

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Brodsky, Nancy S	POSITION TITLE Distinguished Member of the Technical Staff		
eRA COMMONS USER NAME (credential, e.g., agency login) nsbrods			
<i>EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	MM/YY	FIELD OF STUDY
Binghamton University	B.S.	05/77	Geological Sciences
University of Colorado at Boulder	M.S.	05/80	Geology
University of Colorado at Boulder	Ph.D.	08/85	Geophysics

A. Personal Statement

Dr. Nancy S. Brodsky is the project lead for Tobacco Policy Evaluation Modeling, which is part of the Complex Adaptive Systems of Systems (CASoS) Engineering Initiative at Sandia National Laboratories. Dr. Brodsky has degrees from Binghamton University (BS in Geological Sciences), and University of Colorado at Boulder (MS in Geology, PhD in Geophysics.)

Dr. Brodsky brings diverse experience to her position. In 1977 she began performing and supervising testing of materials and conducting 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-Universität (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 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 joined the National Infrastructure Simulation and Analysis Center (NISAC), 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. Starting in late 2003, Dr. Brodsky worked with the 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 that work from 2004 – 2010. 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 group to lead the Tobacco Policy Evaluation Modeling effort. This effort is developing a modeling framework to use in understanding the impact of certain policy and product approval decisions on population health.

B. Positions and Honors

Positions and Employment

1977-1985	University of Colorado at Boulder, Graduate Research Assistant
1985-1995	RE/SPEC Inc., Rapid City South Dakota. Positions included: Analyst, Principal Investigator, Manager of Natural Materials Testing
1995-2011	Sandia National Laboratories, Albuquerque, NM. Positions included: Senior Member of Technical Staff, Principal Member of Technical Staff

Other Experience and Professional Memberships

1979-?? Member, American Geophysical Union

- *Invited Participant*
- *Team lead*
- *Participant*, Sandia National
- *Invited Panelist*,
- *Co-Author*, White Paper
- *Co-Organizer*,
- .

Honors

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	Sandia National Laboratories Employee Recognition Award, Hurricane Katrina Economic Analysis Team
2004	Sandia National Laboratories Employee Recognition Award, Team lead for Fast Analysis and Simulation Team
2002	Sandia National Laboratories Employee Recognition Award, Yucca Mountain Site Recommendation Team
1998	Sandia National Laboratories President's Turquoise Quality Award, Spallings and Disposal Area Fluid Flow and Rock Mechanics Technical Studies Team
	Letters to NISAC/FAST for Hurricane Katrina work?

SAFE Awards: *Sandia Award for Excellence*, Sandia National Laboratory, year (asked Lillian if there is a list of these)

Selected Peer-reviewed Publications

.

Additional recent publications of importance to the field (in chronological order)

NISAC work -

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]

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).

High level waste meeting- 2001 – 2 papers?

Brodsky, N.S., and G.T. Barker, 1999. Effect of Single Heater Test on Intact Rock Properties at Yucca Mountain, Nevada. In: Proceedings of the 37th US Rock Mechanics Symposium, Vail Colorado, June 6-9, 1999 pp 707-714. Rotterdam: Balkema.

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., and G. Barker, 1998. Site-Specific Thermal and Mechanical Property Characterizations of In Situ Thermal Test Areas at Yucca Mountain, Nevada. Accepted for publication: Int. Jour. Of Rock Mech. & Min. Sci.

Pfeifle, T.W., N.S. Brodsky, and D.E. Munson, 1998. Experimental Determination of the Relationship Between Permeability and Microfracture-Induced Damage in Bedded Salt. Accepted for publication: Int. Jour. Of Rock Mech. & Min. Sci.

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.

Brodsky, N.S., M. Riggins, J. Connolly, and P. Ricci, 1997. Thermal Expansion, Thermal Conductivity, and Heat Capacity Measurements for Boreholes UE25 NRG-4, UE25 NRG-5, USW NRG-6, and USW NRG-7/7A. SAND95-1955. SAND95-1955, Sandia National Laboratories, Albuquerque, NM.

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.

Yucca Mountain Site Geotechnical Report, 1996. BAAA00000-01717-4600-00065 REV00. Prepared for U.S. Department of Energy, Yucca Mountain Site Characterization Project. (Brodsky: Primary author of Chapter 5, 149pp).

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.

Hansen, F.D., E.H. Ahrens, V.C. Tidwell, J.R. Tillerson, N.S. Brodsky, 1995, Dynamic Compaction of Salt: Initial Demonstration and Performance Testing. In Proc. 35th U.S. Symp. Rock Mechanics.: 755-760. Rotterdam: Balkema

Brodsky, N.S., 1994. "Measurements of Fluid Transport Properties for Marker Bed 139 Anhydrite From the Waste Isolation Pilot Plant", prepared by RE/SPEC Inc., Rapid City, SD, RSI-0491, for Sandia National laboratories, Albuquerque, NM, January.

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.

Brodsky, N. S., 1993. Thermomechanical Damage Recovery Parameters for Rocksalt from the Waste Isolation Pilot Plant, SAND93-7111, prepared by RE/SPEC, Inc., Rapid City, SD, RSI-0481, for Sandia National Laboratories, Albuquerque, NM.

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.

Brodsky, N. S., 1992. "Experimental Observations of Localization of Deformation before Brittle Failure of Geologic Materials," Proceeding of SECTAM XVI, Nashville, TN, April.

Brodsky, N. S., and T. W. Pfeifle, 1992. Consolidation of the Waste Isolation Pilot Plant Crushed Salt/Bentonite Mixtures as a Function of Confining Pressure and Moisture Content as Compared with

Constitutive Model Predictions, SAND91-7071, prepared by RE/SPEC Inc., Rapid City, SD, RSI-0385, for Sandia National Laboratories, Albuquerque, NM.

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.

Brodsky, N. S., and D. E. Munson, 1991. "The Effect of Brine Injection on the Creep of WIPP Salt During Laboratory Tests," Proceedings, 32nd U.S. Symposium on Rock Mechanics, University of Oklahoma, Norman, OK, July.

Pfeifle, T. W., and N. S. Brodsky, 1991. Swelling Pressure, Water Uptake, and Permeability of 70/30 Crushed Salt/Bentonite, SAND91-7070, prepared by RE/SPEC Inc., Rapid City, SD, RSI-0378, for Sandia National Laboratories, Albuquerque, NM.

Brodsky, N. S., 1990. Crack Closure and Healing Studies in WIPP Salt Using Compressional Wave Velocity and Attenuation Measurements: Test Methods and Results, SAND90-7076, prepared by RE/SPEC Inc., Rapid City, SD, RSI-0356, for Sandia National Laboratories, Albuquerque, NM.

Brodsky, N. S., 1990. The Effect of Brine Injection on the Creep of WIPP Salt during Laboratory Tests, SAND90-2367, prepared by RE/SPEC Inc., Rapid City, SD, RSI-0371, for Sandia National Laboratories, Albuquerque, NM.

Brodsky, N. S., 1989. "Crack Healing Studies in WIPP Salt: Test Methods and Preliminary Results (Abstract)," EOS Trans. Amer. Geophys. Union, vol. 70, No. 43, p. 1323.

Brodsky, N. S., 1989. "Resilient Modulus Measurements on Cohesive Soils," Resilient Moduli of Soils: Laboratory Conditions, ASCE National Meeting, New Orleans, October, LA, pp. 15-30.

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.

Brodsky, N. S., 1985. An Investigation of the Fracture of Granite Under Triaxial Stress, Ph.D. Thesis, University of Colorado, Boulder, CO.

Brodsky, N. S., I. C. Getting, and H. A. Spetzler, 1985. "An Experimental and Theoretical Approach to Rock Deformation at Elevated Temperatures and Pressures," Measurements of Rock Properties at Elevated Temperatures and Pressures, ASTM STP 869, H. J. Pincus and E. R. Hoskins (eds), American Society for Testing and Materials, Philadelphia, PA, pp. 37-54.

Brodsky, N. S., and H. A. Spetzler, 1984. "Direct Observation of an Incipient Fault Zone Using the Scanning Electron Microscope (Abstract)," EOS Trans. Amer. Geophys. Union, vol. 65, p. 1081.

Brodsky, N. S., and H. A. Spetzler, 1984. "Strain Localization During Deformation of Westerly Granite," Proceedings, 25th U.S. Symposium on Rock Mechanics, Northwestern University, Evanston, IL, pp. 87-94.

Brodsky, N. S., I. C. Getting, and H. A. Spetzler, 1983. "Measurement of Strain Rate and Temperature-Dependent Deformation with Comments on Crack and Fault Plane Development (Abstract)," EOS Trans. Amer. Geophys. Union, vol. 64, p. 835.

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.

Brodsky, N. S., and H. A. Spetzler, 1979. "Time-Dependent Deformation of a Basalt at Low Differential Stress," Proc. Lunar Planet Sci. Conf. 10th, pp. 2155-2163.

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.