

# A. JOHN HART

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**Assistant Professor of Mechanical Engineering**  
**Assistant Professor of Art and Design**  
**University of Michigan, Ann Arbor, MI**

## RESEARCH INTERESTS

Manufacturing and application of nanostructured materials; nanotubes and nanowires; energy conversion; catalysis and reaction control; composite materials and structures; optical, electronic, and fluidic devices; self-assembly; machine and instrument design; scientific visualizations.

## TEACHING INTERESTS

Mechanical design; nano- and microscale science, manufacturing, and technology; thermal and fluid systems; laboratory techniques; scientific visualizations.

## EDUCATION

**Massachusetts Institute of Technology** Cambridge, MA  
Ph.D., Mechanical Engineering (GPA 5.0/5.0) Feb. 2002 – Aug. 2006  
Hertz Fellow, National Science Foundation Fellow, MIT Martin Fellow  
Thesis: Chemical, Mechanical, and Thermal Control of Substrate-Bound Carbon Nanotube Growth

**Massachusetts Institute of Technology** Cambridge, MA  
S.M., Mechanical Engineering (GPA 5.0/5.0) Sept. 2000 – Jan. 2002  
Thesis: Design and Analysis of Kinematic Couplings for Modular Machine and Instrument Structures

**University of Michigan** Ann Arbor, MI  
B.S.E., Mechanical Engineering, *Summa Cum Laude* (GPA 4.0/4.0) Sept. 1997 – April 2000

## EMPLOYMENT

**University of Michigan** (Ann Arbor, MI) Sept. 2007 – Present  
Assistant Professor, Department of Mechanical Engineering

**Absolute Nano** (Amherst, NH) Aug. 2007 – Present  
Co-Founder and Partner

**Owlstone Nanotech** (Cambridge, MA and Cambridge, UK) Sept. 2006 – Aug. 2007  
Senior Project Engineer

**Massachusetts Institute of Technology** (Cambridge, MA) Sept. 2006 – July 2007  
Post-Doctoral Associate in Mechanical Engineering, Aeronautics/Astronautics, and Materials Science

**ArKion Systems** (New Bedford, MA) Sept. 2000 – May 2004  
Engineer and System Architect

**General Motors Corporation** (Warren, MI and Troy, MI)  
Technical Project Leader, Advanced Development Group, OnStar May 2001 – Aug. 2001  
Associate Design-Responsible Engineer, Body Structures Engineering May 2000 – Aug. 2000  
Summer Intern, Body Structures Product Engineering May 1999 – Aug. 1999  
Summer Intern, NAO Manufacturing Body Closures Center May 1998 – Aug. 1998

## AWARDS

SME Outstanding Young Manufacturing Engineer Award	2010
R&D100 Award (Spin-Grower Automated Layer-by-Layer Assembly System)	2009
ASME Pi Tau Sigma Gold Medal (outstanding achievement within 10 years of baccalaureate)	2009
Holcim Next Generation Award for Sustainable Construction (with Neri Oxman)	2008
R&D100 Award (SabreTube Desktop Thermal Processing System)	2008
Young Faculty Award, Defense Advanced Research Projects Agency	2008
Finalist, MIT Clean Energy Entrepreneurship Prize	2008
MIT Senturia Prize for Best Doctoral Thesis in Micro/Nano-technology	2006
Fannie and John Hertz Foundation Graduate Fellowship	2002–2006
MIT Deshpande Center Ignition Grant (with Alex Slocum)	2004–2006
Best Poster Presentation, Nanotechnology Session, MIT MTL Annual Research Conference	2006
European Society of Precision Engineering Heidenhain Scholarship	2005
American Society of Precision Engineering R.V. Jones Memorial Scholarship	2002
National Science Foundation Graduate Research Fellowship	2000–2002
Second Place, IEEE Java Programming Contest, Boston Chapter	2001
American Society of Mechanical Engineers (ASME) Trust Scholarships	2000, 2001
MIT Martin Fellowship for Graduate Study	2000
First Place, Optical Research Associates Student Design Competition	2000
University of Michigan Mechanical Engineering Distinguished Achievement Award	2000
University of Michigan Mechanical Engineering Robert M. Caddell Award in Manufacturing	2000
American Society of Mechanical Engineers Garland Duncan Scholarship	1999
University of Michigan James B. Angell Scholar	1997–2000
Hellenic Times Scholarship	1999
General Motors Global Intern Scholarships	1998, 1999
University of Michigan College of Engineering Class of 1931E Scholarship	1998–2000
University of Michigan William J. Branstrom Freshman Prize	1998
United States Congress Robert C. Byrd Honors Scholarship	1997–2000
Michigan Class-A State Champion in individual policy debate and extemporaneous speaking	1997
First Place, National High School Essay Contest on the United Nations	1996

## PUBLICATIONS IN REFEREED JOURNALS

41. M. Bedewy, E.R. Meshot, H. Guo, E.A. Verploegen, W. Lu, A.J. Hart. Collective mechanism of evolution and self-termination of vertically aligned carbon nanotube growth. *Journal of Physical Chemistry C* (in press), 2009, <http://pubs.acs.org/doi/abs/10.1021/jp904152v>.
40. D.L. Plata, A.J. Hart, C.M. Reddy, P.M. Gschwend. Early evaluation of potential environmental impacts of carbon nanotube synthesis by chemical vapor deposition. *Environmental Science and Technology* 43(21):8367-8373, 2009, <http://pubs.acs.org/doi/abs/10.1021/es901626p>.
39. E.R. Meshot, D.L. Plata, S. Tawfick, E. Verploegen, A.J. Hart. Engineering vertically aligned carbon nanotube growth by decoupled thermal treatment of precursor and catalyst. *ACS Nano* 3(9):2477-2486, 2009, <http://dx.doi.org/10.1021/nn900446a>.
38. S. Tawfick, K.P. O'Brien, A.J. Hart. Flexible high conductivity carbon nanotube interconnects made by rolling and printing. *Small* 5(21):2467-2473, 2009, <http://dx.doi.org/10.1002/sml.200900741>.
37. S.A. Steiner, T.F. Baumann, B.C. Bayer, M.A. Worsley, W.J. Moberlychan, E.L. Shaw, A.J. Hart, S. Hofmann, B.L. Wardle. Nanoscale zirconia as a versatile non-metallic catalyst for graphitization of carbon and growth of single- and multi-wall carbon nanotubes. *Journal of the American Chemical Society* 131:12144-12154, 2009, <http://dx.doi.org/10.1021/ja902913r>.
36. G.D. Nessim, M. Seita, K.P. O'Brien, R.R. Mitchell, A.J. Hart, C.V. Thompson. Low temperature synthesis of vertically aligned carbon nanotubes with ohmic contact to metallic substrates enabled by thermal decomposition of the carbon feedstock. *Nano Letters* 9(10):3398-3405, 2009.

35. P. Podsiadlo, M. Michel, K. Critchley, S. Srivastava, M. Qin, J.W. Lee, E.A. Verploegen, A.J. Hart, Y. Qi, N.A. Kotov. Diffusional self-organization in exponential layer-by-layer with micro- and nanoscale periodicity. *Angewandte Chemie International Edition* 48(38):7073-7077, 2009, <http://dx.doi.org/10.1002/anie.200901720>.
34. H. Cebici, R. Guzman de Villoria, A.J. Hart, B.L. Wardle. Multifunctional properties of high volume fraction aligned carbon nanotube polymer composites with controlled morphology. *Composites Science and Technology* 69:2649-2656, 2009, <http://dx.doi.org/10.1016/j.compscitech.2009.08.006>.
33. R. Guzman de Villoria, S.L. Figueredo, A.J. Hart, S.A. Steiner, A.H. Slocum, B.L. Wardle. High-yield growth of vertically aligned carbon nanotubes on a continuously moving substrate. *Nanotechnology* 20:405611, 2009, <http://dx.doi.org/10.1088/0957-4484/20/40/405611>.
32. F. Hill, T.F. Havel, A.J. Hart, C. Livermore. Storing elastic energy in carbon nanotubes. *Journal of Micromechanics and Microengineering* 19:094015, 2009, <http://dx.doi.org/10.1088/0960-1317/19/9/094015>.
31. S. Vozar, Y.C. Poh, T. Serbowicz, M. Bachner, P. Podsiadlo, M. Qin, E. Verploegen, N.A. Kotov, A.J. Hart. Automated spin-assisted layer-by-layer assembly of nanocomposites. *Review of Scientific Instruments* 80:023903, 2009, <http://dx.doi.org/10.1063/1.3078009>. Also published in Virtual Journal of Nanoscience and Nanotechnology.
30. N. Yamamoto, A.J. Hart, B.L. Wardle, E.J. García, S.S. Wicks, H.M. Duong, A.H. Slocum. High-yield growth of aligned carbon nanotubes on ceramic fibers for multifunctional enhancement of structural composites. *Carbon* 47(3):551-560, 2009, <http://dx.doi.org/10.1016/j.carbon.2008.10.030>.
29. D. Bello, B.L. Wardle, K. Ahn, N. Yamamoto, E.J. García, A.J. Hart, M.J. Ellenbecker. Exposure to nanoscale particles and fibers during machining of advanced composites containing carbon nanotubes. *Journal of Nanoparticle Research* 11(1):231-249, 2009, <http://dx.doi.org/10.1007/s11051-008-9499-4>.
28. N. Grossiord, J. Loos, L.C. van Laake, M. Maugey, C. Zakri, C.E. Koning, A.J. Hart. High-conductivity polymer nanocomposites obtained by tailoring the characteristics of carbon nanotube fillers. *Advanced Functional Materials* 18(20):3226-3234, 2008, <http://dx.doi.org/10.1002/adfm.200800528>.
27. G.D. Nessim, A.J. Hart, J.S. Kim, D. Acquaviva, J. Oh, C.D. Morgan, M. Seita, J.S. Leib, C.V. Thompson. Tuning of vertically-aligned carbon nanotube diameter and areal density through catalyst pre-treatment. *Nano Letters* 8(11):3587-3593, 2008, <http://dx.doi.org/10.1021/nl801437c>.
26. B.L. Wardle, D.S. Saito, E.J. García, A.J. Hart, R.G. de Villoria, E.A. Verploegen. Fabrication and characterization of ultra-high volume fraction aligned carbon nanotube polymer composites. *Advanced Materials* 20(14):2710-2714, 2008, <http://dx.doi.org/10.1002/adma.200800295>.
25. P. Podsiadlo, M. Michel, J. Lee, E. Verploegen, N.W.S. Kam, J. Lee, Y. Qi, A.J. Hart, P.T. Hammond, N.A. Kotov. Exponential growth of LBL films with incorporated inorganic sheets, *Nano Letters* 8(6):1762-1770, 2008, <http://dx.doi.org/10.1021/nl8011648>.
24. E.J. García, B.L. Wardle, A.J. Hart. Joining prepreg composite interfaces with aligned carbon nanotubes. *Composites Part A* 39(6):1065-1070, 2008, <http://dx.doi.org/10.1016/j.compositesa.2008.03.011>.
23. E.J. García, B.L. Wardle, A.J. Hart, N. Yamamoto. Fabrication and multifunctional properties of a hybrid laminate with aligned carbon nanotubes grown *in situ*. *Composites Science and Technology* 68:2034-2041, 2008, <http://dx.doi.org/10.1016/j.compscitech.2008.02.028>.
22. E.J. Garcia, A.J. Hart, B.L. Wardle. Long carbon nanotubes grown on the surface of fibers for hybrid composites. *AIAA Journal* 46(6):1405-12, 2008, <http://dx.doi.org/10.2514/1.25004>.
21. D. Bello, A.J. Hart, K. Ahn, M. Hallock, N. Yamamoto, E.J. Garcia, B.L. Wardle, M.J. Ellenbecker. Particle exposure levels during growth and subsequent handling of vertically-aligned carbon nanotube films. *Carbon* 46:974-981, 2008, <http://dx.doi.org/10.1016/j.carbon.2008.03.003>.
20. E.R. Meshot, A.J. Hart. Abrupt self-termination of vertically-aligned carbon nanotube growth. *Applied Physics Letters* 92:113107, 2008, <http://dx.doi.org/10.1002/10.1063/1.2889497>.
19. O. Yaglioglu, R. Martens, A.J. Hart, A.H. Slocum. Conductive carbon nanotube composite microprobes. *Advanced Materials* 20:357-362, 2008, <http://dx.doi.org/10.1002/adma.200700075>.
18. A.J. Hart, H.K. Taylor, A.H. Slocum. 2D and 3D growth of carbon nanotubes on substrates, from nanometre to millimetre scales. *International J. Nanomanufacturing* 1(6):701-709, 2007.

17. B.N. Wang, R.D. Bennett, E. Verploegen, A.J. Hart, R.E. Cohen. Characterizing the morphologies of mechanically-manipulated multi-wall carbon nanotube films by small-angle X-ray scattering, *J. Physical Chemistry C* 111(48):17933-17940, 2007, <http://dx.doi.org/10.1021/jp071798c>.
16. L.C. van Laake, A.J. Hart, A.H. Slocum. A suspended heated silicon platform for rapid thermal control of surface reactions with application to carbon nanotube synthesis, *Review of Scientific Instruments* 78:083901, 2007, <http://dx.doi.org/10.1063/1.2760936>. Also published in Virtual Journal of Nanoscience and Nanotechnology.
15. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Fabrication and nanocompression testing of aligned CNT/polymer nanocomposites, *Advanced Materials* 19:2151-2156, 2007, <http://dx.doi.org/10.1002/adma.200700237>.
14. B.N. Wang, R.D. Bennett, E. Verploegen, A.J. Hart, R.E. Cohen. Quantitative characterization of the morphology of multi-wall carbon nanotube films by small-angle X-ray scattering, *J. Physical Chemistry C* 111(16):5859-5865, 2007, <http://dx.doi.org/10.1021/jp068895a>.
13. A.J. Hart, L.C. van Laake, A.H. Slocum. Desktop growth of carbon nanotube monoliths with *in situ* optical imaging, *Small* 3(5):772-777, 2007, <http://dx.doi.org/10.1002/sml.200600716>.
12. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Fabrication of composite microstructures by capillarity-driven wetting of aligned carbon nanotubes with polymers, *Nanotechnology* 18(16):165602, 2007, <http://dx.doi.org/10.1088/0957-4484/18/16/165602>.
11. O. Yaglioglu, A.J. Hart, R. Martens, A.H. Slocum. Method of characterizing electrical contact properties of carbon nanotube coated surfaces, *Review of Scientific Instruments* 77:095105, 2006, <http://dx.doi.org/10.1063/1.2349300>. Also published in Virtual Journal of Nanoscience and Nanotechnology.
10. R.D. Bennett, A.J. Hart, A.C. Miller, P.T. Hammond, D.J. Irvine, R.E. Cohen. Creating patterned carbon nanotube catalysts through the microcontact printing of block copolymer micellar thin films, *Langmuir* 22:8273-8276, 2006, <http://dx.doi.org/10.1021/la061054a>.
9. R.D. Bennett, A.J. Hart, R.E. Cohen. Controlling the morphology of carbon nanotube films by varying the areal density of catalyst nanoparticles using block copolymer micellar thin films, *Advanced Materials* 18:2274-2279, 2006, <http://dx.doi.org/10.1002/adma.200600975>.
8. A.J. Hart, A.H. Slocum. Force output, control of film structure, and micro-scale shape replication by carbon nanotube growth under mechanical pressure, *Nano Letters* 6:1254-1260, 2006, <http://dx.doi.org/10.1021/nl0524041>.
7. A.J. Hart, A.H. Slocum. Rapid growth and flow-mediated nucleation of millimeter-scale aligned carbon nanotube structures from a thin-film catalyst (with cover feature), *J. Physical Chemistry B* 110(16):8250-8257, 2006, <http://dx.doi.org/10.1021/jp055498b>.
6. A.J. Hart, B.O. Boskovic, A.T.H. Chuang, V.B. Golovko, J. Robertson, B.F.G. Johnson, A.H. Slocum. Uniform and selective cvd growth of carbon nanotubes and nanofibers on arbitrarily microstructured silicon surfaces, *Nanotechnology* 17:1397-1403, 2006, <http://dx.doi.org/10.1088/0957-4484/17/5/039>.
5. A.J. Hart, A.H. Slocum, L. Royer. Growth of conformal single-walled carbon nanotube films from Mo/Fe/Al<sub>2</sub>O<sub>3</sub> deposited by electron beam evaporation, *Carbon*, 44(2):348-359, 2006, <http://dx.doi.org/10.1016/j.carbon.2005.07.008>.
4. P.J. Willoughby, A.J. Hart, A.H. Slocum. Experimental determination of kinematic coupling repeatability in industrial and laboratory conditions, *SME J. Manufacturing Systems* 24:108-121, 2005, <http://proquest.umi.com/pqdlink?did=1075698831&Fmt=7&clientId=5482&ROT=309&VName=PQD>.
3. A.J. Hart, A.H. Slocum, J. Sutin. Segmented and shielded structures for reduction of thermal expansion-induced tilt errors, *J. Int'l. Soc. Precision Engineering and Nanotechnology*, 28:443-458, 2004, <http://dx.doi.org/10.1016/j.precisioneng.2004.01.002>.
2. A.J. Hart, A.H. Slocum, P.J. Willoughby. Kinematic coupling interchangeability, *J. Int'l. Soc. Precision Engineering and Nanotechnology*, 28:1-15, 2004, <http://dx.doi.org/10.1016/j.precisioneng.2004.01.002>.
1. A.H. Slocum, M. Basaran, R. Cortesi, A.J. Hart. Linear motion carriage with aerostatic bearings preloaded by inclined iron core linear electric motor, *J. Int'l. Soc. Precision Engineering and Nanotechnology* 27:382-394, 2003, [http://dx.doi.org/10.1016/S0141-6359\(03\)00037-0](http://dx.doi.org/10.1016/S0141-6359(03)00037-0).

## CONFERENCE PUBLICATIONS AND PRESENTATIONS

71. F.A. Hill, T.F. Havel, A.J. Hart, C. Livermore. Characterizing the failure processes that limit the storage of energy in carbon nanotube springs under tension. 9<sup>th</sup> International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS), Washington, DC, 2009.
70. M. De Volder, D. Vidaud, S.J. Park, S. Tawfick, A.J. Hart. Fabrication of robust carbon nanotube microstructures by elastocapillary densification. 35<sup>th</sup> International Conference on Micro & Nano Engineering, Ghent, Belgium, 2009.
69. E.S. Polsen, S.M. Perkins, E.R. Meshot, M. Bedewy, S. Figueredo, S.A. Steiner, B.L. Wardle, A.J. Hart. Continuous manufacturing of aligned carbon nanotubes for tough and multifunctional interfaces. 17<sup>th</sup> International Conference on Composite Materials, Edinburgh, UK, 2009.
68. E.R. Meshot, M. Bedewy, E. Polsen, S. Perkins, D. Copic, S. Tawfick, A.J. Hart. Limiting mechanisms and continuous manufacturing of vertically aligned carbon nanotube films. NSF CMMI Grantees Conference, Honolulu, HI, 2009.
67. M. De Volder, S. Tawfick, A.J. Hart. Controlled growth orientation of carbon nanotube pillars by catalyst patterning in microtrenches. 15<sup>th</sup> International Conference on Solid-State Sensors, Actuators, and Microsystems, Denver, CO, 2009.
66. E.R. Meshot, D.L. Plata, C.M. Reddy, P.M. Gschwend, A.J. Hart. Co-optimizing carbon nanotube synthesis: Control of diameter, structural quality, and growth kinetics along with simultaneous cost minimization. 4<sup>th</sup> NASA - Air Force Research Laboratory and Rice University Workshop on Nucleation and Growth Mechanisms of Single Wall Carbon Nanotubes, Bourne, TX, 2009.
65. E.R. Meshot, D.L. Plata, C.M. Reddy, P.M. Gschwend, A.J. Hart. Co-optimizing carbon nanotube synthesis: Control of diameter, structural quality, and growth kinetics along with simultaneous cost minimization. American Physical Society March Meeting (Session A24), Pittsburgh, PA, 2009.
64. Y. Zhang, J. Gregoire, A.J. Hart. Ethanol-promoted growth of dense vertically aligned small diameter carbon nanotubes. American Physical Society March Meeting (Session A24), Pittsburgh, PA, 2009.
63. S. Tawfick, A.J. Hart. Manufacturing thin films of densely packed horizontally aligned carbon nanotubes. American Physical Society March Meeting (Session A24), Pittsburgh, PA, 2009.
62. M. Bedewy, E.R. Meshot, Y. Zhang, H. Guo, W. Lu, A.J. Hart. Termination mechanism of carbon nanotube forest growth. American Physical Society March Meeting (Session A24), Pittsburgh, PA, 2009.
61. M. De Volder, D. Vidaud, S. Tawfick, A.J. Hart. Self-similar mechanics of vertically aligned carbon nanotube organization. American Physical Society March Meeting (Session D24), Pittsburgh, PA, 2009.
60. J.G. Ok, A.J. Hart. Optimization of air-assisted CVD growth of vertically aligned ZnO nanowires, guided by structural analysis using X-ray scattering. American Physical Society March Meeting (Session D24), Pittsburgh, PA, 2009.
59. A.J. Hart, E. Polsen, S.M. Perkins, E.R. Meshot, M. Bedewy, E.A. Verploegen, M. Park, B.L. Wardle, E.J. Garcia. Continuous manufacturing and materials integration of structurally-precise carbon nanotube forests. Materials Research Society Fall Meeting (Symposium JJ), Boston, MA, 2008.
58. A.J. Hart, E.A. Verploegen, E.R. Meshot, S. Han, J. Ng. Dynamics of vertically-aligned carbon nanotube growth revealed by *in situ* X-ray scattering. Materials Research Society Fall Meeting (Symposium OO), Boston, MA, 2008.
57. S. Tawfick, K. O'Brien, M. Moebius, A.J. Hart. Roll-to-roll fabrication and transfer printing of dense horizontally-aligned carbon nanotube ribbons. Materials Research Society Fall Meeting (Symposium I), Boston, MA, 2008.
56. G.D. Nessim, M. Seita, D. Plata, K.P. O'Brien, A.J. Hart, C.V. Thompson. Low-temperature growth of carbon nanotubes on metallic substrates for interconnect applications. Materials Research Society Fall Meeting (Symposium JJ), Boston, MA, 2008.

55. S.A. Steiner, M.S. Tsai, K. Ishiguro, R.G. de Villoria, A.J. Hart, B.L. Wardle. Growth of aligned carbon nanotubes on carbon fibers and nanotube yarns: Hierarchical fiber architectures for advanced composites. Materials Research Society Fall Meeting (Symposium JJ), Boston, MA, 2008.
54. H. Cebici, R.G. de Villoria, B.L. Wardle, A.J. Hart. Fabrication and characterization of aligned CNT polymer nanocomposites (PNCs). Materials Research Society Fall Meeting (Symposium JJ), Boston, MA, 2008.
53. F.A. Hill, T.F. Havel, A.J. Hart, C. Livermore. Storing elastic energy in carbon nanotubes. Eighth International Workshop on Micro and Nanotechnology for Power Generation and Energy Conversion Applications (PowerMEMS), Sendai, Japan, 2008.
52. H. Cebeci, R.G. de Villoria, B.L. Wardle, D.S. Saito, N. Yamamoto, K. Ishiguro, E.J. Garcia, A.J. Hart, Processing of advanced composites using capillarity-driven wetting of aligned carbon nanotubes. SAMPE Fall Technical Conference, Memphis, TN, 2008.
51. B.L. Wardle, D. Bello, K. Ahn, N. Yamamoto, R.G. de Villoria, M. Hallock, E.J. Garcia, A.J. Hart, Particle and fiber exposures during processing of hybrid carbon nanotube advanced composites. SAMPE Fall Technical Conference, Memphis, TN, 2008.
50. P. Podsiadlo, M. Michel, J. Lee, E. Verploegen, N.W.S. Kam, J. Lee, Y. Qi, A.J. Hart, P.T. Hammond, N.A. Kotov, Exponential growth of LBL films with incorporated inorganic sheets, Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA, 2008.
49. R.G. de Villoria, H. Cebeci, D.S. Saito, E.J. Garcia, A.J. Hart, H.M. Duong, N. Yamamoto, A. Schmidt, M. Park, E. A. Verploegen, D.V. Papavassiliou, S. Maruyama, B.L. Wardle. Novel platform for fabricating and testing ultra-high volume fraction aligned-cnt nanocomposites, 9<sup>th</sup> International Conference on the Science and Application of Nanotubes, Montpellier, France, 2008.
48. R.G. de Villoria, N. Yamamoto, K. Ishiguro, S. Wicks, E.J. Garcia, A.J. Hart, S. Steiner III, B.L. Wardle. Nanostitching and fuzzy fibers: Practical fabrication of hybrid nano-engineered composites with enhanced multifunctional properties using aligned CNTs, 9<sup>th</sup> International Conference on the Science and Application of Nanotubes, Montpellier, France, 2008.
47. N. Yamamoto, A.J. Hart, E.J. Garcia, S.S. Wicks, H.M. Duong, A.H. Slocum, B.L. Wardle, Multifunctional enhancement of structural composites via growth of radially aligned carbon nanotubes on ceramic fibers, 9<sup>th</sup> International Conference on the Science and Application of Nanotubes, Montpellier, France, 2008.
46. S. Wicks, N. Yamamoto, R.G. de Villoria, K. Ishiguro, E.J. Garcia, H. Cebeci, A.J. Hart, B.L. Wardle. Fabrication of nano-engineered composites reinforced with carbon nanotubes, 10<sup>th</sup> Annual Nano Science and Technology Institute Conference, Boston, MA, 2008.
45. E.J. Garcia, B.L. Wardle, R.G. de Villoria, S. Wicks, K. Ishiguro, N. Yamamoto, A.J. Hart. Aligned carbon nanotube reinforcement of advanced composite ply interfaces, 49<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Chicago, IL, 2008.
44. D.S. Saito, B.L. Wardle, E.J. Garcia, L. Megalini. Fabrication and multifunctional properties of high volume fraction aligned carbon nanotube polymeric composites. 49<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Chicago, IL, 2008.
43. L. Megalini, B.L. Wardle, D.S. Saito, E.J. Garcia, A.J. Hart. DC and AC properties of aligned carbon nanotube forests and polymeric nanocomposites. 49<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Chicago, IL, 2008.
42. A.J. Hart, E. Verploegen, E.R. Meshot, S. Han. Elucidating the dynamics of vertically-aligned carbon nanotube growth by in situ x-ray scattering. International Winter School on the Electronic Properties of Nanomaterials, Kirchberg, Austria, 2008.
41. A.J. Hart, A.H. Slocum, D.A. Lucca, L. Shao, B.N. Wang, R.D. Bennett, R.E. Cohen. Competition among limiting growth mechanisms of vertically-aligned carbon nanotubes, Materials Research Society Fall Meeting (Symposium II), Boston, MA, 2007.

40. A.J. Hart, E. Verploegen, B.N. Wang, R.D. Bennett, R.E. Cohen. Quantifying structural characteristics of carbon nanotube ensembles using x-ray scattering, Materials Research Society Fall Meeting (Symposium II), Boston, MA, 2007.
39. E.J. Garcia, A.J. Hart, N. Yamamoto, B.L. Wardle, A.H. Slocum. Fiber composites reinforced by aligned carbon nanotubes, Materials Research Society Fall Meeting (Symposium II), Boston, MA, 2007.
38. G.D. Nessim, A.J. Hart, J.S. Kim, D. Acquaviva, J. Oh, C. Morgan, C.V. Thompson, Tuning of vertically-aligned carbon nanotube length, number of walls, and areal density through catalyst pre-treatment, Materials Research Society Fall Meeting (Symposium II), Boston, MA, 2007.
37. G.D. Nessim, J. Oh, A.J. Hart, D. Acquaviva, C.V. Thompson. Carbon nanotube growth into periodic scaffolds on conductive substrates for interconnect applications, SRC Techcon, Austin, TX, 2007.
36. E. Verploegen, B.N. Wang, R.D. Bennett, A.J. Hart, R.E. Cohen. Quantitative morphological characterization of multi-wall carbon nanotube films by small-angle X-ray scattering, 234<sup>th</sup> American Chemical Society National Meeting, Boston, MA, 2007.
35. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Aligned carbon nanotube reinforcement of graphite/epoxy ply interfaces, 16<sup>th</sup> International Conference on Composite Materials, Kyoto, Japan, 2007.
34. N. Yamamoto, E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Multifunctional characterization of aligned CNT-reinforced woven fiber composites, 16<sup>th</sup> International Conference on Composite Materials, Kyoto, Japan, 2007.
33. A.J. Hart, D. Kuhn, L.C. van Laake, A.H. Slocum, SabreTube: A flexible, low-cost desktop system for chemical vapor deposition, 8<sup>th</sup> International Conference on the Science and Application of Nanotubes, Ouro Preto, Brazil, 2007.
32. E.J. Garcia, A.J. Hart, B.L. Wardle, A.H. Slocum, Fiber composites reinforced by aligned carbon nanotubes (poster), 8<sup>th</sup> International Conference on the Science and Application of Nanotubes, Ouro Preto, Brazil, 2007.
31. G.D. Nessim, A.J. Hart, D. Acquaviva, J. Oh, J. Kim, C.V. Thompson, Tuning the diameter and areal density of aligned carbon nanotubes by engineered pre-treatment of the catalyst film (poster), 8<sup>th</sup> International Conference on the Science and Application of Nanotubes, Ouro Preto, Brazil, 2007.
30. B.N. Wang, E. Verploegen, R.D. Bennett, A.J. Hart, R.E. Cohen, Elucidating and mapping morphological variations in carbon nanotube films by small-angle x-ray scattering (poster), 8<sup>th</sup> International Conference on the Science and Application of Nanotubes, Ouro Preto, Brazil, 2007.
29. N. Grossiord, J. Meuldijk, J. Loos, P. van der Schoot, O. Regev, A.J. Hart, L.C. van Laake, H.E. Miltner, B. van Mele and C.E. Koning. A latex-based concept for obtaining carbon nanotube-polymer nanocomposites, 10<sup>th</sup> Annual Nano Science and Technology Institute Conference, Santa Clara, CA, 2007.
28. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Aligned carbon nanotube reinforcement of ply interfaces in woven composites 48<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Honolulu, HI, 2007.
27. L.C. van Laake, A.J. Hart, A.H. Slocum, D.A. Lucca, L. Shao, M. J. Klopstein. Growth and *in situ* optical characterization of aligned carbon nanotube monoliths using a desktop reactor apparatus with rapid thermal control, Materials Research Society Fall Meeting, Symposium Q, Boston, MA, 2006.
26. R.D. Bennett, A.J. Hart, R.E. Cohen. Controlling the morphology of carbon nanotube films by varying the areal density of catalyst nanoparticles using block copolymer micellar thin films (poster), Materials Research Society Fall Meeting, Boston, MA, 2006.
25. A.J. Hart, H.K. Taylor, A.H. Slocum. Two-dimensional and three-dimensional growth of carbon nanotubes on substrates, from nm-to mm-scales, 4<sup>th</sup> International Symposium on Nanomanufacturing, Cambridge, MA, 2006.

24. R.D. Bennett, A.J. Hart, R.E. Cohen. Controlling the morphology of carbon nanotube films by varying the areal density of catalyst nanoparticles using block copolymer micellar thin films, Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA, 2006.
23. B.O. Boskovic, A. J. Hart, A.T.H. Chuang, V. B. Golovko, B. F. G. Johnson, A. H. Slocum, J. Robertson. Carbon nanotube synthesis on arbitrary three-dimensional surfaces, Carbon 2006 International Conference, Aberdeen, Scotland, 2006.
22. O. Yaglioglu, R. Martens, A.J. Hart, A.H. Slocum. Transfer and reinforcement of carbon nanotube structures with epoxy (poster), 7<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 317, Nagano, Japan, 2006.
21. A.J. Hart, A.H. Slocum. High-precision and combinatorial studies of carbon nanotube cvd synthesis using microchannel arrays, 7<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 89, Nagano, Japan, 2006.
20. A.J. Hart, A.H. Slocum. Force output and control of carbon nanotube film structure by applying mechanical pressure during growth, 7<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 53, Nagano, Japan, 2006.
19. L.C. van Laake, A.J. Hart, A.H. Slocum. A flexible, controllable, and observable platform for laboratory studies of carbon nanotube growth, 7<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 88, Nagano, Japan, 2006.
18. A.J. Hart, L.C. van Laake, A.H. Slocum. Precision design of tube furnace systems for growth of carbon nanotube films, 6<sup>th</sup> International Conference of the European Society of Precision Engineering and Nanotechnology, p. 413-416, Baden, Austria, 2006.
17. O. Yaglioglu, A.J. Hart, A.H. Slocum. Electromechanical characterization of carbon nanotube contact surfaces, 6<sup>th</sup> International Conference of the European Society of Precision Engineering and Nanotechnology, p. 406-409, Baden, Austria, 2006.
16. L.C. van Laake, A.J. Hart, A.H. Slocum. Design and modeling of a suspended silicon substrate heater and its application to novel studies of carbon nanotube growth, 6<sup>th</sup> International Conference of the European Society of Precision Engineering and Nanotechnology, p. 381-384, Baden, Austria, 2006.
15. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Fabrication and testing of long carbon nanotubes grown on the surface of fibers for hybrid composites, 47<sup>th</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Newport, RI, 2006.
14. A.J. Hart, A.H. Slocum. Carbon nanotube growth under applied pressure: Mechanical energy output and control of film structure, Meeting of the American Physical Society, Baltimore, MD, 2006.
13. A.J. Hart, A.H. Slocum. Combinatorial flow studies of carbon nanotube growth using microchannel arrays, Materials Research Society Fall Meeting (Symposium LL), Boston, MA, 2005.
12. R.D. Bennett, A.J. Hart, R.E. Cohen. Strategies for controlling the planar arrangement of micellar-templated inorganic nanoclusters and their applications in carbon nanotube synthesis, Materials Research Society Fall Meeting (Symposium O), Boston, MA, 2005.
11. A.J. Hart, A.H. Slocum. Versatility of the Fe/Al<sub>2</sub>O<sub>3</sub> System for high-yield carbon nanotube growth by thermal CVD of C<sub>2</sub>H<sub>4</sub>, 6<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 28, Göteborg, Sweden, 2005.
10. A.J. Hart, A.H. Slocum. Carbon nanotube growth studies using gas activity gradients introduced by novel sample configurations, 6<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 29, Göteborg, Sweden, 2005.
9. O. Yaglioglu, A.J. Hart, A.H. Slocum. Electrical resistance and contact properties of carbon nanotube films on silicon surfaces, 6<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 427, Göteborg, Sweden, 2005.
8. J. Sutin, S. Awtar, A.J. Hart, A.H. Slocum, and E. Gratton. Improving the performance of the optical microscope via modern optical and optomechanical design, Focus on Microscopy, Jena, Germany, 2005.

7. A.H. Slocum, J. Lang, S. Awtar, A.J. Hart, K. Mukaddam. Magnetically-preloaded wheels, in Proceedings of the 4<sup>th</sup> International Conference of the European Society of Precision Engineering and Nanotechnology, p. 368-369, Glasgow, Scotland, 2004.
6. A.J. Hart, A.H. Slocum. Design and fabrication of microchannel arrays for combinatorial studies of nanomaterials growth, 5<sup>th</sup> International Conference of the European Society of Precision Engineering and Nanotechnology, p. 81-84, Montpellier, France, 2005.
5. A.J. Hart, A.H. Slocum. Thermal CVD of CNTs from Fe/Mo catalysts: Morphology transitions mediated by gas temperature and substrate topography (poster), in Abstracts of the 5<sup>th</sup> International Conference on the Science and Application of Nanotubes, p. 20, San Luis Potosi, Mexico, 2004.
4. A.H. Slocum, S. Awtar, A.J. Hart. Magnebots—A magnetic wheels-based overhead transportation concept, 2<sup>nd</sup> IFAC Conference on Mechatronic Systems, p. 833-838, Berkeley, CA, 2003.
3. P.J. Willoughby, A.J. Hart, A.H. Slocum. Experimental determination of kinematic coupling repeatability in industrial and laboratory conditions, American Society for Precision Engineering Annual Meeting, Portland, OR, 2003.
2. A.J. Hart, A.H. Slocum. Kinematic coupling interchangeability, American Society for Precision Engineering Annual Meeting, p. 158-161, St. Louis, MO, 2002.
1. A.J. Hart, A.H. Slocum. Segmented and shielded structures for reduction of thermal expansion-induced tilt errors, American Society for Precision Engineering Annual Meeting, p. 193-198, St. Louis, MO, 2002.

## INVITED TALKS

19. “Making Carbon Nanotube Forests: From Collective Growth Mechanics to Complex Materials”, Materials Research Society Spring Meeting, San Francisco, CA, 2010.
18. “Investigating the Collective Dynamics of Carbon Nanotube Forest Growth”, AFRL Carbon Nanotube Collaborators Workshop, Yellow Springs, OH, November 4, 2009.
17. “Making Nanostructures: From Atomic-Scale Mechanisms to Programmable Building Materials?”, Architectural Record Innovation Conference, New York, NY, October 7, 2009.
16. “Principles and Demands for Precise Organization and Integration of Carbon Nanotubes in N/MEMS”, DARPA Nano-MTO Workshop, Sunriver, OR, July 7, 2009.
15. “Making Massive Crowds of Nanotubes: Growth Mechanisms, Microstructures, and Composite Materials”, Mechanical Engineering Seminar, Georgia Institute of Technology, September 8, 2008.
14. “Revealing the Dynamics of Carbon Nanotube Forest Growth by *In Situ* X-Ray Scattering”, CHESS Users Meeting, Cornell University, Ithaca, NY, June 11, 2008.
13. “Massive Crowds of Nanostructures: Synthesis and Applications”, TNG TechDay, Munich, Germany, May 30, 2008.
12. “Making Massive Crowds of Nanotubes: Growth Mechanisms, Microstructures, and Composite Materials”, WIMS Seminar, Department of Electrical Engineering and Computer Science, University of Michigan, April 9, 2008.
11. “Manufacturing of Carbon Nanotubes”, Instituto Tecnológico de Aeronáutica, São José dos Campos, Brazil, June 21, 2007.
10. “International Assessment of CNT Manufacturing and Applications”, keynote in Session on CNT Manufacturing Progress, 10<sup>th</sup> Annual Nano Science and Technology Institute Conference, Santa Clara, CA, May 22, 2007.
9. “Manufacturing of Carbon Nanotube Films: From Atomic-Scale Growth Mechanisms to Airplane-Scale Composites”, Mechanical Engineering Department Seminar, Massachusetts Institute of Technology, May 11, 2007.
8. “Nanobliss: Creating and Imaging Microscopic Landscapes of Carbon and Silicon”, Boston University School of Fine Arts Lecture Series, April 17, 2007.
7. “Manufacturing of Carbon Nanotube Films: From Atomic-Scale Growth Mechanisms to Airplane-Scale Composites”, Materials Science Seminar, Harvard University, April 5, 2007.

6. “Electronic Applications of Carbon Nanotubes”, Final Workshop of NSF/WTEC International Assessment of Research and Development on Carbon Nanotubes, Arlington, VA, November 2, 2006.
5. “Chemical, Mechanical, and Thermal Control of Substrate-Bound Carbon Nanotube Growth”, US-China Workshop on Carbon Nanotube Manufacturing, Beijing, China, September 28, 2006.
4. “Adventures in Carbon Nanotube Growth: from the Atomic Scale to the Airplane Scale and Beyond”, MIT Small-Talks Student Seminar Series, October 4, 2006.
3. “Synthesis of Carbon Nanotubes: Toward New Systems for Science and Manufacturing”, Senturia Prize lecture in MIT Micro-Nano Seminar Series (MNSS), May 11, 2006. Also presented in 2006 at McGill University, University of Edinburgh, Technical University of Eindhoven, University of Illinois, and University of Michigan.
2. “Carbon Nanotubes: Old Material, Recent Momentum”, MIT Deshpande Center IdeaStream Conference, Cambridge, MA, April 26, 2005.
1. “Kinematic Couplings and Modular Interfaces”, Forum of CIMIT Innovative Technology for Medicine, April 2002.

## PATENTS AND PATENT APPLICATIONS

1. A.H. Slocum, S. Awtar, A.J. Hart. Material Transportation System. U.S. Patent 6,886,651, issued May 3, 2005.  
*Twelve additional patents pending, as of November 2009.*

## REPORTS

1. A.J. Hart, A. Rinzler, and J. Kong. “Electronic, optical, and optoelectronic applications of carbon nanotubes”, Chapter 6 in WTEC/NSF Report on Carbon Nanotube Manufacturing and Applications, 2007, <http://www.wtec.org/cnm>.

## RESEARCH STUDENTS AND THESES SUPERVISED

### At University of Michigan (2007-Present)

Mostafa Bedewy, Ph.D. Pre-Candidate, University of Michigan, January 2009 – Present  
 Davor Copic, Ph.D. Pre-Candidate, University of Michigan, September 2008 – Present  
 Anne Juggernaut, Ph.D. Candidate, University of Michigan, January 2009 – Present (co-advisor S. Daly)  
 Jinjing Li, Ph.D. Pre-Candidate, University of Michigan, September 2009 – Present  
 Eric Meshot, Ph.D. Pre-Candidate, University of Michigan, September 2007 – Present  
 Erik Polsen, Ph.D. Pre-Candidate, University of Michigan, September 2008 – Present  
 Jong-Girl Ok, Ph.D. Pre-Candidate, University of Michigan, September 2007 – Present  
 Megan Roberts, Ph.D. Pre-Candidate, University of Michigan, September 2009 – Present  
 Sameh Tawfick, Ph.D. Pre-Candidate, University of Michigan, September 2007 – Present

### At MIT (2000-2007)

M. Franzkowiak, “Analytical and Numerical Fluid Modeling of a Microchannel Device for Growing Aligned Carbon Nanotubes”, Diploma thesis completed at MIT as visiting graduate student from RTWH-Aachen (Germany), Feb-Oct/03.  
 L. Royer, “Gas and Temperature Studies of Carbon Nanotube Growth by Thermal CVD”, Internship report at MIT completed as visiting undergraduate student from UTT Troyes (France), Aug/04-Feb/05.  
 L.C. van Laake, “Design and Modeling of a Resistively Heated Substrate Apparatus for Carbon Nanotube Growth Studies”, Master’s thesis completed at MIT as visiting graduate student from TU-Eindhoven (Netherlands), April-Dec/05.

D.S. Kuhn, “Desktop Systems for Manufacturing Carbon Nanotubes by Chemical Vapor Deposition”,  
Master of Science in Mechanical Engineering and Engineer’s Degree in Naval Construction and  
Engineering, MIT, completed May/07.

Four MIT Mechanical Engineering bachelor’s thesis projects, 2000-2006.

Five MIT undergraduate research opportunities program (UROP) students (non-thesis), 2000-2006.

## TEACHING EXPERIENCE

**Nanomanufacturing (U. Michigan, ME599)** Fall 2007 and Winter 2009

- Created and taught new graduate course on properties, synthesis, and assembly of nanostructured materials; 20 students per term; lectures online at <http://www.mechanosynthesis.com>.

**Design and Manufacturing III (U. Michigan, ME450)** Fall 2008

- Senior capstone design course with concept-to-prototype team project. Shared full course lecture (100 students) with three other faculty, and created and taught theme project section “Machines and instruments for small-scale science and manufacturing”; 25 students.

**Design and Manufacturing I (U. Michigan, ME250)** Winter 2008 and Fall 2009

- Core sophomore-level course which teaches design process, 3D modeling, manufacturing processes, and culminates in a team design-build-test project; 140 students.

- Leading comprehensive revision of course content during Fall 2009 semester.

**Lab Instructor, Wheelchair Design in Developing Countries (MIT, SP.784)** Spring 2007

- Guided a team of three undergraduate students on design and prototyping of a frame for hand-powered tricycle wheelchairs; [http://web.mit.edu/sp.784/www/course\\_info.html](http://web.mit.edu/sp.784/www/course_info.html).

**Section Instructor, Introduction to Design and Manufacturing (MIT, 2.007)** Spring 2006

- Core undergraduate course teaches engineering design process, machine kinematics, structures, and power transmission elements; <http://pergatory.mit.edu/2.007>.

- Co-taught lab section of ten students through a semester-long design-and-build project of a remote-controlled machine, from concept-to-prototype, culminating in an interactive competition.

- Created and guided experimental activity where students build semi-autonomous machines using optical and inertial sensors and microcontroller.

**Co-instructor, “MEMS 101” short course (MIT)** Jan. 2005 and Jan. 2006

- Developed and taught five-hour short course along with four other graduate students.

- Topics included silicon and polymer microfabrication, MEMS sensors and actuators, packaging, wafer bonding, and nanomaterials.

**Project advisor to “i-Teams” entrepreneurship course (MIT, 15.371)** Fall 2005

- Worked throughout the semester with a team of five engineering and business graduate students who evaluated the commercialization potential for materials utilizing long carbon nanotubes.

## MEDIA COVERAGE AND OUTREACH

Research on carbon nanotube synthesis was featured in BBC documentary

“Visions of the Future: The Quantum Revolution”, November 2007.

**Nanobliss** gallery of visualizations micro- and nanoscale structures, <http://www.nanobliss.com>, inaugurated January 2006. Work has been featured in Nature (2008), Science (2008), New Scientist (2008), PC Magazine (2007), SEED Magazine (2007), Playboy (2007), K Magazine (2007), American Scientist (2006), and hundreds of newspapers, journals, trade publications, blogs, and broadcast and online media outlets around the world.

Gallery exhibitions of images of micro- and nanoscale structures:

- University of Michigan Faculty Art Exhibition, Ann Arbor, MI, November 2009.

- “NanoArt” exhibit at the Center for Nanoscale Science and Engineering (CNSE), State University of New York at Albany, April 2009.

- Materials Research Society Science as Art Competition (Second Prize), Boston, MA, December 2008
- Permanent collection at the Princeton Center for Theoretical Science, opened October 2008.
- University of Michigan Faculty Art Exhibition, Ann Arbor, MI, November 2007.
- Eighth International Conference on the Science and Application of Nanotubes, Ouro Preto, Brazil, June 2007.
- Hertz Foundation Symposium, San Jose, CA, March 2007.
- CollisionCollective C9 show at Art Interactive in Cambridge, MA and Jewett Arts Center Gallery in Wellesley, MA, February 2006 (with R. Wartena, E. Marley, and A. Embry-Pelrine).
- Materials Research Society Science as Art Competition, San Francisco, CA, March 2006.
- Materials Research Society Science as Art Competition, San Francisco, CA, March 2005.

## ACADEMIC AND PROFESSIONAL ACTIVITIES

Co-organizer, Symposium on “Carbon nanostructures: from properties to applications”, International Conference on Advanced Materials (ICAM), Rio de Janeiro, Brazil, 2009

Faculty Affiliate, Michigan Memorial Phoenix Energy Institute (MMPEI), 2007-present

Principal Member, IEEE-1784 Nanoelectronic Standards Working Group, 2007-present

Member, ASME Micro/Nanosystems (MNS) Committee, 2007-9

Member, Technical Review Committee, NSTI Nanotech 2008 Conference

Member of NSF/NIST/WTEC expert panel, “International Assessment Carbon Nanotube Manufacturing and Applications”, <http://www.wtec.org/cnm>, 2006-7

Co-founder and organizer of MIT “SmallTalks” interdisciplinary graduate student seminar series, with sponsorship from several departments, <http://web.mit.edu/small-talks>.

Founder and organizer of MIT carbon nanotube interest group, 2003-2007, which comprised over seventy students and faculty among many departments, and met regularly for seminars.

### Professional Society Memberships:

American Physical Society

American Society of Mechanical Engineers

American Society for Precision Engineering

European Society for Precision Engineering and Nanotechnology

Institute of Electrical and Electronics Engineers

Materials Research Society

Pi Tau Sigma, National Mechanical Engineering Honor Society

Tau Beta Pi, National Engineering Honor Society

### Reviewer for:

ACS Nano, 2007-8

Advanced Functional Materials, 2009

Advanced Materials, 2007-9

Applied Physics Letters, 2008-9

ASME Journal of Manufacturing Science and Engineering, 2007

Carbon, 2006-9

Chemistry of Materials, 2006-7

IEEE Transactions on Nanotechnology, 2009

Journal of Applied Physics, 2008

Journal of Electronic Materials, 2008

Journal of Nanoscience and Nanotechnology, 2007, 2009

Journal of Physical Chemistry, 2006-9

Journal of Physics D, 2006, 2008

Journal of the American Chemical Society, 2009

Materials Science and Engineering B, 2009  
Nanotechnology, 2006-8  
New Journal of Physics, 2007  
Physica Status Solidi, 2007-8  
Scripta Materialia, 2009  
Small, 2007  
Synthetic Metals, 2009