

NANCY S. BRODSKY

Distinguished Member of Technical Staff

Current Role: Tobacco Control Project Team Lead

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EDUCATION:

1985: PhD, Geophysics, University of Colorado at Boulder

1980: MS, Geology, University of Colorado at Boulder

1977: BS, Geological Sciences, State University of New York at Binghamton

AWARDS:

1999: Outstanding Accomplishments in Rock Mechanics: Applied Research Award. Awarded by the U.S. National Committee for Rock Mechanics, National Research Council, National Academy of Sciences.

2006: Hurricane Katrina Economic Analysis Team member, which won a Sandia National Laboratories Employee Recognition Award

2004: Team lead for Fast Analysis and Simulation Team, which won a Sandia National Laboratories Employee Recognition Award

2002: Yucca Mountain Site Recommendation Team member, team won Sandia National Laboratories Division 6000 Employee Recognition Award.

1998: Member of "Spallings and Disposal Area Fluid Flow and Rock Mechanics Technical Studies" team, which won Sandia National Laboratories President's Quality Award, Turquoise

EXPERIENCE:

Beginning in 1977, Dr. Brodsky has performed and supervised testing of materials and conducted research in rock mechanics. Her early work at the University of Colorado in Boulder focused on the effects of strain rate, temperature, moisture content, and compressive stress on the deformation and failure of brittle rock, conducting tests using high temperature, high pressure environmental chambers and double exposure laser holography, and performing numerical modeling of the failure process based on stress corrosion cracking and linear elastic fracture mechanics. Experience includes participation in studies of the fracture of large (~1 meter) rock specimens at the Institute of the Physics of the Earth, Moscow, Russia; rock mechanics laboratory work in temperature-dependent deformation of rocks in compression at the Ruhr-Universitat (1980-1981).

In 1985, Dr. Brodsky joined RE/SPEC Inc, where her work focused on performing and supervising experimental laboratory studies in support of nuclear waste isolation programs, particularly the Waste Isolation Pilot Plant (WIPP). As Manager of Natural Materials Testing and as a Project Manager she was responsible for performance of work, supervision of staff, and maintaining compliance with Quality Assurance programs consistent with NQA-1 criteria. Avenues of research included damage mechanics investigations using ultrasonic velocity measurements, creep properties of rock salt, consolidation of backfill and sealing materials, and fluid transportation properties.

After joining Sandia National Laboratories in 1995, Dr. Brodsky worked on laboratory and field testing in support of construction of a national nuclear waste repository at Yucca Mountain, Nevada, working in NQA-1 – compliant programs. She developed a thermal properties testing

laboratory and performed thermal and mechanical properties studies in support of the in-situ Yucca Mountain Repository Single Heater Test and Drift Scale Tests. She was the Principal Investigator for planning tests and interpreting data for field thermal conductivity tests in the underground environment. Dr. Brodsky also conducted laboratory testing in support of the Gas Migration in Shear Zones (GAM) experiment, conducted at the underground Grimsel Test Site, Switzerland. She represented Sandia National Laboratories at international working group meetings for this project, which was conducted under the auspices of NAGRA, the Swiss National Cooperative for the Disposal of Radioactive Waste. Her Yucca Mountain Project work included serving as the SNL lead for the Features, Events, and Processes (FEPs) Database which contained evaluations of factors that could impact the performance of the proposed nuclear waste repository. She provided an interface between the legal team, subject matter experts, and customers. She was part of a small team of Sandians who conducted a FEPs workshop for Taiwan's Institute of Nuclear Energy Research (INER).

In 2003 Dr. Brodsky began work in infrastructure protection, initially working within the Infrastructure Complexity Research and Development (R&D) Group to identify theories, methods, and analytical tools from the study of complex systems applicable to critical infrastructure problems. In late 2003, Dr. Brodsky began working with the NISAC (National Infrastructure Simulation and Analysis) rapid response team, responding to information requests from DHS and DOE pertaining to immediate potential threats to infrastructure. She was the SNL team lead for rapid response (Fast Analysis and Simulation Team, or FAST) work from 2004 until the Spring of 2010. She also served as the Sandia Deputy Project Lead from 2008-2010. In 2006 she was one of a small group of NISAC leads selected to present a briefing to Michael Chertoff, then Secretary of the Department of Homeland Security. She has authored and co-authored numerous reports and presentations for DHS on a wide range of infrastructure issues including pre-landfall projected hurricane analyses, post-event analysis evaluations, policy analyses, top officials and principals exercise support, and event analyses such as potential impacts of wildfires.

In 2010 Dr. Brodsky rejoined the Complexity Research and Development Group, which had expanded its breadth and depth to become the CASoS Engineering Initiative. Dr. Brodsky is currently the lead for the Tobacco Control Project, working directly with the Food and Drug Administration. The tobacco products system comprises an extremely complex set of interwoven and evolving social and economic systems, and exhibits properties associated with complex adaptive system behavior. The tobacco control project is developing a modeling framework for analysis of the potential impacts of possible policy decisions.

PUBLICATIONS AND REPORTS

SAND Reports: Nancy Brodsky is an author or co-author on 52 SAND reports. These can be accessed by searching for Nancy Brodsky on the Sandia Technical Library website:

https://sharepoint.sandia.gov/sites/Technical_Library/collections/Pages/Reports.aspx

FAST Reports: While Dr. Brodsky was the NISAC Sandia FAST (Fast Analysis and Simulation Team) lead, the team produced a multitude of reports and briefings (well over 100). Most of these were for Official Use Only. A 14-page summary is available upon request.

Publications and Presentations:

Brodsky, Nancy S., Arlo L. Ames, Robert J. Glass, Theresa J. Brown, Patrick D. Finley, Thomas W. Moore, John M. Linebarger, Aldo A. Zagonel, S. Louise Maffitt, 2011. Application of Complex Adaptive

- Systems of Systems Engineering to Tobacco Products. In proceedings: International Conference on Complex Systems, June 2011.
- Moore, Thomas W., Patrick D. Finley, John M. Linebarger, Alexander V. Outkin, Stephen J. Verzi, Nancy S. Brodsky, Daniel Cannon, Robert J. Glass, 2011. Extending Opinion Dynamics to Model Public Health Problems and the Evaluation of Policy Interventions. In proceedings: International Conference on Complex Systems, June 2011.
- Moore, Thomas, Patrick Finley, John Linebarger, Alexander Outkin, Stephen Verzi, Nancy Brodsky, Daniel Cannon, Aldo Zagonel, and Robert Glass, 2011. Extending Opinion Dynamics to Model Public Health Problems and Analyze Public Policy Interventions. In proceedings: System Dynamics Conference, July 2011
- Zagonel, Aldo, Mohammad Mojtahedzadeh, George Richardson, Nancy Brodsky, Theresa Brown, Stephen Conrad, and Robert Glass, 2011. Developing a theory of the societal lifecycle of cigarette smoking: Explaining & anticipating trends using information feedback. In proceedings: System Dynamics Conference, July 2011
- Zagonel, Aldo, A., George P. Richardson, Mohammad Mojtahedzadeh, Nancy S. Brodsky, Theresa J. Brown, Stephen H. Conrad, Robert J. Glass, 2010. Developing a theory of the societal lifecycle of cigarette smoking: Explaining and anticipating trends using information feedback. Presentation at Modeling for Public Health Action: From Epidemiology to Operations, December 2010.
- Zagonel, Aldo, A., Steve Conrad, Robert Glass, Theresa Brown, Arlo Ames, Nancy Brodsky, John Linebarger, Pat Finley, Tom Moore, Daniel Cannon, 2010 (SAND 2010-4467C). Presentation to Surgeon General Report Meeting regarding Mathematical and Statistical Modeling on Population Impact of Smoking, July 2010 Washington DC
- Robert J Glass, Robert J., Walter E Beyeler, Stephen H Conrad, Nancy S Brodsky, Paul G Kaplan, and Theresa J Brown, 2003. SAND 2003-1778 Defining Research and Development Directions for Modeling and Simulation of Complex, Interdependent Adaptive Infrastructures.
- Marschall P.; Brodsky N.; Mayor J.C.; Meier P. (2001): Solute and gas migration experiments in a heterogeneous shear zone.- Proceedings of the 9th International high-level radioactive waste management conference: April 29-May 3, 2001, Alexis Park Resort, Las Vegas, Nevada. American Nuclear Society, La Grange Park, Session N-3 / 3. [CD-ROM]
- Brodsky, N.S., and G.T. Barker, 1999. Thermal Conductivity as a Function of Saturation for Welded and Nonwelded Tuff. In: Proceedings of the 37th US Rock Mechanics Symposium, Vail Colorado, June 6-9, 1999 pp 699-705. Rotterdam: Balkema.
- Stormont, J.C., C. Boney, N.S. Brodsky, J.T. Fredrich, P. Davies, 1998. Preliminary Laboratory Measurements of Porosity and Permeability (Gas, Liquid, and Relative) for Shear Zone Material from the Grimsel Test Site, Switzerland. Progress Report submitted to Nationale Genossenschaft fur die Lagerung radioaktiver Abfalle (NAGRA).
- Brodsky, N.S., 1998. Lateral Variability of Thermal Properties at Yucca Mountain, Nevada. Proceedings of the 1998 International High-Level Radioactive Waste Management Conference, Las Vegas, Nevada, May 11-14, 1998.
- Brodsky, N.S., M. Riggins, and J. Connolly, 1997. Thermal Expansion, Thermal Conductivity, and Heat Capacity Measurements at Yucca Mountain, Nevada. Int. Jour. Rock Mech & Min. Sci. Vol. 34, No. 3-4.
- K.S. Chan, N. S. Brodsky, A.F. Fossum, D.E. Munson, and S. R. Bodner, 1997. Creep-Induced Cleavage Fracture in WIPP Salt Under Indirect Tension. Jour. Of Engineering Materials and Technology, Vol. 119, No. 4.
- Brodsky, N.S., F.D. Hansen, T.W. Pfeifle, 1996. Properties of Dynamically Compacted WIPP Salt. In: Fourth Conference on the Mechanical Behavior of Salt, Ecole Polytechnique de Montreal, Jun 17-18, 1996.

Brodsky, N.S., D.J. Zeuch, and D.J. Holcomb, 1995. Consolidation and Permeability of Crushed WIPP Salt in Hydrostatic and Triaxial Compression. In Proc. 35th U.S. Symp. Rock Mechanics.: 497-502. Rotterdam: Balkema.

Munson, D.E., D.J. Holcomb, K.L. DeVries, N.S. Brodsky, K.S. Chan, 1995. Correlation of Theoretical Calculations and Experimental Measurements of Damage Around a Shaft in Salt. In Proc. 35th U.S. Symp. Rock Mechanics.: 491-496. Rotterdam: Balkema.

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Brodsky, N. S. and D. E. Munson, 1994. "Thermomechanical Damage Recovery Parameters for Rocksalt from the Waste Isolation Pilot Plant," Proceedings of the First North American Rock Mechanics Symposium, Austin, TX, pp. 731-738.

Chan, K.S., N.S. Brodsky, A.F. Fossum, S.R. Bodner, and D.E. Munson, 1994. "Damage-Induced Nonassociated Inelastic Flow in rock Salt," International Journal of Plasticity, Vol. 10, No. 6, pp 623-642.

Brodsky, N. S., 1993. Hydrostatic and Shear Consolidation Tests with Permeability Measurements on Waste Isolation Pilot Plant Crushed Salt, SAND93-7058, prepared by RE/SPEC, Inc., Rapid City, SD, RSI-0453, for Sandia National Laboratories, Albuquerque, NM.

Brodsky, N. S., 1993. Porosity and Gas Permeability Measurements on marker Bed 139 Anhydrite from the Waste Isolation Pilot Plant, Prepared by RE/SPEC, Inc., Rapid City, SD, RSI-0484, for Sandia National Laboratories, Albuquerque, NM, September.

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Fossum, A. F., N. S. Brodsky, K. S. Chan, and D. E. Munson, 1993. "Experimental Evaluation of a Constitutive Model for Inelastic Flow and Damage Evolution in Solids Subjected to Triaxial Compression," Proceedings, 34th U.S. Symposium on Rock Mechanics, University of Wisconsin-Madison, Madison, WI, June 27-31, 1993.

Senseny, P. E., N. S. Brodsky, and K. L. DeVries, 1993. "Parameter Evaluation for a Unified Constitutive Model," Journal of Engineering Materials and Technology, Transactions of the ASME, Vol. 115, pp. 157-162.

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Brodsky, N. S. And D. H. Zeuch, 1992. "Consolidation and Permeability of Crushed WIPP Salt Under Hydrostatic and Shear Stress States," EOS Trans. Amer. Geophys. Union, vol. 73.

Mellegard, K. D., and N. S. Brodsky, 1992. Phase I Testing Results for the ISR/ASTM Interlaboratory Test Program for Rock Properties, prepared by RE/SPEC Inc., Rapid City, SD, RSI-0413 for Dr. Howard Pincus, Chairman, ITP/RP Steering Committee, San Diego, CA, January.

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Brodsky, N. S., P. E. Senseny, and F. D. Hansen, 1987. "Stress Relaxation Tests in Avery Island Salt as a Function of Initial Stress and Temperature (Abstract)," EOS Trans. Amer. Geophys. Union, vol. 68, p. 1454.

Krause, W. B., and N. S. Brodsky, 1987. Intracrystalline Brine Inclusion Motion for Palo Duro Unit 5 Salt from the Mansfield No. 1 Borehole in Oldham County, Texas, BMI/ONWI-663, prepared by RE/SPEC Inc., Rapid City, SD, for Office of Nuclear Waste Isolation, Battelle Memorial Institute, Columbus, OH.

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Brodsky, N. S., and H. A. Spetzler, 1982. "Time-Dependent Failure of Rock in Compression (Abstract)," EOS Trans. Amer. Geophys. Union, vol. 63, p. 1110.

Brodsky, N. S., I. C. Getting, and H. A. Spetzler, 1979. "The Effect of Strain Rate on the Stiffness and Compressive Strength of Lunar Analogues (Abstract)," Lunar Planet Sci X, pp. 155-156.

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Brodsky, N. S., I. C. Getting, and H. A. Spetzler, 1978. "Strain-Rate Dependence of Poisson's Ratio During Deformation of a Brittle Rock (Abstract)," EOS Trans. Amer. Geophys. Union, vol. 59, p. 1193.