

Steven J. Murray, Ph.D., P.E.
Principal Engineer

Professional Profile

Dr. Steven J. Murray is a Principal Engineer in Exponent's Electrical and Computer Science practice. His areas of expertise include failure analysis of electrical and mechanical systems, metallurgy, and the mechanical and electrical properties of materials. Dr. Murray also specializes in the areas of shape memory alloys, magnetism, and magnetic materials.

Dr. Murray provides electrical and mechanical materials consulting services to a variety of industries. Engineering systems investigated include appliances, computers and consumer electronics, biomedical devices and medical electronics, pipelines, cranes, plumbing, heat exchangers, and large electrical generators and motors. These investigations have involved understanding and analysis of complex electrical and electronic systems, fracture and fractography, risk assessment, environmental effects, electrical and magnetic modeling, and materials defects. Dr. Murray has also conducted multiple investigations related to potential product recalls.

Dr. Murray holds an appointment as a Consulting Assistant Professor in the School of Engineering at Stanford University where he teaches the course *Techniques of Failure Analysis*. Prior to joining Exponent, Dr. Murray was employed as a Senior Engineer at the Midé Technology Corporation, where he worked on developing smart material systems involving conventional and magnetic shape memory alloys as well as piezoelectric materials.

Academic Credentials and Professional Honors

Ph.D., Materials Science and Engineering (Electronic Materials Panel), Massachusetts Institute of Technology, 2000

B.S., Mechanical Engineering, University of California at Berkeley (with High Honors), 1996

B.S., Materials Science and Mineral Engineering, University of California at Berkeley (with High Honors), 1996

ASM Undergraduate Award, 1996; Drake Scholar, University of California at Berkeley, 1992–1996; Chancellor's Scholar, University of California at Berkeley, 1992–1996

Licenses and Certifications

Registered Professional Electrical Engineer, Oregon, #77681PE

Registered Professional Mechanical Engineer, California, #M32549

Current Academic Appointments

- Consulting Assistant Professor Stanford University, Department of Aeronautics and Astronautics (Appointed yearly from January to June, 2006–present)

Publications

Donahoe D, Zha K, Murray SJ, Ray R. Accelerated life testing. In: Encyclopedia of Quantitative Risk Assessment. Everitt B and Melnick E (eds), Wiley, in press.

Edmonds J, Daneshpooy A, Murray SJ, Sire R. Turbogenerator stator core study. Proceedings, IEEE Symposium for Electrical Machines, Power Electronics & Drives, Cracow, Poland, in press.

Murray SJ, Ray R, Grossman H. Using Weibull analysis for cases with an unknown susceptible population. Proceedings, IMECE2007, Seattle, WA, 2007.

Kemal A, Mattison D, Murray SJ, Loose M. Degradation and ignition of polyvinyl chloride wire insulation. Proceeding, Fire and Materials, San Francisco, CA, 2007.

Ray RM, Grossman H, Murray SJ, Lange R. Evaluation of passenger vehicle crashworthiness using field performance data. Proceedings, IMECE2006, Chicago, IL, 2006.

Murray SJ, Loud J, Caligiuri RD. Failure modes in Calrod-type heaters used in home appliances. Proceedings, International Appliance Technology Conference, Chicago, IL, 2006.

Loud J, Murray SJ, Ray RM, Iyer M, Jackson O. Shock injury risk assessment of portable and handheld appliances and use environments. Proceedings, International Appliance Technology Conference, Chicago, IL, 2006.

James BA, Wood L, Murray SJ, Eiselstein LE, Foulds JR. Compressive damage-induced cracking in Nitinol. Proceedings, International Conference on Shape Memory and Superelastic Technologies, 2004.

Murray SJ. Ferromagnetic shape memory alloys, principals and applications. Proceedings, International Conference on Shape Memory and Superelastic Technologies, 2004.

Murray SJ, Edmonds J, Foulds JR, Sire RA, Chi W-M. Modeling fault propagation in and electric generator stator core. Proceedings, 8th EPRI Steam Turbine-Generator Workshop and Vendor Exposition, 2003.

James BA, Murray SJ, Saint S. Fracture characterization in nickel titanium alloys. Proceedings, International Conference on Shape Memory and Superelastic Technologies, pp. 321–330, 2003.

Murray SJ, Marioni M, Tello PG, Allen SM, O'Handley RC. Giant magnetic-field-induced strain in Ni-Mn-Ga crystals: Experimental results and modeling. *Magnet Magnetic Mat* 2001; 226–230:945–947.

Murray SJ, O'Handley RC, Allen SM. Model for discontinuous actuation of ferromagnetic shape memory alloy under stress. *Appl Phys* 2001; 89(2):1295–1301, January 15.

Murray SJ, Marioni M, Allen SM, O'Handley RC, Lograsso TA. 6% magnetic-field-induced strain by twin-boundary motion in ferromagnetic Ni–Mn–Ga. *Appl Phys Lett* 2000; 77:886–888.

Murray SJ, Marioni M, Kulka AM, Robinson J, O'Handley RC, Allen SM. Large, field-induced strain in single crystal NiMnGa ferromagnetic shape memory alloys. *Appl Phys* 2000; 87:5744.

Hayashi R, Murray SJ, O'Handley RC, Allen SM. Magnetic and mechanical properties of Fe-Ni-Co-Ti magnetic shape memory alloy. *Sensor Actuator A*, 2000; 81:219–223.

Murray SJ. Magneto-mechanical properties and applications of Ni-Mn-Ga ferromagnetic shape memory alloy. Doctoral Dissertation, Massachusetts Institute of Technology, 2000.

Murray SJ, O'Handley RC, Allen SM. Modeling and experiments for deformation under load in Ni-Mn-Ga ferromagnetic shape memory alloy. *Proceedings, MRS*, Vol. 604, pp. 279–284, 2000.

Murray SJ, O'Handley RC, Marioni M, Nembach H, Allen SM. Phenomenology of giant Magnetic-Field induced Strain in Ferromagnetic shape memory materials. *Appl Phys* 2000; 87:4712.

Murray SJ, Hayashi R, Marioni M, Allen SM, O'Handley RC. Magnetic and mechanical properties of FeNiCoTi and NiMnGa magnetic shape memory alloys. *SPIE Smart Materials Technologies* 1999; 3675.

Murray SJ, Marioni M, Huang JK, O'Handley RC, Allen SM. Field-induced strain under load in Ni-Mn-Ga magnetic shape memory materials. *Appl Phys* 1998; 83:7297.

Editorial Review

Practice Problems for Mechanical Engineering, 12th Edition, Chapters 63 and 64, Professional Publications, Inc., Belmont, CA, 2006.

Mechanical PE Sample Examination, Professional Publications, Inc., Belmont, CA, 2006.

Published Report

Murray SJ, Foulds JR, Spisak A. Generator core overheating risk assessment, J.T. Deely core investigation. Electric Power Research Institute, TR-1008738, Palo Alto, CA, September 2003.

Presentations

Murray SJ. Design for reliability and safety with thermal limit devices. IEEE Product Safety Engineering Society Conference, Longmont, CO, October 2007.

Murray SJ. Failure analysis in materials science. University of California at Berkeley, Department of Materials Science and Mineral Engineering, October 2007.

Murray SJ. Careers in engineering research and failure analysis. Milpitas High School, March 2007.

Murray SJ. Accelerated stress testing for home appliances. IEEE ASTR Conference, San Francisco, CA, October 2006.

Murray SJ. Consumer product failure investigations. International Bar Association Conference, Chicago, IL, 2006.

Murray SJ. Product defect investigations. Farella, Braun + Martel, LLP, San Francisco, CA, March 2005.

Murray SJ. Ferromagnetic shape memory alloys, principals and applications. Shape Memory and Superelastic Technologies Conference, Baden Baden, Germany, October 2004.

Murray SJ. Failure investigations and quality processes in engineering. NASA Ames, Mountain View, CA, December 2003.

Murray SJ. Engineering in litigation: How engineering knowledge and experience becomes evidence in the courtroom. ASM/NACE Joint Meeting, Oakland, CA, November 2003.

Murray SJ. Product defect investigations. Claims Conference of Northern California, Sacramento, CA, September 2003.

Murray SJ. Fracture characterization in Superelastic Nitinol. Lawrence Berkeley National Laboratory, Berkeley, CA, April 2003.

Murray SJ. Magneto-mechanical performance and mechanical properties of Ni-Mn-Ga ferromagnetic shape memory alloys. SPIE Conference on Smart Materials and Structures in Newport Beach, CA, March 2000.

Murray SJ. Magnetic shape memory. Invited seminar for the Materials Processing Center at MIT's Materials Unlimited Seminar Series, Boston, MA, May 1999.

Murray SJ. Magnetic and mechanical properties of FeNiCoTi and NiMnGa magnetic shape memory alloys. SPIE conference on Smart Materials and Structures in Newport Beach, CA, March 1999.

Murray SJ. Modeling and experiments for deformation under load in Ni-Mn-Ga ferromagnetic shape memory alloy. Fall Meeting of the Materials Research Society, Boston, MA, November 1999.

Murray SJ. Large field induced strain in single crystalline Ni-Mn-Ga ferromagnetic shape memory alloy. Magnetics and Magnetic Materials Conference, San Jose, CA, December 1999.

Murray SJ. Magnetic shape memory alloy. Presentations on continuing research given to the Board of Directors of Lord Corporation on three occasions, January 1998, July 1998, and January 1999.

Murray SJ. Magnetic and mechanical properties of Fe-Ni-Co-Ti shape memory alloy. 2nd European Magnetic Sensors and Actuators Conference, Sheffield, England, July 1998.

Murray SJ. The shape memory effect. Midé Technology Corporation, Cambridge, MA, October 1997.

Selected Technical Reports

Murray SJ. Report on Thermonorte STG failure in Porto Velho, Brazil. Exponent Failure Analysis Associates, Inc., January 2005.

Murray SJ. Investigation of El Dorado fan blade fracture. Exponent Failure Analysis Associates, Inc., September 2004.

Murray SJ, Foulds JR. Examination and aging study of Deely generator laminations. Exponent Failure Analysis Associates, Inc., February 2003.

Murray SJ, Hopkins S, Duffner D. Supplemental report on applied materials Centura [shipment] damage. Exponent Failure Analysis Associates, Inc., December.

Murray SJ, Hopkins S, Duffner D. Analysis of [shipment] damage to an applied materials Centura tool. Exponent Failure Analysis Associates, Inc., November.

Murray SJ. Investigation of corrosion failure of Calprop copper laterals. Exponent Failure Analysis Associates, Inc., May 2002.

Murray SJ. Investigation of heat exchangers 100 and 301 at Merck's Flint River plant. Exponent Failure Analysis Associates, Inc., March 2002.

Murray SJ. Investigation of the collapse of the Derrick Barge Lili Bisso. Exponent Failure Analysis Associates, Inc., November 2001 (with R.D. Caligiuri).

Murray SJ, James B. Metallurgical investigation of Equilon Tracy kickoff valve failure. Exponent Failure Analysis Associates, Inc., July 2001.

Murray SJ, James B. Evaluation of pitting and cracking in Sonoma cutrer hot water storage tank. Exponent Failure Analysis Associates, Inc., July 2001.

Prior Experience

Senior Engineer, Mide Technology Corporation, 2000–2001

Student Researcher, LORD Corporation, 1998

Student Researcher, Lawrence Berkeley National Laboratory, 1994–1996

Professional Affiliations

- American Society of Mechanical Engineers
- American Society for Metals
- Institute of Electrical and Electronics Engineers
- Board Member, Berkeley Engineering Fund (2007–)