial Resonant Tuning Fork Gyroscope", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 930-933.

65. **C.H. Ahn, D.D. Shin, V.A. Hong, Y. Yang, E.J. Ng, Y. Chen, I.B. Flader**, and T.W. Kenny, "Encapsulated Disk Resonator Gyroscope with Differential Internal Electrodes", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 962-969.

66. P. Taheri-Tehrani, M. Kline, I. Izyumin, B. Eminoglu. Y-C- Yeh, **Y. Yang, Y. Chen, I. Flader, E.J. Ng**, T.W. Kenny, B.E. Boser, and D.A. Horsley, "Epitaxially-Encapsulated Quad Mass Gyroscope with Nonlinearity Compensation", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 966-969.

67. **D.D. Gerrard, C.H. Ahn, I.B. Flader, Y. Chen, E.J. Ng, Y.Yang**, and T.W. Kenny "Q-Factor Optimization in Disk Resonator Gyroscopes via Geometric Parameterization", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 994-997.

68. **I.B. Flader, C.H. Ahn, E.J. Ng, Y. Yang, V.A. Hong**, and T.W. Kenny, "Stochastic Method for Disk Resonating Gyroscope Mode Matching and Quadrature Nulling", Proceedings 2016 IEEE MEMS, January 24-27, 2016, Shanghai China, p. 998-1001.

69. **C. H. Ahn, , V.A. Hong, W. Park, T. Yang, Y. Chen, E. Ng, J. Huynh,** A.D. Challoner, K.E Goodson and T.W. Kenny, "On-Chip Ovenization of Encapsulated Disk Resonator Gyroscope (DRG)", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 39-42 (2015).

70. **V.A. Hong**, J. Stehle, **C.H. Ahn, D.B. Heinz**, G. Yama, B. Kim, G.J. O'Brien and T.W. Kenny, "Capacitive Sensor Fusion : Co-Fabricated X/Y and Z axis Accelerometers, Pressure Sensor and Thermometer", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 295-298 (2015).

71. **Y. Yang, E.J. Ng, Y Chen, I.B. Flader, C.H. Ahn, V.A. Hong** and T.W. Kenny, "A Unified Epi-Seal Process for Resonators and Inertial Sensors", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 1326-1329 (2015).

72. **D.D. Gerrard, E.J. Ng, C.H. Ahn, V.A. Hong, Yushi Yang**, and T.W. Kenny, "Modeling

the Effect of Anchor Geometry on the Quality Factor of Bulk-Mode Resonators", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 1997-2000 (2015).

73. **J. Rodriguez, Y. Yang, C.H. Ahn, Y. Chen, E.J. Ng, V.A. Hong, S. Ghaffari**, and T.W. Kenny, "Damping Mechanisms in Light and Heavy-Doped Dual-Ring and Double-Ended Tuning Fork Resonators (DETF)", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 2005-2009 (2015).

74. B.W. Soon, Y. Qian, **E.J. Ng**, T.W. Kenny and C. Lee, "Silicon-to-Silicon Microswitch with Wide Operation Temperature Range", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 2105-2108 (2015).

75. P. Polunin, **Y. Yang**, J. Atalaya, **E. Ng**, S. Strachan, O. Shoshani, M. Dykman, S. Shaw and T.W. Kenny, "Characterizing MEMS Nonlinearities Directly : The Ring-Down Measurements", Proceedings, 2015 International Conference on Solid-State Sensors, Actuators and Microsystems, June 23-27, 2015, Anchorage, AK, p 2176-2179 (2015).

76. **C. H. Ahn, E. Ng, V.A. Hong, J. Huynh**, T.W. Kenny and **S. Wang**, "Oxide-coated Polysilicon Disk Resonator Gyroscope (DRG) within the Wafer-Scale Encapsulation Process", Proceedings 2nd IEEE International Symposium on Inertial Sensors and Systems, P. 127 (2015).

77. P.Taheri-Tehrani, O. Izyumin, **C.H. Ahn, E.J. Ng, V.A. Hong, Y. Yang**, T.W. Kenny, B.E. Bozer, D.A. Horsley, "Disk Resonator Gyroscope with Whole-Angle Mode Operation", Proceedings 2nd IEEE International Symposium on Inertial Sensors and Systems, P. 9 (2015).

78. **E. Ng**, **Y. Yang, V.A. Hong, C.H. Ahn, D.B. Heinz, I. Flader, Y. Chen, C.L.M. Everhart, B. Kim, R. Melamud, R.N. Candler, M.A. Hopcroft, J.C. Salvia, S. Yoneoka, A.B. Graham, M.Agarwal, M.W. Messana, K.L. Chen, H.K. Lee, S. Wang, G. Bahl, V. Qu, C.F. Chiang**, and T.W. Kenny, A. Partridge, M. Lutz, G. Yama, and G.J. O'Brien, "The Very Long Path from MEMS Resonators to Timing Products", Proceedings 2015 IEEE MEMS Conference, Estoril Portugal, P.1 (2015).

79. D. Senkal, **E.J. Ng, V.A Hong, Y. Yang, C.H. Ahn**, T.W. Kenny and A.M. Shkel, "Parametric Drive of a Toroidal MEMS Rate Ingegrating Gyroscope Demonstrating <20PPM Scale Factor Stability", Proceedings 2015 IEEE MEMS Conference, Estoril Portugal, P.33 (2015).

80. I.I. Izuymin, M.H. Kline, Y-C. Yeh, B. Eminoglu, **C.H. Ahn. V.A. Hong, Y. Yang, E.J. Ng,** T.W. Kenny and B.E. Bozer, "A 7PPM 6d/HR Frequency-Output MEMS Gyroscope", Proceedings 2015 IEEE MEMS Conference, Estoril Portugal, P.1 (2015).

81. **D.B. Heinz, V.A. Hong, T.S. Kimbrell, J. Stehle, C.H. Ahn, E.J. Ng, Y. Yang**, G. Yama, G.J. O'Brien and T.W. Kenny, "Stiction Forces and Reduction by Dynamic Contact in Ultra-Clean Encapsulated MEMS Devices", Proceedings 2015 IEEE MEMS Conference, Estoril Portugal, P.393 (2015).

82. **Y. Chen, E.J. Ng, Y. Yang, C.H. Ahn, I. Flader** and T.W. Kenny, **"**In-Situ Ovenization of Lame-Mode Silicon Resonators for Temperature Compensation**",** Proceedings 2015 IEEE MEMS Conference, Estoril Portugal, P.809 (2015).

83. **Y. Yang, E.J. Ng,** P. Polunin, **Y. Chen**, S. Strachan**, V.A. Hong, C.H. Ahn,** O. Shoshani, S. Shaw, M. Dykman and T.W. Kenny**, "Experimental Investigation on Mode Coupling of Bulk-Mode Silicon MEMS Resonators",** Proceedings 2015 IEEE MEMS Conference, Estoril Portugal, P.1008 (2015).

84. **Yushi Yang, Eldwin J. Ng, Vu A. Hong, Chae Hyuck Ahn, Yunhan Chen, Elia Ahadi**, Mark Dykman, and Thomas W. Kenny, "Measurement of the Nonlinear Elasticity of Doped Bulk-Mode MEMS Resonators", Proceedings 2014 Solid State Sensors and Actuators Workshop, 285-288, Hilton Head, SC (2014).

85. **Eldwin J. Ng, Yushi Yang, Yunhan Chen**, and Thomas W. Kenny, "An Etch Hole-Free Process for Temperature-Compensated, High-Q Encapsulated Resonators", Proceedings 2014 Solid State Sensors and Actuators Workshop, 99-100, Hilton Head, SC (2014).

86. J. Stehle, **V.A. Hong**, A. Feyh, G.J. O'Brien, G. Yama, O. Ambacher, B. Kim, and T.W. Kenny, "Silicon Migration of Through-Holes in Single and Poly-Crystalline Silicon Membranes", Proceedings 2014 Solid State Sensors and Actuators Workshop, 32-35, Hilton Head, SC (2014).

87. M. Li, S. Sonmezoglu, **E.J. Ng, V.A. Hong, C. H. Ahn, Y. Yang,** T.W. Kenny and D.A. Horsley, "Lorentz Force magnetometer with Quadrature Frequency Moduation", Proceedings 2014 Solid State Sensors and Actuators Workshop, 52-55, Hilton Head, SC (2014).

88. **T.S. English**, F. Purkl, A. Daus, J Provine, Y. Won, G. Yama, A. Feyh, G. O'Brien, K.E. Goodson, O. Ambacher, and T.W. Kenny, "Atomic Layer Deposited Platinum as a Sensor Material: Uniformity, 1/F Noise and Young's Modulus", Proceedings 2014 Solid State Sensors and Actuators Workshop, 44-47, Hilton Head, SC (2014).

89. S. Nitzan, T-H. Su, **C. Ahn, E. Ng, V. Hong, Y. Yang**, T. Kenny, and D.A. Horsley, "Impact of Gyroscope Operation Above the Critical Bifurcation Threshold on Scale Factor and Bias Instability", Proceedings 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), San Francisco, 749-752 (2014).

90. **David B. Heinz, Vu A. Hong, Eldwin J. Ng, Chae Hyuck Ahn, Yushi Yang**, Thomas W. Kenny, "Characterization of Stiction Forces in Ultra-Clean Encapsulated MEMS Devices", Proceedings 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), San Francisco, 588-591 (2014).

91. Mo Li, **Eldwin J. Ng, Vu A. Hong, Chae H. Ahn, Yushi Yang**, Thomas W. Kenny and David A. Horsley "Single-Structure 3-Axis Lorentz Force Magnetometer with Sub-30 nT/√Hz Resolution", Proceedings 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), San Francisco, 80-83 (2014).

92. **Eldwin J. Ng**, Kimberly L. Harrison, **Camille L. Everhart, Vu A. Hong, Yushi Yang, Chae Hyuck Ahn, David B. Heinz**, Roger T. Howe and Thomas W. Kenny, "Stable Charge-Biased Capacitive Resonators with Encapsulated Switches", Proceedings 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), San Francisco, 1277-1280 (2014).

93. **Eldwin J. Ng, Yushi Yang, Vu A. Hong, Chae Hyuck Ahn, David L. Christensen**, Brian A. Gibson, Kamala R. Qalandar, Kimberly L. Turner, Thomas W. Kenny, "Stable Pull-In Electrodes for Narrow Gap Actuation", Proceedings 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), San Francisco, 1281-1284 (2014).

94. D. Senkal, S. Askari, M.J. Ahamed, **E.J. Ng, V. Hong, Y. Yang, C.H. Ahn**, T.W. Kenny, A.M. Shkel, "100K Q-Factor Torodial Ring GyroscopeImplemented in Wafer-Level Epitaxial Silicon Encapsulation Process", Proceedings 2014 IEEE 27th International Conference on Micro Electro Mechanical Systems (MEMS), San Francisco, 24-27 (2014).

95. **E.J. Ng, C.H. Ahn, Y. Yang, V.A. Hong, C-F. Chiang, E. Ahadi, M.W. Ward** and T.W. Kenny, "Localized, Degenerately-Doped Epitaxial Silicon for Temperature Compensation of Resonant Microsystems", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 2419-2422.

96. **E.J. Ng, C-F. Chiang, Y. Yang, V.A. Hong, C.H. Ahn** and T.W. Kenny, "Ultra-High Aspect Ratio Trenches in Single Crystal Silicon with Epitaxial Gap Tuning", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 182-185.

97. **Y. Yang, E.J. Ng, C.H. Ahn, V.A. Hong, E. Ahadi** and T.W. Kenny, "Mechanical Coupling of Dual Breath-Mode Ring Resonator", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 502-505.

98. **C.H. Ahn, E.J. Ng, V.A. Hong. Y. Yang, B.J. Lee, M.W. Ward,** and T.W. Kenny, "Geometric Compensation of (100) Single Crystal Silicon Disk Resonating Gyroscope for Mode-Matching", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 1723-1726.

99. **V.A. Hong, B.J. Lee, D.L Christensen, E.J. Ng, C.H. Ahn, Y. Yang** and T.W. Kenny, "X-Y and Z-Axis Capacitive Accelerometers Packaged in an Ultra-Clean Hermetic Environment", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 618-621

100. **D.L. Christensen, C.H. Ahn, V.A. Hong, E.J. Ng, Y. Yang, B.J. Lee** and T.W. Kenny, "Hermetically-Encapsulated Differential Resonant Accelerometer", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 606-609.

101. **M.A. Philippine**, H. Zareie, O. Sigmund, G.M. Rebeiz and T.W. Kenny, "Topology Optimized RF MEMS Switches", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 2477-2480.

102. F. Purkl, **T.S. English**, G. Yama, J. Provine, A.K. Samaro, A. Feyh, B. Kim, G. O'Brien, O, Ambacher, R.T. Howe and T.W. Kenny, "Serpentine Geometry for Enhanced Performance of Nanometer-Thin Platinum Bolometers", Proceedings, The 17th International Conference on Solid-State Sensors, Actuators and Microsystems, June 16-20, 2013, Barcelona. Spain, p 1507-1510

103. **C-F Chiang**, A.B. Graham, **B.J. Lee, C-H Ahn, E. Ng**, G.J. O'Brien and T.W. Kenny "Resonant pressure sensor with on-chip temperature and strain sensors for error correction", Proceedings 2013 IEEE 26th International Conference on Micro Electro Mechanical Systems (MEMS), Taipei, Taiwan 45-48 (2013).

104. S. Nitzan, **C-H Ahn**, T-H Su, **E. Ng, S. Wang**, G. O'Brien, B.E. Boser, T.W. Kenny and D.A Horsley, "Epitaxially-encapsulated polysilicon disk resonator gyroscope", Proceedings 2013 IEEE 26th International Conference on Micro Electro Mechanical Systems (MEMS), Taipei, Taiwan 625-628 (2013).

105. F. Purkl, **T. English**, G. Yama, J. Provine, A.K. Samarao, A. Feyh, G. O'Brien, O. Ambacher, R.T. Howe and T.W. Kenny, " Sub-10 nanometer uncooled platinum bolometers via plasma enhanced atomic layer deposition", Proceedings 2013 IEEE 26th International Conference on Micro Electro Mechanical Systems (MEMS), Taipei, Taiwan 185-188 (2013).

106. Y. Won, Y. Gao, R.G. deVilloria, B.L. Wardle, T.W. Kenny and K.E. Goodson, "Crust Removal and Effective Modulus of Aligned Multi-Walled Carbon Nanotube Films", 13th IEEE Intersociety Conference on Thermal and Thermomechanical Phenomana in Electronic Systems (ITHERM), San Diego, CA PP 1070-1076 (2012).

107. S. Seth, **S. Wang**, T. Kenny, and B. Murmann, "A −131-dBc/Hz, 20-MHz MEMS Oscillator with a 6.9-mW, 69-kΩ, Gain-Tunable CMOS TIA", SSCIRC 2012 - 38th European Solid State Circuits Conference, Bordeaux, France Pages: 249-52 ,(2012).

108. **B. Kim, R. Melamud, R.A. Candler, M.A. Hopcroft**, and T.W. Kenny, "MEMS Packaging for Reliable Resonators and Oscillators", 2012 IEEE/MTT-S International Microwave Symposium - MTT 2012, Montreal Canada (2012).

109. **C-F. Chiang, A.B. Graham, E.J. Ng, C.H. Ahn**, G.J. O'Brien and T.W. Kenny, "A Novel, High-Resolution Resonant Thermometer used for Temperature Compensation of a Cofabricated Pressure Sensor", Proceedings 2012 Solid State Sensors and Actuators Workshop, P54, Hilton Head, SC (2012).

110. **E.J. Ng, S. Wang, D. Buchman, C-F. Chiang**, T.W. Kenny, H. Muenzel, M. Fuertsch, J. Marek, U.M. Gomez, G. Yama and G.O'Brien, "Ultra-Stable Epitaxial Polysilicon Resonators", Proceedings 2012 Solid State Sensors and Actuators Workshop, P271, Hilton Head, SC (2012).

111. **V.A. Hong, S. Yoneoka, M.W. Messana, A.B. Graham, J.C. Salvia, T.T. Branchflower, E.J. Ng** and T.W. Kenny, "High-Stress Fatigue Experiments on Single Crystal Silicon in an Oxygen-Free Environment", Proceedings 2012 Solid State Sensors and Actuators Workshop, P553, Hilton Head, SC (2012).

112. **M.A. Philippine**, O. Sigmund, G.M Rebeiz and T.W. Kenny, "Reduction of Stress-Stiffening by Topology Optimization", Proceedings 2012 Design Test Integration and Packaging Workshop (DTIP 2012), 2012, Cannes France (2012).

113. **C-F. Chiang, A.B. Graham**, G.J. O'Brien, and T.W. Kenny, "A single process for building capacitive pressure sensors and timing references with precise control of released area using lateral etch stop", Proceedings IEEE MEMS 2012, P. 519, Paris (2012).

114. **E. Ng, H.K. Lee, C.H. Ahn, R. Melamud**, and T.W. Kenny, "Stability measurements of silicon MEMS resonant thermometers", Proceedings IEEE Sensors 2011, Limerick (2011).

115. **C-F. Chiang, A.B. Graham, M.W. Messana**, J. Provine, **D.T. Buchman**, G.J. O'Brien, and T.W. Kenny, "Capacitive Absolute Pressure Sensor with Independent Electrode and Membrane Sizes for Improved Fractional Capacitance Change", Proceedings Transducers 2011, P. 894, Beijing (2011).

116. **H.K. Lee, R. Melamud, S.A. Chandorkar, Y.Q. Qu, J.C. Salvia, B. Kim, M.A. Hopcroft**, and T.W. Kenny, "Influence of the A-F Effect on the Temperature Stability of Silicon Micromechanical Resonators", Proceedings Transducers 2011, P. 506, Beijing (2011).

117. **H.K. Lee**, P.A. Ward, A.E. Duwel, **J.C. Salvia, Y.Q. Qu, R. Melamud, S.A. Chandorkar, M.A. Hopcroft, B. Kim**, and T.W. Kenny, "Verification of the Phase-Noise Model for MEMS Oscillators Operating in the Nonlinear Regime", Proceedings Transducers 2011, P. 510, Beijing (2011).

118. R.G. Hennessy, M. M. Shulaker, **M. W. Messana, A. B. Graham**, N. Klejwa, J Provine, T. W. Kenny and R. T. Howe, "Temperature Dependence of Vacuum-Encapsulated Resonators for Humidity Measurement", Proceedings Transducers 2011, P. 1950, Beijing (2011).

119. **S. Wang, S. A. Chandorkar, A. B. Graham, M. W. Messana, J. Salvia**, and T.W. Kenny, "Encapsulated Mechanically-Coupled Fully-Differential Breathe-Mode Ring Filters with Ultra-Narrow Bandwidth", Proceedings Transducers 2011, P. 942, Beijing (2011).

120. **H.K. Lee, R. Melamud, S. Chandorkar, Y-Q Qu, J. Salvia** and T.W. Kenny, "Motional Impedance of Resonators in the Nonlinear Regime", Proceedings IEEE International Frequency Control Conference, 2011, San Francisco (2011).

121. **S. Yoneoka**, M. Liger, G. Yama, R. Schuster, F. Purkl, J. Provine, F.B. Prinz, R.T. Howe and T.W. Kenny, "ALD-Metal Uncooled Bolometer", Proceedings IEEE MEMS 2011 P. 676, Cancun, MX (2011).

122. J. Provine, N. Ferralis, **A.B. Graham, M.W. Messana**, R. Kant, R. Maboudian, T.W. Kenny, and R.T. Howe, "Time Evolution of Released Hole Arrays into Membranes via Vacuum Silicon Migration", Proceedings 2010 Solid State Sensors and Actuators Workshop, P344, Hilton Head, SC (2010).

123. **G. Bahl, J. Salvia, H-K. Lee, R. Melamud, B. Kim**, R.T. Howe and T.W Kenny, "Heterodyned Electrostatic Transduction Oscillators Evade Low-Frequency Noise Aliasing", Proceedings 2010 Solid State Sensors and Actuators Workshop, P384, Hilton Head, SC (2010).

124. **W.S. Smith**, P.G. Hartwell, R.G. Walmsley, and T.W. Kenny, "Contact Geometry Effects on Friction in MEMS Probe Arrays", Proceedings 2010 Solid State Sensors and Actuators Workshop, P198, Hilton Head, SC (2010).

125. **M.A. Philippine, C-F. Chang, J. Salvia, C.M. Jha, S. Yoneoka**, and T.W. Kenny, "Material Distribution Design for a Piezoelectric Energy Harvester Desplaying Geometric Nonlinearity", Proceedings 2010 Solid State Sensors and Actuators Workshop, P451, Hilton Head, SC (2010).

126. R.G. Hennessy, M.M. Shulaker, **R. Melamud**, N. Klejwa, **S. Chandorkar, B. Kim**, J. Provine, T.W. Kenny and R.T. Howe, "Vacuum Encapsulated Resonators for Humidity Measurement", Proceedings 2010 Solid State Sensors and Actuators Workshop, P487, Hilton Head, SC (2010).

127. **H.K. Lee, J.C. Salvia, S. Yoneoka, G. Bahl, Y.Q. Qu, R. Melamud, S. Chandorkar, M.A. Hopcroft, B. Kim** and T.W. Kenny, "Stable Oscillation of MEMS Resonators Beyond the Critical Bifuration Point", Proceedings 2010 Solid State Sensors and Actuators Workshop, P70, Hilton Head, SC (2010).

128. **M.W. Messana, A.B. Graham, S. Yoneoka**, R.T. Howe and T.W. Kenny, "Packaging of Large Lateral Deflection MEMS using a Combination of Fusion Bonding and Epitaxial Reactor Sealing", Proceedings 2010 Solid State Sensors and Actuators Workshop, P336, Hilton Head, SC (2010).

129. **B. Kim, R. Melamud, R.A. Candler, M.A Hopcroft, C.M. Jha, S. Chandorkar**, and T.W. Kenny, "Encapsulated MEMS Resonators – A technology path for MEMS into Frequency Control", (Invited) Proceedings 2010 International Frequency Control Symposium, 1 Newport Beach, CA, 2010.

130. **G. Bahl, J. Salvia, I. Bargatin, S. Yoneoka, R. Melamud, B. Kim, S. Chandorkar, M.A. Hopcroft,** R. Bahl, R.T. Howe, and T.W. Kenny, "Charge-drift elimination in resonant electrostatic MEMS", 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010), Hong Kong January 2010, P. 108 (2010).

131. **S. Wang, C. Chandorkar, J. Salvia, R. Melamud, Y.Q. Qu, H.K. Lee**, and T.W. Kenny, "Nonlinearity of hermetically-encapsulated high-Q double-balanced breathe-mode ring resonator", 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010), Hong Kong January 2010, P. 715 (2010).

132. **H.K. Lee, S. Yoneoka, G. Bahl, J. Salvia, Y.Q. Qu, R. Melamud, C. Chandorkar, B. Kim, M.A. Hopcroft**, and T.W. Kenny, "A novel characterization method for temperature compensation of composite resonators", 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010), Hong Kong January 2010, P. 743 (2010).

133. **S. Yoneoka, Y.Q. Qu, S. Wang, M.W. Messana, A.B. Graham, J. Salvia, B. Kim, R. Melamud, G. Bahl** and T.W. Kenny, "High-cyclic fatigue experiments on single crystal silicon in an oxygen-free environment", 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010), Hong Kong January 2010, P. 224 (2010).

134. **H.K. Lee, J.Salvia, G. Bahl, R. Melamud, S. Yoneoka, Y.Q. Qu, M.A. Hopcroft, B. Kim** and T.W. Kenny, "Influence of the temperature-dependent A-F effect on the design and performance of oscillators", 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010), Hong Kong January 2010, P. 699 (2010).

135. **Y.Q. Qu, R. Melamud, S.A. Chandorkar, H.K. Lee** and T.W. Kenny, "Stress relaxation study of sputtered platinum films near room temperature using an ultrasensitive strain gauge", 23rd IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2010), Hong Kong January 2010, P. 548 (2010).

136. **K.L. Chen, S. Wang, J. Salvia**, R.T. Howe, and T.W. Kenny, "Encapsulated Out-Of-plane Differential Square-Plate Resonator with Integrated Actuation Electrodes", 15th International Conference on Solid-State Sensors, Actuators and Microsystems, Transducers 2009 June, 2009.

137. C.S. Roper, **R. Candler, S. Yoneoka**, T. Kenny, R.T Howe, R. Maboudian, "Simultaneous Wafer-Scale Vacuum-Encapsulation and Microstructure Cladding with LPCVD Pilycrystalline 3C-SiC", 15th International Conference on Solid-State Sensors, Actuators and Microsystems, Transducers 2009 June, 2009.

138. **Y.Q. Qu, R. Melamud** and T.W. Kenny, "Using Encapsulated MEMS Resonators to Measure Evolution in Thin Film Stress", 15th International Conference on Solid-State Sensors, Actuators and Microsystems, Transducers 2009 June, 2009.

139. M. Weinberg, **R. Candler, S. Chandorkar**, J Varasnik, T. Kenny, and A. Duwel, "Energy Loss in MEMS Resonators and the Impact on Inertial and RF Devices", 15th International Conference on Solid-State Sensors, Actuators and Microsystems, Transducers 2009 June, 2009.

140. **K.L. Chen, R. Melamud, S Wang** and T.W. Kenny, "An Integrated Solution for Wafer-Level packaging and Electrostatic Actuation of Out-Of Plane Devices", Proceedings 22nd International Conference on MicroElectro Mechanical Systems (IEEE MEMS), January 2009.

141. **S. Yoneoka, G. Bahl, J. Salvia, K.L. Chen, A.B Graham, H.K. Lee**, G. Yama, **R.N. Candler** and T.W. Kenny "Acceleration Compensation of MEMS Resonators using Electrostatic Tuning", Proceedings 22nd International Conference on MicroElectro Mechanical Systems (IEEE MEMS), January 2009.

142. **A.B. Graham, M. Messana,** P. Hartwell, J. Provine, **S. Yoneoka, B. Kim, R. Melamud**, R.T. Howe, and T.W. Kenny, "Wafer-Scale Encapsulation of Large Lateral Deflection MEMS Structures", Proceedings 22nd International Conference on MicroElectro Mechanical Systems (IEEE MEMS), January 2009.

143. **J. Salvia, R. Melamud, S Chandorkar, H.K.Lee, Y.Q.Qu, S.F. Lord**, B. Muhrmann, and T.W. Kenny, "Phase Lock Pool-Based Temperature Compensation for MEMS Oscillators", Proceedings 22nd International Conference on MicroElectro Mechanical Systems (IEEE MEMS), January 2009.

144. **K.L. Chen**, H. Chandrahalim, **A.B. Graham**, S.A. Bhave, R.T. Howe and T.W. Kenny, "Epitaxial Silicon Microshell Vacuum-Encapsulated CMOS-Compatible 200 MHz Bulk-Mode Resonator", Proceedings 22nd International Conference on MicroElecrtro Mechanical Systems (IEEE MEMS), January 2009.

145. **J. Salvia, M. Messana**, M. Ohline, **M.A. Hopcroft, R. Melamud, S. Chandorkar, H.K. Lee, G. Bahl**, B. Muhrmann, and T.W. Kenny, "Exploring the limits and practicality of Q-Based Temperature Compensation for Silicon Resonators", Proceedings 2008 IEDM Meeting, December 2008.

146. **S.A. Chandorkar, M. Agarwal, R. Melamud**, R.N. Candler, K.E. Goodson and T.W. Kenny, "Limits of Quality Factor in Bulk-Mode Micromechanical Resonators", Proceedings IEEE MEMS Conference, Tucson, AZ (2008).

147. **H.K. Lee, M.A. Hopcroft, R. Melamud, B. Kim, J. Salvia, S. Chandorkar**, and T.W. Kenny, "Electrostatic Tuning of Hermetically-Encapsulated Composite Resonator", Proceedings 2008 Solid State Sensors and Actuators Workshop, Hilton Head, SC (2008).

148. **G. Bahl, R. Melamud, B. Kim, S. Chandorkar, J. Salvia, M.A. Hopcroft, R.G. Hennessy, S. Yoneoka, C.M. Jha**, G. Yama, D. Elata, R.N. Candler, R.T. Howe, and T.W. Kenny, "Observations of Fixed and Mobile Charge in Composite MEMS Resonators", Proceedings 2008 Solid State Sensors and Actuators Workshop, Hilton Head, SC (2008).

149. **B. Kim, M.A. Hopcroft, R. Melamud, C.M. Jha, M. Agarwal, S.A. Chandorkar** and T.W. Kenny, " CMOS-Compatible wafer-scale encapsulation with MEMS Resonators", Proceedings of the ASME InterPACK 2007, 499 (2007).

150. **H-S. Kim**, **H.O. Song**, T.W. Kenny, "An improved method of thermal resistance measurement for variable thermal resistors", Proceedings of the ASME InterPACK 2007, 249 (2007).

151. **M.A. Hopcroft, H.K. Lee, B. Kim, R. Melamud, S. Chandorkar, M. Agarwal, C.M. Jha, J. Salvia, G. Bahl, H. Mehta,** and T.W. Kenny "A High-Stability MEMS Frequency Reference", Proceedings, 14th International Conference on Solid State Sensors Actuators and Mictosystems (Transducers '07), 1307 (2007).

152. **Ginel C. Hill, Daniel R. Soto, Stephanie J. Lue,** Anne M. Peattie, Robert J. Full, and Thomas W. Kenny, "Investigating the Role of Orientation Angle on Gecko Setae Adhesion using a Dual-Axis MEMS Force Sensor", Proceedings, 14th International Conference on Solid State Sensors Actuators and Mictosystems (Transducers '07), 2263 (2007).

153. **C. M. Jha, G. Bahl, R. Melamud, S. A. Chandorkar, M. A. Hopcroft, B. Kim, M. Agarwal, J. Salvia, H. Mehta and T. W. Kenny**, "CMOS Compatible Dual Resonator MEMS Temperature Sensor with Milli-degree Accuracy", Proceedings, 14th International Conference on Solid State Sensors Actuators and Mictosystems (Transducers '07), 229 (2007)

154. **B. Kim, M. Hopcroft, C.M Jha, R. Melamud, S. Chandorkar, M. Agarwal, K.L. Chen, W.T. Park, R. Candler**, G. Yama[2] A. Partridge, M. Lutz, T.W. Kenny, "Using MEMS to Build the Device and the Package", Invited Talk, Transducers '07 Lyon France (6/7/07)

155. **B. Kim, M.A. Hopcroft, R. Melamud, C.M. Jha. M. Agarwal, S.A. Chandorkar,** and T.W. Kenny, "MEMS Resonators in CMOS Compatible Wafer-Scale Encapsulation", Proceedings of IPACK2007 (2007).

156. **R. Melamud, B. Kim, M.A. Hopcroft, S.Chandorkar, M.Agarwal, C.M. Jha**, and T.W. Kenny, "Composite Flexural-Mode Resonator with Controllable Turnover Temperature", Proceedings 2007 International Conference on MEMS, Kobe, Japan (2007).

157. **S. A. Chandorkar[1], H. Mehta[1], M. Agarwa1[1], M.A. Hopcroft[1], C. M. Jha[1], R.N. Candler[2],** G.Yama[2]**, G. Bahl[1], B. Kim[1], R. Melamud[1]**, K. E. Goodson[1] and T. W. Kenny [1] "Non-Isothermal Micromechanical Resonators", Proceedings 2007 International Conference on MEMS, Kobe, Japan (2007).

158. **M.Agarwal , H. Mehta, R.N. Candler, S.A. Chandorkar, B. Kim , M.A. Hopcroft, R. Melamud, G. Bah**l, G. Yama, T.W. Kenny and B. Murmann, "Impact of Miniaturization on the Current Handling of MEMS Resonators", Proceedings 2007 International Conference on MEMS, Kobe, Japan (2007).

159. T.Kenny, M. Lutz, A. Partridge, G. Yama, **R.N. Candler, W.T. Park, M. Hopcroft, B. Kim, M. Agarwal, S. Chandorkar, R. Melamud, C. Jha**, "Advances in MEMS Integration: MEMS First or MEMS Last?", Proceedings 12th International Micromachine/Nanotech Symposium, Tokyo, Japan 11/06.

160. T.W.Kenny, A. Partridge, **R.N. Candler, W.T. Park, M. Hopcroft, B. Kim, M. Agarwal, S. Chandorkar, R. Melamud, C. Jha**, M. Lutz and G. Yama, "Manufacturable MEMS : Building the MEMS, the Package and the Circuit in the Same Technology" Proceedings, Second International Forum on Micro-nano Hetero System Integration (MHSI'06) and 2nd Fraunhofer Gesellschaft Symposium, Sendai, Japan 11/06.

161. **M. Agarwal, K.K. Park, R.N. Candler, B. Kim, M.A. Hopcroft, S.A. Chandorkar, C.M. Jha, R. Melamud,** T.W. Kenny, and B. Murmann, "Nonlinear Characterization of Electrostatic MEMS Resonators", 2006 Frequency Control Symposium (2006)

162. **M. Agarwal, K.K. Park, B. Kim, M.A. Hopcroft, S.A. Chandorkar, R.N. Candler, C.M. Jha, R. Melamud,** T.W. Kenny and B. Murmann, "Amplitude Noise Induced Phase Noise in Electrostatic MEMS Resonators", Proceedings of the 2006 Hilton Head Workshop in Solid State Sensors, Actuators, and Microsystems, p62 (2006).

163. **R Melamud, B. Kim, M.A. Hopcroft, S. Chandorkar, M. Agarwal, C. Jha, S. Bhat, K.K. Park**, and T.W. Kenny, "Composite Flexural Mode Resonators with Reduced Temperature Coefficient of Frequency", Proceedings of the 2006 Hilton Head Workshop in Solid State Sensors, Actuators, and Microsystems, p90 (2006).

164. **B. Kim, C.M. Jha, T. White, R.N. Candler, M. Hopcroft, M. Agarwal, K.K. Park, R. Melamud**, and T.W. Kenny, "Temperature Dependence of Quality Factor in MEMS Resonators", Proceedings 2006 International Conference on MEMS, Istanbul, Turkey (2006).

165. **M. Agarwal, K.K. Park, M. Hopcroft, S. Chandorkar, R.N. Candler, B. Kim, R. Melamud,** G. Yama, B. Murmann, and T.W. Kenny, "Effects of Mechanical Vibrations and Bias Voltage Noise on Phase Noise of MEMS Resonator-based Oscillators", Proceedings 2006 International Conference on MEMS, Istanbul, Turkey (2006).

166. **M.A. Hopcroft, M. Agarwal, K.K. Park, B. Kim, C.M. Jha, R.N. Candler,** G. Yama, B. Murmann, and T.W. Kenny, "Temperature Compensation of a MEMS Resonator using Quality Factor as a Thermometer", Proceedings 2006 International Conference on MEMS, Istanbul, Turkey (2006).

167. **M. Agarwal, K. Park, R. Candler, M. Hopcroft, C. Jha, R. Melamud, B. Kim**, B. Muhrman, and T. Kenny, "Nonlinearity Cancellation in MEMS Resonators for Improved Power Handling", 2005 International Electron Devices Meeting (2005).

168. **R. Melamud, M. Hopcroft, C. Jha, B. Kim, S. Chandorkar, R. Candler**, T.W. Kenny, "Effects of Stress on the Temperature Coefficient of Frequency in Double-Clamped Resonators", Proceedings Transducers '05, 392-395 (2005).

169. **W.T. Park**, K.N. O'Connor, J.R. Mallon, T. Maetani, **R.N. Candler, V. Ayanoor-Vitikkate**, J. Roberson, S. Puria, and T.W. Kenny, "Sub-Millimeter Encapsulated Accelerometers : A Fully Implantable Sensor for Cochlear Implants", Proceedings Transducers '05 109-112 (2005).

170. **R.N. Candler, W.T. Park, M. Hopcroft,, B. Kim**, and T.W. Kenny, "Hydrogen Diffusion and Pressure Control of Encapsulated MEMS Resonators", Proceedings, Transducers '05, 597-600 (2005).

171. **R.N. Candler, M. Hopcroft, C.W. Low, S. Chandorkar, B. Kim**, M. Varghese, A. Duwel, and T.W. Kenny, "Impact of Slot Location in Thermoelastic Dissipation in Micromechanical Resonators", Proceedings, Transducers '05, 920-923 (2005).

172. **B. Kim, R.N. Candler, M. Hopcroft, M. Agarwal, W.T. Park**, and T.W. Kenny, "Frequency Stability of Wafer-Scale Encapsulated MEMS Resonators", Proceedings, Transducers '05, 1965-1968 (2005).

173. **W.T. Park, R.N. Candler, V.A. Vittikkate**, M. Lutz, A. Partridge, G. Yama, T.W. Kenny, "Fully-Encapsulated Sub-MM Accelerometer", Proceedings18th IEEE International Conference on MEMS, 347, Miami, Fl (2005), 347-350 (2005).

174. **B. Kim, R.N. Candler, M. Hopcroft, M. Agarwal, W.T Park, J.T. Li**, and T. Kenny, "Investigation of MEMS Resonator Characteristics for Long-Term Operation and Wide Temperature Variation Condition", ASME Winter Annual Meeting, Anaheim CA, 2004.

175. **M. Hopcroft, R. Melamud, R.N. Candler, W-T. Park, B. Kim**, G. Yama, A. Partridge, M. Lutz, and T.W. Kenny, "Active Temperature Compensation for Micromachined Resonators", Proceedings 2004 Solid State Sensors and Actuators Workshop, 364-367 (2004).

176. **E.N. Wang,** S. Devasenathipathy, C.H. Hidrovo, D.W. Fogg, J.M. Koo, J.G. Santiago. K.E. Goodson and T.W. Kenny, "A Quantitative Understanding of Transient Bubble Growth in Microchannels using μPIV", Proceedings 2004 Solid State Sensors and Actuators Workshop, 101-102 (2004).

177. **R.N. Candler, M. Hopcroft, WT. Park, S.A. Chandorkar,** G. Yama, K.E. Goodson, M. Varghese, A.E. Duwel, A. Partridge, M. Lutz and T.W. Kenny, "Reduction in Thermoelastic Dissipation in Micromechanical Resonators by Disruption of Heat Transport", Proceedings 2004 Solid State Sensors and Actuators Workshop, 45-48 (2004).

178. T.W. Kenny, **Y. Liang, B.L. Pruitt, J.A. Harley, M. Bartsch, and R. Rudnitsky**, "Fundamental Noise in MEMS Force Sensors", Proceedings 2004 SPIE Conference on Fluctuations and Noise in Sensors and Measurements, Maspalomas Gran Canaria ,143-151 (2004).

179. G. Upadhya, P. Zhou, K. Goodson, M. Munch, and T.W. Kenny, "Closed-Loop Cooling Technologies for Microprocessors", Proceedings 2003 International Electronic Devices Meeting, Washington, 775-778 (2003).

180. **W.T. Park, R.N. Candler, J. Cho, H. Li, H. Li**, M. Lutz, A. Partridge, G. Yama, and T.W. Kenny, "Wafer-Scale Encapsulation of MEMS Devices", Proceedings InterPACK '03, Kanapaali, HI IPACK 2003-35032 (2003).

181. **W.T. Park, R.N. Candler**, S. Kronmueller, M. Lutz, A. Partridge, G. Yama, and T.W. Kenny, "Wafer-Scale Film Encapsulation of Micromachined Accelerometers", Proceedings Transducers '03, Boston, 1903-1906 (2003).

182. B.W. Chui, **Y. Hishinuma**, R. Budakian, H.J. Mamin, T.W. Kenny, and D. Rugar, "Mass-Loaded Cantilevers with Suppressed Higher-Order Modes for Magnetic Resonance Force Microscopy", Proceedings Transducers '03, Boston, 1120-1123 (2003).

183. **M.S. Bartsch**, W. Federle, R.J. Full, and T.W. Kenny, "Small Insect Force Measurements using a Custom MEMS Force Sensor", Proceedings Transducers '03, Boston, 1035-1038 (2003).

184. **R.N. Candler, H. Li**, M. Lutz, **W.T. Park**, A. Partridge, G. Yama, and T.W. Kenny, "Investigation of Energy Loss Mechanisms in Micromechanical Resonators", Proceedings Transducers '03, Boston, 332-335 (2003).

185. **D.J. Laser**, A.M. Meyeers, S. Yao, K.F. Bell, K.E. Goodson, J.G. Santiago, and T.W. Kenny, "Silicon ElectroOsmotic MicroPumps for Integrated Circuit Thermal Management", Proceedings Transducers '03, Boston, 151-154 (2003).

186. L. Jiang, J.M. Koo, S. Zheng, J.C. Mikkelsen, **L. Zhang**, J.G. Santiago, T.W. Kenny, K.E. Goodson, "Two-phase microchannel heat sinks for an electrokinetic VLSI chip cooling system" Seventeenth Annual IEEE Semiconductor Thermal Measurement and Management Symposium, (2001).

187. J.M. Koo, L. Jiang, A. Bari, L. Zhang, **E. Wang**, T.W. Kenny, J.G. Santiago, K.E. Goodson, "Convective boiling in microchannel heat sinks with spatially-varying heat generation", ITherm 2002. Eighth Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, 30 (2002).

188. J.P. Lynch, K.H. Law, A.S. Kiremidjian, E. Carryer, T.W. Kenny, A. Partridge, A. Sundararajan, "Validation of a Wireless Modular Monitoring System for Structures", Proceedings of the SPIE - The International Society for Optical Engineering 4696, 124 (2002)

189. T.W. Kenny, **R.N. Candler, H.J. Li, W.T. Park, J. Cho, H. Li**, A. Partridge, G. Yama, M. Lutz, "An Integrated Wafer-Scale Packaging Process for MEMS", 2002 ASME International Mechanical Engineering Congress and Exhibition, New Orleans (2002).

190. Jiang, L., Mikklsen, J., Koo, J-M, **Zhang, L.,** Huber, D., Yao, S., Bari, A., Zhou, P., Santiago, J., and Kenny, T.W. and Goodson, K.E., "Transient and Sub-atmospheric Performance of A Closed-loop Electroosmotic Microchannel Cooling System", *Proceeding of Thermal Challenges in Next Generation Electronic Systems, THERMES 2002*, Santa Fe, New Mexico, USA, 133-139, Jan. 13-16, 2002.

191. **A.E. Herr**, J.C. Mikkelsen, J.G. Santiago, and T.W. Kenny , "Two-Dimensional Chip-Based Protein Analysis using Coupled Isoelectric Focusing and Capillary Electrophoresis", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 366-369 (2002).

192. **A. Tewary, K.Y. Yasumura, T.D. Stowe**, T.W. Kenny, and D. Rugar, "Quality Factor Enhancement of in situ Annealing Cantilevers", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 337-340 (2002).

193. **B.L. Pruitt, W.-T. Park**, and T.W. Kenny , "Measurement System for Low Force and Small Displacement Contacts", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head 297-300 (2002)

194. **D.J. Laser,** K.E. Goodson, J.G. Santiago, and T.W. Kenny , "High-Frequency Actuation with Silicon Electroosmotic Micropumps", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 231-235 (2002)

195. **W.P. King**, T.W. Kenny, K.E. Goodson, M. Despont, U. Duerig, M. Lantz, H. Rothuizen, G. Binnig, and P. Vettiger, "Microcantilevers for Thermal NanoImaging and Thermomechanical Surface Modification", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 210-213 (2002)

196. V. Chandrasekaran, **E.M. Chow**, T.W. Kenny, T. Nishida, L.N. Cattafesta, B.V. Sankar, and M.Sheplak, "Thermoelastically Actuated Acoustic Proximity Sensor with Integrated Through-Wafer Interconnects", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 102-105 (2002)

197. T.W. Kenny, **Y. Liang, S-W Ueng, M. Bartsch and R. Rudnitsky**, "Micromechanical Force Sensing with Application to Biology", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 62-65 (2002)

198. **E.N. Wang, L. Zhang,** L. Jiang, J-M. Koo, K.E. Goodson, and T.W. Kenny, "Micromachined Jet Arrays for Liquid Impingement Cooling of VLSI Chips", Proceedings, 2002 Workshop on Solid State Sensors, Actuators and Microsystems, Hilton Head, 46-49 (2002)

199. **L. Zhang, E.N. Wang,** J-M. Koo**,** L. Jiang, K.E. Goodson, J.G. Santiago, and T.W. Kenny, "Enhanced Nucleate Boiling in Microchannels", 2002 IEEE International Conference on MicroElectroMechanical Systems, Las Vegas, 89-92 (2002).

200. **L. Zhang, E.N. Wang,** J. Koch, J.Liu, J-M. Koo, L. Jiang, K.E. Goodson, J.G. Santiago, T.W. Kenny, "Microscale Liquid Impingement Cooling", 2001 ASME International Mechanical Engineering Congress and Exhibition, New York (2001).

201. **D.J. Laser,** K.E. Goodson, J.G. Santiago, and T.W. Kenny, "Impact of Pumping Surface Separation Distance on Micromachined Silicon Electrokinetic Pump Performance", 2001 ASME International Mechanical Engineering Congress and Exhibition, New York (2001).

202. **O. Ajakaiye**, and T.W. Kenny, "Performance Characterization of Micromachined Tunneling Infrarred Sensors", 2001 ASME International Mechanical Engineering Congress and Exhibition, New York (2001).

203. T. Kenny **A. Partridge, A. Rice** and M. Lutz, "An Integrated Wafer-Scale Packaging Process for MEMS", Proceedings IEEE/ASME InterPACK Conference, Kauai (2001).

204. **L. Zhang,** J. Koo, L, Jiang, K. Goodson,. J. Santiago, and T.W. Kenny, "Study of Boiling Regimes and Transient Signal Measurements in Microchannels", Proceedings Transducers '01, Munich Germany, 1514-1517 (2001).

205. **D. Laser,** S.Yao, C-H Chen, J. Mikkelsen, K.E. Goodson, J.Santiago, and T.W. Kenny, "A Micromachined Low-Voltage, Parallel-Plate Electrokinetic Pump", Proceedings Transducers '01, Munich Germany, 930-933 (2001).

206. **Y. Liang, S-W Ueng**, T.W. Kenny, "Performance Characteristics of Ultra-Thin n-Type Piezoresistive Cantilevers", Proceedings Transducers '01, Munich Germany, 998-1001 (2001).

207. **M. Bartsch**, T. Kenny, W. Federle, and R. Full, "Exploring insect Biomechanics with Micromachined Force Sensors", Proceedings Transducers '01, Munich Germany, 1662-1665 (2001).

208. **B. Pruitt,** D. Choi, J. Florando, W. Nix, T. Kenny, R. Martens, S. Wenzel, and C. Reynolds, "Low-Force Electrical Contact Measurements using Piezoresistive MEMS Cantilevers to Characterize Thin Film Metallization", Proceedings Transducers '01, Munich Germany, 1032 –1035 (2001).

209. J.M. Koo, L. Jiang**, L. Zhang,** P. Zhou, **S. Bannerjee**, T.W. Kenny, J.G. Santiago, and K.E. Goodson, "Modeling of Two-Phase Microchannel Heat Sinks for VLSI Chips", Proceedings 2001 IEEE International Conference on MicroElectromechanical Systems, 422-425 (2001)

210. **A. Partridge, A.E. Rice**, T.W. Kenny and M. Lutz, "New Thin Film Epitaxial Polysilicon Encapsulation for Piezoresistive Accelerometers", Proceedings 2001 IEEE International Conference on MicroElectromechanical Systems, 54-57 (2001)

211. **A.E. Herr**, J.C. Mikkelsen, J.G. Santiago, and T.W. Kenny, "Electroosmotic Flow Suppression and its Implications for a Miniaturized Full-Field Detection Approach to Capillary Isoelectric Focusing (cIEF)", Proceedings ASME 2000 Winter Annual Meeting, MEMS Vol. 2, 513 (2000).

212. **M.S. Bartsch, A. Partridge, B.L.. Pruitt**, R.J. Full and T.W. Kenny, "A Three-Axis Piezoresistive Micromachined Force Sensor for Studying Cockroach Biomechanics", Proceedings ASME 200 Winter Annual Meeting, MEMS Vol. 2, 443-448 (2000).

213. **B.L. Pruitt, A. Partridge, M. Bartsch, Y. Liang**, T.W. Kenny, S. Wenzel, and C. Reynolds, "Design of Piezoresistive Cantilevers for Low-Force Electrical Contact Measurements", Proceedings ASME 2000 Winter Annual Meeting, MEMS Vol. 2, 183-188 (2000).

214. **L. Zhang,** J.M. Koo**, L. Jiang, S. Bannerjee,** M. Asheghi**,** K.E. Goodson, J.G. Santiago, and T.W. Kenny, "Measurements and Modeling of Two-Phase Flow in Microchannels with Nearly-Constant Heat Flux Boundary Conditions", Proceedings ASME 2000 Winter Annual Meeting, MEMS Vol. 2, 129-135 (2000)

215. L. Jiang, J.M. Koo, S. Zeng, J.C. Mikkelsen, **L. Zhang,** P. Zhou, J.G. Santiago, T.W. Kenny, K.E. Goodson, J.G. Maveety, and Q.A. Tran, "An Electrokinetic Closed-Loop MicroCooler for High-Power VLSI Chips", Proceedings 2001 SEMI-Therm Conference.

216. W.P. King, T.W.Kenny, K.E. Goodson, G. Cross, M. Despont, U. Dürig, M. I. Lutwyche, H. Rothuizen, G.K.Binnig, and P. Vettiger, Design of AFM Cantilevers for Combined Thermomechanical Data Writing and Reading, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 1-5 (2000).

217. **J.D. Grade**, J.H. Jerman, and T.W. Kenny, A Large-Deflection Electrostatic Actuator for Optical Switching Applications, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 97-100 (2000).

218. **J.I. Molho, A.E Herr,** B.P. Mosier, J.G. Santiago, and T.W. Kenny, A Low-Dispersion Turn for Miniaturized Electrophoresis, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 132-137 (2000).

219. **A.E. Herr, J.I. Molho**, J.G. Santiago, T.W. Kenny, D.A. Borkholder, G.J. Kintz, P. Belgrader, and M.A. Northrup, Optimization of a Miniaturized Capillary Isoelectric Focusing System using a Full-Field Detection Approach, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 115-119 (2000).

220. **Y. Liang**, K. Autumn, S.T. Hsieh, W. Zesch, W.P. Chan, R.S. Fearing, R.J. Full and T.W. Kenny, Adhesion Force Measurements on Single Gecko Setae, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 33-38 (2000).

221. **L Zhang, S.S. Banerjee**, J.M. Koo, **D.S. Laser**, M. Asheghi, K.E. Goodson, J.G. Santiago, and T.W. Kenny, A Micro Heat-Exchanger with Integrated Heaters and Thermometers, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 275-280 (2000).

222. **E.M. Chow, A. Partridge**, C.F. Quate, and T.W. Kenny, Thru-Wafer Electrical Interconnects Compatible with Standard Semiconductor Processing, Proceedings 2000 Hilton Head Workshop on Sensors and Actuators, 343-346 (2000).

223. **A.M. Fitzgerald**, R.H. Dauskardt, T.W. Kenny, "High-Resolution Measurement of Crack Growth in Micromachined Single Crystal Silicon", 1999 MRS Symposium Proceedings : Materials Science of Microelectromechanical Systems, p. 43-48 (1999)

224. W.P. King, J.G. Santiago, T.W. Kenny, and K.E. Goodson, Modeling and Prediction of Sub-Micrometer Heat Transfer during Thermomechanical Data Storage, Proceedings 1999 ASME Winter Meeting (1999).

225. **Y. Liang, J.N. Welch, R.G. Rudnitsky**, and T.W. Kenny, Biological Force Measurements using Micromachined Cantilevers, Proceedings 1999 ASME Winter Meeting (1999).

226. **J.K. Reynolds**, T.W. Kenny, D.C. Catling, R.C. Blue, M.H. Hecht, and N.I. Maluf, Packaging of Micromachined Absolute Pressure Sensors for High-Accuracy Measurements, Proceedings InterPAK '99 137-142 (1999).

227. **K.Yasumura,** J.A. Chiaverini**,** and T.W. Kenny, Thermoelastic Dissipation in Silicon Nitride Microcantilevers, Proceedings 10th International Conference on Solid State Sensors and Actuators. 564-567 (1999)

228. **T. Stowe,** T.W. Kenny, D. Rugar, and D. Thompson, Dissipation Microscopy based on Electronic Drag, Proceedings 10th International Conference on Solid State Sensors and Actuators. 1208-1211 (1999)

229. **A.M. Fitzgerald,** R.H. Dauskardt, and T.W. Kenny, Fracture Toughness of Plasma-Etched Single-Crystal Silicon and Implications for MEMS Design, Proceedings 10th International Conference on Solid State Sensors and Actuators. 928-931 (1999).

230. **C.H. Liu, A. Barzilai, O. Ajakaiye,** H.K. Rockstad, and T.W. Kenny, Performance Enhancements for the Micromachined Tunneling Accelerometer, Proceedings 10th International Conference on Solid State Sensors and Actuators.1290-1293 (1999)

231. **J.K. Reynolds,** D.C. Catling, R.C. Blue, N. Maluf, and T.W. Kenny, Packaging and Calibration of a Piezoresistive Pressure Sensor for High-Accuracy at Low Temperatures and Pressures, Proceedings 10th International Conference on Solid State Sensors and Actuators. 1494-1497 (1999)

232. **E.M. Chow,** H.T. Soh, H.C. Lee, J.D. Adams, S.C. Minne, G. Yaralioglu, A. Atalar, C.F. Quate, and T.W. Kenny, Two-Dimensional Cantilever Arrays with Integrated Thru-Wafer Interconnects, Proceedings 10th International Conference on Solid State Sensors and Actuators. 1886-1889 (1999)

233. **R. Rudnitsky, E.M. Chow,** and T.W. Kenny, High-Speed Biochemical Screening with Magnetic Force Microscope Cantilever Arrays, Proceedings 10th International Conference on Solid State Sensors and Actuators. 706-709 (1999)

234. **J.A. Harley, T.D. Stowe,** and T.W. Kenny, Piezoresistive Cantilevers with Femtonewton Force Resolution, Proceedings 10th International Conference on Solid State Sensors and Actuators. 1628-1631 (1999)

235. **A.E. Herr, J.I. Molho,** T.W. Kenny, J.G. Santiago, M.G. Mungal and M.G. Garguilo, Variation of Capillary Wall Potential in Electrokinetic Flow, Proceedings 10th International Conference on Solid State Sensors and Actuators. 710-713 (1999)

236. **B.W. Chui,** M. Asheghi, Y.S. Ju, H.J. Mamin, K.E. Goodson, and T.W. Kenny, Measurement and Modeling of Thermal-Electrical Runaway in Silicon Cantilevers, Proceedings 10th International Conference on Solid State Sensors and Actuators. 1862-1865 (1999)

237. M. Ashegi, W.P. King, **B.W. Chui**, T.W. Kenny, and K.E. Goodson, Thermal Engineering of Doped Single-Crystal Silicon Microcantilevers for High Density Data Storage, Proceedings 10th International Conference on Solid State Sensors and Actuators. 1840-1843 (1999)

238. S.M Kumar**,** W.C. Reynolds, and T.W. Kenny, MEMS-Based Transducers for Boundary Layer Control, Proceedings 12th International Conference on Micro Electro Mechanical Systems, 135-138 (1999).

239. M.C. Deshpande, C. Ghaddar, J.R. Gilbert, P.M. St. John, T. Woudenberg, C. Connel**, J.I. Molho, A.E. Herr**, G. Mungal, and T.W. Kenny, "Numerical Framework for the Modeling of Electrokinetic Flows", Microfluidic Devices and Systems, Proceedings SPIE 217-223 (1998).

240. **K. Yasumura, T. Stowe, E. Chow,** T. Pfafman**,** T.W. Kenny, and D. Rugar, A Study of Microcantilever Mechanical Quality Factor, Proceedings 1998 Hilton Head Workshop on Sensors and Actuators, 65-68. (1998).

241. **A. Partridge, B.W. Chui, J.K. Reynolds, E. Chow, A.M. Fitzgerald, L. Zhang, S. Cooper,** T.W. Kenny, and N.I. Maluf, A High-Performance Planar Piezoresistive Accelerometer, Proceedings 1998 Hilton Head Workshop on Sensors and Actuators, 59-61. (1998).

242. **E.M. Chow ,** H.T. Soh, **A. Partridge, J.A. Harley,** T.W. Kenny, and C.F. Quate, Fabrication of High-Density Cantilever Arrays and Thru-Wafer Interconnects, Proceedings 1998 Hilton Head Workshop on Sensors and Actuators, 220-223. (1998).

243. P.M. St. John, T. Woudenberg, C. Connell, **J, Molho, A. Herr**, T.W. Kenny, M.G. Mungal, M. Desphande, J.R. Gilbert, M. Garguilo, D. Rakestraw, and P. Paul, Metrology and Simulation of Chemical Transport in Microchannels, Proceedings 1998 Hilton Head Workshop on Sensors and Actuators, 106-109. (1998).

244. **B.W. Chui**, T.W. Kenny, H.J. Mamin, B.D. Terris, and D. Rugar, Independent Detection of Vertical and Lateral Forces with a Sidewall-Implaned Dual-Axis Piezoresistive Cantilever, Proceedings of IEEE MicroElectroMechanical Systems Workshop. 12-15 (1998).

245. **Grade, A. Barzilai, K. Reynolds, C.H. Liu, A. Partridge**, H. Jerman, and T.W. Kenny, Wafer-Scale Processing, Assembly, and Testing of Tunneling Infrared Detectors, Proceedings of Transducers '97 - The 9th International Conference on Solid State Sensors and Actuators 1241-1244 (1997)

246. **C.H. Liu, J. D. Grade, A. M. Barzilai, J. K. Reynolds, A. Partridge**, H. K. Rockstad, and T. W. Kenny , Characterization of a High-Sensitivity Micromachined Tunneling Accelerometer, Proceedings of Transducers '97 - The 9th International Conference on Solid State Sensors and Actuators Actuators. 471-472 (1997)

247. **J.Grade, C.H. Liu, K. Reynolds, A. Partridge, A. Barzilai**, L.Miller, and T.Kenny, Reducing the Low-Frequency Drift in Tunneling Transducers, Proceedings of Transducers '97 - The 9th International Conference on Solid State Sensors and Actuators 871-874 (1997)

248. **T.D. Stowe, K. Yasumura**, T. Pfafman, T. Kenny, D. Botkin, and D. Rugar, Ultrasensitive Torsional Probes Optimized for Higher-Order Mode Suppression, Proceedings of Transducers '97 - The 9th International Conference on Solid State Sensors and Actuators, P. 141-144 (1997).

249. **B.W. Chui, T.D. Stowe**, T.W. Kenny, H.J., Mamin, B.D. Terris, and D.Rugar, Micromachined Heaters with 1-µs Thermal Time Constants for AFM Thermomechanical Data Storage, Proceedings of Transducers '97 - The 9th International Conference on Solid State Sensors and Actuators 1085-1088 (1997).

250. P. Scheeper, **J.K. Reynolds**, and T.W. Kenny, Development of a Modal Analysis Accelerometer Based on a Tunneling Displacement Transducer, Proceedings of Transducers '97 - The 9th International Conference on Solid State Sensors and Actuators 867-870 (1997).

251. **P. Graven** and T.W. Kenny, Laboratory (and on-orbit) Magnetometer Calibration without Coil Facilities or Orientation Information, Proceedings 1996 AIAA Small Satellite Conference (1996).

252. **D.S. Clarke, M.T. Hicks, A.M. Fitzgerald, J.J. Suchman**, R.J. Twiggs, J.A. Randolph, and T.W. Kenny, Picosat Free Flying Magnetometer Experiment, Proceedings 1996 AIAA Small Satellite Conference (1996).

253. **Grade, A. Barzilai, J.K. Reynolds, C.H. Liu, A. Partridge**, T.W. Kenny, T.R. VanZandt, L.M. Miller, and J.A. Podosek, Progress in Tunnel Sensors, Proceedings 1996 IEEE Solid State Sensors and Actuators Workshop, 80-83 (1996).

254. **B.W. Chui**, H.J., Mamin, D. Rugar, B.D. Terris, R. Ried**, T.D. Stowe, S.C. Minne, H.T. Soh**, C.F. Quate, **Y.S.Ju**, O.W. Kaeding, K.E. Goodson, and T.W. Kenny, Improved Cantilevers for AFM Thermomechanical Data Storage, Proceedings 1996 IEEE Solid State Sensors and Actuators Workshop, 219-224 (1996).

255. **T. Stowe, K. Yasumura**, T. Kenny, D. Botkin, K. Wago, and D. Rugar, Ultrasensitive Vertical Force Probe for Magnetic Resonance Force Microscopy, Proceedings 1996 IEEE Solid State Sensors and Actuators Workshop, 225-230 (1996).

256. L.M. Miller, J.A. Podosek, E. Kruglick, T.W. Kenny, J.A. Kovacich, and W.J. Kaiser, A µ-Magnetometer Based on Electron Tunneling, Proceedings IEEE MEMS Workshop, 467-470 (1996).

257. **C.H. Liu, J.K. Reynolds, A. Partridge**, T.W. Kenny, L.M. Miller, J.A. Podosek, H.K. Rockstad, and W.J. Kaiser, High-Bandwidth Feedback Control of Micromachined Tunneling Sensors, Proceedings of ASME, DSC-57-2, 1001-1007 (1995).

258. H.K. Rockstad, **J.K. Reynolds**, T.K. Tang, T.W. Kenny, W.J. Kaiser, and T.B. Gabrielson, A Miniature, High-Sensitivity, Electron-Tunneling Accelerometer, Proceedings, Transducers '95, 675-679 (1995).

259. H.K. Rockstad, T.W. Kenny, P.J. Kelly, and T.B. Gabrielson, "A Micro-Fabricated Electron-Tunneling Accelerometer as a Directional Acoustic Sensor", Proceedings of Acoustic Particle Velocity Sensors : Design, Performance and Applications 9/95 Published in AIP Conf. Proc. 368, 57-62 (1996).

260. R.A. Brennen, M.H. Hecht, D.V. Wiberg, T.D. Stowe, T.W. Kenny, K.H. Jackson, C.K. Malek, "Fabricating Sub-Collimating Grids for X-Ray Solar Imaging Spectrometer using LIGA Technique", SPIE Microlithography and Metrology in Micromachining 10/95, SPIE Vol. 2640, 214-217 (1995).

261. A.W. Chen, P.A. Kaaret, T.W Kenny, "Micromachined Silicon X-Ray Optics", Proceedings SPIE 2279, 298-301 (1994).

262. A.W. Chen, P.A. Kaaret, T.W Kenny, "Focusing of X-Rays Using Micromachined Silicon Lobster-Eye Lenses", Proceedings SPIE 2011, 227-230 (1994).

263. L.M. Miller, M.L. Agronin, R.K. Bartman, W.J. Kaiser, T.W. Kenny, R.L. Norton, and E.C. Vote, "Fabrication and Characterization of a Micromachined Deformable Mirror for Adaptive Optics Applications", Proceedings SPIE V1945, 421-424 (1993).

264. H.K. Rockstad, T.W. Kenny, J.K. Reynolds, W.J. Kaiser, and T.R. VanZandt, A Miniature High-Resolution Accelerometer Utilizing Electron Tunneling, Proceedings 1992 ASME Winter Meeting, 41-52 (1992).

265. T.W. Kenny, W.J. Kaiser, J.A. Podosek, H.K. Rockstad, and J.K. Reynolds, Micromachined Electron Tunneling Infrared Sensors, Proceedings IEEE Solid State Sensors and Actuators Workshop, 174-177 (1992).

266. T.R. VanZandt, T.W. Kenny and W.J. Kaiser, Novel Position Sensor Technologies for Microaccelerometers, Proceedings of the SPIE 1694, 165-168 (1992).

267. T.W. Kenny and W.J. Kaiser, Electron Tunnel Sensors, Progress in Precision Engineering, 39-49, May, (1991).

268. T.W. Kenny, S.B. Waltman, J.K. Reynolds, and W.J. Kaiser, A Micromachined Silicon Electron Tunnel Sensor, Proceedings 1990 IEEE MEMS Workshop, 192-196 (1990).

DARPA Program Manager Portfolio (10/1/06 – 9/30/10)

DARPA MIATA Program (MicroAntenna Arrays – Technology and Applications).

- $40M Program Launched by Henryk Temkin in 2005
- Focused on microfabricated antennas for mm-wave radiation sensors, and on integration of antenna, sensor, amplifier and readout circuitry in same structure

DARPA TGP Program (Thermal Ground Plane).

- $50M Program Launched by Thomas Kenny in 2007
- Focused on microfabricated vapor chamber chamber heat spreaders with reduced dimensions, increased performance, and circuit-compatible materials

DARPA YFA Program (Young Faculty Award).

- $7M/year Program Launched by Henryk Temkin in 2006, re-run in 2007 and 2008.
- Provided small ($200K) grants to promising young faculty throughout the US with ideas and interests that could lead to new technologies for the DoD.

DARPA TBN Program (Tip-Based Nanofabrication)

- $50M Program Launched by Thomas Kenny in 2007
- Focused on controlled nanofabrication, with emphasis on controlling the size, shape, location and other properties of every nanostructure formed on a surface.

DARPA MACE Program (Microtechnologies for Air-Cooled Exchangers).

- $35M Program Launched by Thomas Kenny in 2008
- Focused on use of microtechnologies in air-cooled heat exchangers

DARPA NTI Program (NanoThermal Interfaces).

- $30M Program Launched by Thomas Kenny in 2009
- Focused on development of new nanostructured materials for enhanced thermal interfaces for electronics cooling.

DARPA CEE Program (Casimir Effect Enhancement).

- $10M Program Launched by Thomas Kenny in 2010
- Focused on demonstration of reduced adhesion at the nanoscale through the use of the Casimir effect

DARPA ACM Program (Active Cooling Modules).

- $30M Program Launched by Thomas Kenny in 2010)
- Focused on development of complete, high-performance cooling modules based on thermoelectric refrigeration, vapor compression refrigeration, and other novel refrigeration concepts.

DARPA NJTT Program (Near-Junction Thermal Transport).

- $25M Program Formulated by Thomas Kenny in 2010, Launched by Avram Bar-Cohen in 2011
- Program focus is on enhanced thermal conduction in the region immediately beneath the hot spots in high-power electronic devices.

DARPA "Seedlings" ($250K efforts to prove key initial pieces of technology)

- ~20 projects solicited, launched and managed
- Produced important early results for TGP, TBN, NTI and ACM programs.

Patents (>50 Issued US Patents)

1. Targeting Microbubbles, Robert H Grubbs, Marshall L Stoller, Hoyong Chung, Alissa M Fitzgerald, Thomas W Kenny, Renee M Thomas, **US Patent 10,357,565 (7/23/2019), US Patent 10,149,906B2 ((12/11/2018), EP3375435A1, EP2748299B1, CN103917637B, WO2013028942A1, KR102076069,**

2. Composite Mechanical Resonators and Method Therefor, R. Melamud, B. Kim, M. Hopcroft, S. Chandorkar, T, Kenny, **US Patent 7,806,586 (9/5/10), US Patent #7,824,098 (11/2/10).**

3. Cooling Systems Incorporating Heat Exchangers and Thermoelectric Layers, Thomas W. Kenny, Mark Munch, Peng Zhou, James Gill Shook, Kenneth Goodson, Dave Corbin, Mark McMaster, James Lovette, **US Patent 8,464,781 (6/18/13).**

4. Pump and Fan Control Concepts in a Cooling System, S. Sinha, M. Munch, K. Goodson, T. Kenny, **US Patent # 7,591,302 (9/22/09), US Patent #8,602,092 (12/10/13)**

5. Remedies to Prevent Cracking in a Liquid System, M. Munch, D. Werner, T. Kenny, K Goodson, **US Patent # 7,077,634 (7/18/06), US Patent # 7,201,214 (4/10/07), US Patent # 7,201,012 (4/10/07). US Patent # 7,278,549 (10/9/07), US Patent#7,344,363 (3/18/08)**, **US Patent # 7,402,029 (7/22/08),** Pending (US2005/0182845A1, US2005/0183445A1, US2005/0183444A1, US2005/0183443A1, US2005/0016715A1, WO0471139A3, WO04071139A2, US2004/0148959A1)

6. Apparatus for Conditioning Power and Managing Thermal Energy in an Electronic Device, T.W. Kenny, K.E. Goodson, J.G. Santiago.,G. K. Everett **US Patent # 7,061,104 (6/13/06)**

7. Boiling temperature Design in Pumped Microchannel Cooling Loops, P. Zhou, S. Zheng, T. Kenny, M. Munch. G. Upadhya, K. Goodson, J. Santiago, US 2004/0182551A1, WO04083742A2).

8. Method and Apparatus for achieving temperature uniformity and hot-spot cooling in a heat-producing device, K. Goodson, T. Kenny, P, Zhou, G. Upadhya, M. Munch, M. McMaster, J, Hom, **US Patent# 7,104,312 (9/12/06**), US2004/0112585A1, WO 04042306A3, WO 04042306A2.

9. Hermetic Closed-Loop Fluid System, D. Werner, M.. Munch, and T. Kenny, **US Patent # 7,021,369 (4/4/06).**

10. Removeable Heat Spreader support mechanism and method of manufacturing thereof, G. Upadhya, M. Munch, P. Zhou, K.E. Goodson and T.W. Kenny, US 2004/0233639A1, WO04070304A3, WO04070304A2,

11. Method and Apparatus for Low-Cost Electrokinetic Pump Manufacturing, J. Lovette, M. Munch, J.G. Shook, S. Zheng, T.W. Kenny, D. Werner, Z. Cichocki, TCE. Lin, 2004/0234378A1, WO04076857A2).

12. Apparatus and Method of Forming Channels in a Heat Exchanging Device, T. Kenny, M. McMaster, J. Lovette, **US Patent # 7,017,654 (3/28/06).**

13. Boiling Temperature Design in Pumped Microchannel Cooling Loops, P. Zhou, S. Zheng, T. Kenny, M. Munch, G. Upadhya, K. Goodson, J. Santiago, Pending

14. Method and Apparatus for Efficient Vertical Fluid Delivery for Cooling a Heat-Producing Device, T. Kenny, M. Munch, P. Zhou, J. Shook, K. Goodson, D. Corbin, M. McMaster, J. Lovette, **US Patent#7,000,684 (2/21/06)**, US 2004/0206477A1, US 2004/0112571A1, WO04042304A3, WO04042304A2, WO04042297A3, WO04042297A2,

15. Apparatus for Conditioning Power and Managing Thermal Energy in an Electronic Device, K. Goodson, J. Santiago, T. Kenny, and G Everett, **US Patent #6,882,543**, 10/882475, 10/883530, 10/882607

16. Interwoven Manifolds for Pressure Drop Reduction in Microchannel Heat Exchangers, G. Upadhya, M. Munch, P. Zhou, G. Shook, T. Kenny, K. Goodson, D. Corbin, **US Patent# 6,986,382 (1/17/06)** US 2004/0104010A1, WO04042303A3, WO04042303A2

17. Method and Apparatus for Flexible Fluid Delivery for cooling desired Hot Spots in a heat-producing device, T. Kenny, J.G. Shook, D. Corbin, M.Munch, K. Goodson, **US Patent# 6,988,534 (1/24/06),** US2004/0104022A1, WO04042313A1

18. Vapor Escape Microchannel Heat Exchanger, P. Zhou, K. Goodson, T. Kenny, J Santiago, Pending 10/366122.

19. Ultra-Miniature Accelerometers, T.W. Kenny and W.T. Park, **US Patent# 7,104,130, (9/12/06)**, WO0492746A1

20. Method and Apparatus for Removably Coupling a Heat Rejection Device to a Heat Producing Device, T.W. Kenny, K.E Goodson, US 2004/0076408A1.

21. Microfabricated Electrokinetic Pump with On-Frit Electrodes, T. Kenny, J.G. Shook, S. Zeng, D.J. Lenehan, J. Santiago, J. Lovette, **US Patent # 7,086,839 (8/8/06)**

22. Microfabricated Electrokinetic Pump, D. Corbin, K. Goodson, T. Kenny, J. Santiago, and S. Zheng, **US Patent # 6,881,039** (5/27/04), US 2005/0042110A1, US200500843385A1, **US Patent # 7,449,122 (11/11/08)**

23. Electroosmotic MicroPump with Planar Features, **D. Laser**, J.G. Santiago, K.E. Goodson, and T.W. Kenny, **US Patent 7,316,543 (1/8/08)**

24. UltraMiniature Pressure Sensor and Probes, **M. Bly**, T.W. Kenny, **S.A. Shaughnessey, M.S. Bartsch**, **US Patent #6,959,608**

25. Method of making a Nanogap for Variable Capacitive Elements, and Device having a NanoGap, M. Lutz, A. Partridge, and T.W. Kenny, WO 04095540A3, WO 04095540A2, US Patent **7,127,917 (2/6/07)**

26. System Including Power Conditioning Module, T.W. Kenny, K.E. Goodson, J.G. Santiago, C. K, Everett, R. Chaplinsky, J. Kim, **US Patent # 6,678,168**.

27. Power Conditioning Module, T.W. Kenny, K.E. Goodson, J.G. Santiago, C. K, Everett, **Patent # 6,606,251 (8/12/03)**, **US Patent # 7,050,308 (5/23/06).**

28. Closed-Loop Microchannel Cooling System, K.E. Goodson, **D.E. Huber**, L. Jiang, T.W. Kenny, **J-M Koo**, J.C. Mikkelsen, J.G. Santiago**, E. Wang, S. Zheng, L. Zhang, D. Laser, H. Chen, US Patent # 7,334,630 (2/26/08),** US20050205241A1.

29. Electroosmotic Microchannel Cooling System, K.E. Goodson, **D.E. Huber**, L. Jiang, T.W. Kenny, **J-M Koo**, J.C. Mikkelsen, J.G. Santiago**, E. Wang, S. Zheng, L. Zhang, D. Laser, H. Chen, US Patent # 7,185,697 (3/6/07), US Patent # 7,131,486 (12/7/06**), **Patent # 6,942,018 (9/13/05) US Patent#6,991,024 (1/24/06), US Patent #7,131,486 (11/7/06)** EP1576320A2, US2005/0098299A1, US2004/0089442A2, US2003/0164231A1, WO0302973A3, WO0302973A2, US2003/0062149A1,

30. Adhesive Microstructure and Method of Forming Same, B. Full, K. Autumn, R. Fearing, and T. Kenny, **US Patent # 6,737,160, US Patent # 7,011723 (3/14/06)**, **US Patent # 7,229,865 (7/11/07)**, US20050072509A1, US2004/0005454A1, EP1241930A4, WO0149776C2, EP1241930A2, WO 0149776A3, WO0149776A2.

31. Non-Contact Mechanical Resonance Method for Determining the Near-Surface Carrier Mobility in Semiconductors, **T.D.Stowe**, D. Rugar, and T.W, Kenny, **Patent #6,489,776** (12/3/02)

32. In-Plane Micromachined Accelerometer and Bridge Circuit having same**, A. Partridge, A. M. Fitzgerald, B.W. Chui, J. K. Reynolds** and T.W. Kenny, **Patent # 6,389,899** (5/21/02)

33. Method of Making Electrical Elements on the Sidewalls of Micromechanical Structures, **B.W. Chui** and T.W. Kenny, **Patent # 6,025,208** (2/15/00).

34. Micromachined Cantilever Structure Providing for Independent Multidimensional Force Sensing Using High Aspect Ratio Beams, **B.W. Chui** and T.W. Kenny, **Patent # 5,959,200** (9/28/99).

35. Tunnel Effect Measuring Systems and Particle Detectors, W.J. Kaiser, S.B. Waltman, and T.W. Kenny, **Patent #5,290,102 (3/1/94/94), Patent #5,265,470 (11/30/93), 5,293,781 (3/15/94)**.

36. Methods and Apparatus for Improving Sensor Performance, W.J. Kaiser, T.W. Kenny, S.B. Waltman, **J.K. Reynolds** and T.R. VanZandt. **Patent # 5,211,051 (5/18/93)**.

37. Tunnel Effect Wave Energy Detection, W.J. Kaiser, S.B Waltman, and T.W. Kenny. **Patent # 5,449,909** (9/12/95).

38. Uncooled Tunneling Infrared Sensor, T.W. Kenny, W.J. Kaiser, J.A. Podosek, E.C. Vote, H.K. Rockstad, and **J.K. Reynolds**. **Patent # 5,298,748** (3/29/94).

39. Uncooled Tunneling Infrared Sensor, T.W. Kenny, W.J. Kaiser, J.A. Podosek, E.C. Vote, R.E. Muller, and P.D. Maker. **Patent # 5,436,452** (7/25/95)

40. Dual Element Electron Tunneling Accelerometer, W.J. Kaiser, T.W. Kenny, H.K. Rockstad**, J.K. Reynolds**, and T.R. VanZandt. **Patent # 5,563,344** (10/8/96)

41. High Performance Miniature Hygrometer and Method Thereof, T.R. VanZandt, W.J. Kaiser, and T.W. Kenny, **Patent # 5,364,185** (11/15/94).

42. Method and Apparatus for Measuring a Magnetic Field using a Deflectable Energized Loop and a Tunneling Tip, W.J. Kaiser, S.B. Waltman, and T.W. Kenny, **Patent # 5,315,247 (1994)**