

Steve Naruk, PhD

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Shell Research Team Leader and Structural Geology Principal Technical Expert Retired

Responsible for Technical QA/AC of Shell's Structurally Complex Conventional and
Unconventional Plays Worldwide

Areas of Expertise:

Research Management | Fault- and Top-Seal Analysis | Seismic Interpretation | Reconstructions | Burial
History Modeling | Fracture Prediction | Coaching & Mentoring

Professional Experience

2018-Present: Consultant & Adjunct Professor, University of Houston, Earth & Atmospheric Sciences

- Teach graduate-level Advanced Structural Geology.
- Coached 2019 UH 1st place AAPG International Barrel Award team.

2006-2018: Research Team Leader, Shell International E&P Inc., Houston, TX

- Subject Matter Expert Fault and Top Seals
- Created and managed global network of 200+ E&P structural geologists.
- Managed from 4 to 19 research staff, with project budgets of \$1 - \$5 million.
- Delivered multi-hundred-million-dollar business impacts affecting well numbers and locations in Alaska, Appalachia, Argentina, Bolivia, Borneo, Colombia, Gulf of Mexico, Malaysia, Nevada, Nigeria, North Sea, Oklahoma.
- Developed industry-leading geologic modeling algorithms and software.
- Supervised multi-cultural teams in structural geology, turbidite stratigraphy and reservoir engineering.
- Managed external relations with multiple universities and research consortia in US and Europe resulting in new geologic concepts, student mentoring, and enhanced industry – academic relationships.
- Developed on-line training courses, reducing training-related travel costs ~1,000,000 annually.

2003-2006: Senior Staff Structural Geologist, Shell International E&P Inc. Reservoir Compartmentalization Team.

- Developed integrated concepts and technologies for modeling combined effects of stratigraphic and structural compartmentalization of well performance.
- Deployed results in Shell's proprietary reservoir simulation software,

2000-2003: Staff Geologist, Shell Oil Company, Structure Traps and Seals Research Team.

- Developed proprietary algorithms for static and dynamic fault seal prediction.
- Deployed results via new Shell proprietary fault-seal prediction software.

Additional Professional Experience

Chair, AAPG Petroleum Structure and Geomechanics Division, 2006-2007.
Senior Exploration Geologist, Shell Western Exploration and Production, Inc. Unconventional Exploration Team
Senior Exploration Geologist, Shell Pecten Latin America Exploration Division.
Senior Exploration Geologist, Shell Western Exploration and Production Inc. Continental Division, New Play Development.
Research Geologist, Shell Development Co., Structure-Tectonics Group.
Exploration Geologist, Shell Western Exploration and Production, Inc., Alaska Exploration.
Research Mineralogist, AMAX Minerals & Mining Co., Golden, Co.

Education

BS, Yale University, Geology & Geophysics
MS, The University of Arizona, Structural Geology and Tectonics
PhD, The University of Arizona, Structural Geology and Tectonics

Refereed Publications

Salem, A.C., Naruk, S.J. and Solum, J.G., 2022, Impact of Natural Fractures on Production from an Unconventional Shale: the Delaware Basin Wolfcamp Shale, AAPG Bulletin, v. 106, no.1, pp. 1-20
Naruk, S.J., Brandenburg, J.P., Solum, J.G., Wolf, D.E., and Origo, P., 2019, Effective stress constrains on vertical fault flow: Learnings from Natural CO₂ Reservoirs, AAPG Bulletin, v. 103. pp. 1979-2008.
Wilkins, S.J., Naruk, S.J., and Davies, R., 2019, Subsurface Observations of Deformation Bands and Their Impact on Hydrocarbon Production within the Holstein Field, Gulf of Mexico, USA, Geological Society of London Special Publication 496, pp. 18-39
Alpak, O., Barton, M.D., and Naruk, S.J., 2013, The impact of fine-scale turbidite architecture on deep-water reservoir performance, AAPG Bulletin v.97, no.2, pp. 251-284
Solum, J.G., Brandenburg J.P. and Naruk, S.J., 2012, Characterization of deformation bands associated with normal and reverse stress states in the Navajo Sandstone, Utah: Reply, AAPG Bulletin v.96, no.6, pp. 877-890
Brandenburg, J.P., Alpak, F.O., Solum, J.G., Naruk, S.J., 2012, A kinematic Trishear model to predict deformation bands in a fault-propagation fold; East Kaibab Monocline, Utah, AAPG Bulletin v.96, no.1, pp. 109-132
Solum, J.G., Brandenburg, J.P., Naruk, S.J., Kostenko, V.V., Wilkins, S.J. and Schultz, R.A., 2010, Characterization of deformation bands associated with normal and reverse stress states in the Navajo Sandstone, Utah, AAPG Bulletin v.94, no.9, pp. 1463-1475.
Kostenko, O.V., Naruk, S.J., Hack, W., Poupon, M., Meyer, H-J, Mora-Glukstad, M; Anowai, C; and Mordi, M., 2008, Structural evaluation of column-height controls at a toe-thrust discovery, deep-water Niger Delta, AAPG Bulletin, V. 92, no 12, pp. 1615-1638.
Wilkins, S J. Naruk, S J., 2007, Quantitative Analysis of Slip-Induced Dilation With Application to Fault Seal., AAPG Bulletin v.91, no.1, pp.97-113.
Onyeagoro, U O. Naruk, S J. Ikomi, J G, 20014, Production-induced Cross-Fault Flow Case Study: Implications For a Swamp Field Development in the Niger Delta, Nigeria Int Conf. SPE-88907.
Onyeagoro, U.O., Busch, J.P., Naruk, S.J., Ozumba, B.M., 2002, Fault Seal Characterization in Tertiary Basins Exploration and Production Life Cycle, 26th Annual SPE Nigeria International Conference, SPE-79151.
Naruk, S.J., 1994, Geometric Analyses and Balanced Cross Sections of the Arbuckle Mountains and Washita Valley Fault, Shale Shaker, v. 45, pp. 10-15.

- Naruk, S.J., and Bykerk-Kauffman, A., 1990, Late Cretaceous and Tertiary deformation of the Santa Catalina Metamorphic Core Complex, Arizona, in, Gehrels, G.E., and Spencer, J.E., Geologic Excursions through the Sonoran Desert Region, Arizona and Sonora, Arizona Geological Survey Special Paper 7, pp.41-50.
- Ruf, A.S., Naruk, S.J., Butler, R.F., and Calderone, G.J., 1988, Strain and magnetic fabrics in the Santa Catalina and Pinaleno Mountains metamorphic core complex mylonite zones, Arizona: Tectonics, v.7, p.235-248.
- Houser, B.B., Thorman, C.H., Naruk, S.J., 1988, Geologic map of the Thatcher SE quadrangle, Graham County, Arizona, U.S. Geological Survey Geologic Quadrangle Map GQ-XXXX scale 1:24,000.
- Houser, B.B., Thorman, C.H., Naruk, S.J., 1988, Geologic map of the Thatcher SW quadrangle, Graham County, Arizona, U.S. Geological Survey Geologic Quadrangle Map GQ-XXXX scale 1:24,000.
- Naruk, S.J., 1987, Displacement calculations across a metamorphic core complex mylonite zone: Pinaleno Mountains, southeastern Arizona: Geology, v. 15, p.656-660.
- Naruk, S.J., Bykerk-Kauffman, A., Davis, G.H., Currier-Lewis, D., Lewis, S.W., and Faulds, J.E., 1987, Reply to comment by Verbeek on "Kink folding in an extended terrane: Tortilla Mountains, southeastern Arizona:" Geology, v. 15, p.87 1.
- Naruk, S.J., Bykerk-Kauffman, A., Davis, G.H., Currier-Lewis, D., Lewis, S.W., and Faulds, J.E., 1987, Reply to comment by Wust on "Kink folding in an extended terrane: Tortilla Mountains, southeastern Arizona:" Geology, v.15, p.872.
- Davis, G.H., Naruk, S.J., and Thorman, C.H., 1987, Structural geology of the Rincon and Pinaleno metamorphic core complexes, southeast Arizona, Davis, G.H., and VandenDolder, E.M., (eds.), Geologic diversity of Arizona and its margins: Excursions to choice areas. Geological Society of America, p.249-259.
- Thorman, C.H., and Naruk, S.J., 1987, Generalized bedrock geologic map and distribution of mylonitic rocks in the eastern Pinaleno Mountains, Graham Co., Az. USGS Open File Report 87-614.
- Naruk, S.J., 1986, Strain and displacement across the Pinaleno Mountains shear zone, Arizona, USA: Journal of Structural Geology, v.8, p.35-46.
- Naruk, S.J., Bykerk-Kauffman, A., Currier-Lewis, D., Davis, G.H., Faulds, J.E., and Lewis, S.W., 1986, Kink folding in an extended terrane: Tortilla Mountains, southeastern Arizona: Geology, v.14, p.1012-1015.
- Kligfield, R., Crespi, J., Naruk, S., and Davis, G.H., 1985, Reply to comment on "Displacement and strain patterns of extensional orogens:" Tectonics, v.4., p.591-593.
- Kligfield, R., Crespi, J., Naruk, S., and Davis, G.H., 1984, Displacement and strain patterns of extensional orogens: Tectonics, v.3, p.577-609.
- Odekirk, J.R., Naruk, S., and Taylor, P., 1981, Computer processing of microscopic point-count data - an example, in Hausen, D.M., and Park, W.C., (eds.), Process Mineralogy: Extractive Metallurgy Mineral Exploration, Energy Resources, p.253-265.
- Naruk, S., 1981, Quantitative microscopic analysis of sulfide flotation circuits – an example, -in Hausen, D.M., and Park, W.C., (eds.), Process Mineralogy: Extractive Metallurgy, Mineral Exploration, Energy Resources, p.429-434.

Selected Abstracts

- Naruk, S., Solum, J., and Van Berkel, J., 2018, Loss of Containment and Leakage up Fault Zones, AAPG 2018 Annual Convention and Exhibition, Salt Lake City, Utah.
- Naruk, S., Brandenburg, J.P., Solum, J., Origo, P., and Wolf, D., 2018, Effective Stress Constraints on Vertical Fault Seal Capacity: Implications for subsurface CO₂ sequestration and conventional HC Production,

- EAGHG Modelling and Risk Management Network Meeting 18th-22nd June 2018, Grand Forks, North Dakota.
- Salem, A., Solum, J., Naruk, S., Minisini, D., Desjardins, P., and Hnat, J., 2018, Integration of Core Fracture and Lithofacies Descriptions in the Wolfcamp Shale: Implications for Mechanical Stratigraphy and Production, Unconventional Resources Technology Conference Book p.27.
- Getsinger, A. and Naruk, S., 2017, Investigating the Effect of Deformation on Hydrocarbon Retention in Shale Plays: AAPG 2017 Annual Convention and Exhibition, Houston, Texas.
- Molinaro, M., Hauge, T., O'Connor, S., Salem, A., Kostenko, O., V., and Naruk, S., 2017, Onshore San Joaquin Basin and Temblor Range, California: New Insights into the Structural Framework and Exploration Potential of a Complex and Mature Fold and Thrust Belt, AAPG 2017 Annual Convention and Exhibition, Houston, Texas.
- Naruk, S., Brandenburg, J.P., He, D., Kirschner, D., Solum, J., and Wolf, D., 2014, Scale-dependent Strategies for Modeling the Impact of Seismically Unimaged Deformation Features, Invited Keynote Speaker, Geological Society London conference on Small to Subseismic Scale Deformation.
- Naruk, S., 2013, Forward Modeling of Un-imaged Foldbelt Traps, AAPG 2013 Annual Convention and Exhibition, Pittsburg, PA.
- Solum, J.G., Jolley, S.J., Lawson, R., and Naruk, S., 2013, Increasing Interpreter Capability in Structurally Complex Settings, AAPG Hedberg Conference, 3D-Structural Geologic Interpretation: Earth, Mind and Machine, Reno, Nevada.
- Naruk, S.J., Brandenburg, J.P., Solum, J.G. and Wolf, D.E., 2012, Effective Stress Controls on Fault Vertical Conductivity: Learnings for both Carbon Storage and Conventional Hydrocarbon Reservoirs, AAPG 2012 Annual Convention and Exhibition, Long Beach, CA.
- Orlando, O., Lonnee, J., Tcherepanov, E., Prudhomme, M., Sur, S., Costello, M., Jennings, J., Mahood, R. and Naruk, S.J., 2012, AAPG 2012 Annual Convention and Exhibition, Long Beach, CA.
- Brandenburg, J.P., Cardozo, N., Naruk, S., and Wolf, D., 2012, Direct Strain Estimates from Palinspastic Restoration of Compressional Structures: Strengths and Limitations, AAPG 2012 Annual Convention and Exhibition, Long Beach, CA.
- Summers, J., Naruk, S., Thackerey, S., Solum, J.G., and Wolf, D.E., 2012, Integrated Trap Analysis in High Pressure High Temperature Fields; Central North Sea, AAPG 2012 Annual Convention and Exhibition, Long Beach, CA.
- Alpak, F.O., Noirot, J.-C., Barton, M.D. and Naruk, S.J., 2011, Impact of fine-scale turbidite architecture on deepwater reservoir performance, AAPG 2011 Annual Convention and Exhibition, Houston, Tx.
- Noirot, J.C., Alpak, F.O., Barton, M.D., Sylvester, Z., Naruk, S.J., 2011, A generic workflow for incorporating the impact of fine scale turbidite architecture into coarse dynamic models, AAPG 2011 Annual Convention and Exhibition, Houston, Tx.
- Brandenburg, J.P., Alpak, F.O., Naruk, S. and Solum, J., 2011, Optimized Trishear Modeling and Incomplete Seismic Data: Filling the White Space, AAPG 2011 Annual Convention and Exhibition, Houston, Tx.
- Kostenko, O.V., and Naruk, S., 2009, 3-D Geometry and Kinematic Evolution of Deep-Water Toe Thrust Anticlines, AAPG Annual Meeting and Convention, Denver, Co.
- Solum, J.G., Naruk, S., Thompson, J., and Snee, R., 2009, Improving Understanding of Compartmentalization Through Linking Mechanical Stratigraphy to Statistical Predictions of Sub-seismic Faults, AAPG Annual Meeting and Convention, Denver, Co.
- Kostenko, O.V., Naruk, S., Solum, J.G., Mora-Glukstad, M., Brandenburg, J., 2009, Sealing Properties of Thrust Faults, AAPG Annual Meeting and Convention, Denver, Co.
- Onyeagoro, K., Naruk, S., Eikmans, D., van der Vlugt, F., Jolley, S.J., Zijlstra, E., DeKeijzer, M., Kristensen, M., Reemst, P., King, R., 2009, New Fault Permeability and Capillary Entry Pressure Relations for Production History Matching of Matured Fields, AAPG Annual Meeting and Convention, Denver, Co.

- Brandenburg, J., Solum, J.G., Kostenko, O.V., Naruk, S., and Schultz, R.A., 2009, Deformation Band Networks in Mesozoic Eolian Sandstones of the Western United States and Offshore Hydrocarbon Reservoirs, AAPG Annual Meeting and Convention, Denver, Co.
- Onyeagoro, U.O., Van der Vlugt, F.F., and Naruk, S.J., 2006, The Impact of Fault Properties on Reservoir Production Behaviour, AAPG International Conference, Perth, Australia
- Naruk, S. J., Dula, W.F., Busch, J.P., Couzens-Schultz, B.A., Garmezzy, L., Griffiths, H., Gunst, A.M., Hedlund, C.A., McAllister, F., Onyeagoro, U.O., Ozumba, B.M., and Younes, A., 2002, Common Characteristics of Proven Sealing and Leaking Faults, AAPG Hedberg Research Conference, Evaluating the Hydrocarbon Sealing Potential of Faults and Caprocks, AAPG Search and Discovery Article #90009.
- Naruk, S.J., 2000, Fault Seal Evaluation and Prediction, AAPG Annual Meeting and Convention, New Orleans, La.
- Naruk, S.J., 2000, Fault-seal Prediction in the Gulf of Mexico: Empirical Data, in Shoup, R., Watkins, J., Karlo, J., and Hall, D., eds., Integration of Geologic Models for Understanding Risk in the Gulf of Mexico, AAPG Hedberg Conference Proceedings.
- Naruk, S., 1994, Balanced Cross Sections of the Arbuckle-Ardmore Region, Southern Oklahoma: Implications for Interpreting Strike-Slip Deformation, Houston Geological Society Bulletin, Volume 36, No. 5, January 1994.
- Apotria, T.G., and Naruk, S.J., 1993, Stress History and Fracturing of the Bakken Shale in the Williston Basin, AAPG Annual Meeting and Convention, New Orleans, La.
- Naruk, S.J., 1984, A model for detachment fault gold mineralization, Geological Society of America Abstracts with Programs, v. 18, no. 2.