

Timothy A. Cross
 Strategic Stratigraphy, Inc.
 strategicstratigraphy@skybeam.com
tacross@mines.edu

Tim is President of Strategic Stratigraphy, Inc. (1986-present) and Emeritus Professor of Geology at the Colorado School of Mines. He has held positions in both academia and industry, and is a current academician in the Russian Academy of Science. He is a consultant to and advisor in stratigraphy with several petroleum companies. He holds two U.S. patents for stratigraphic inversion.

After a first career in structure/tectonics, his research of the past two decades has pursued his goal of making stratigraphy a more accurate and predictive science. In collaboration with students and colleagues, he developed the discipline of high-resolution genetic stratigraphy and, most recently, the new technology of stratigraphic inversion. Over the years, this research has produced new concepts and systematic methods of stratigraphic analysis and correlation that supply objective, quantitative and more accurate predictions about petrophysical, geometric and volumetric arrangements of sedimentary rocks. His current interests are in using these concepts and methods, along with stratigraphic inversion for: reservoir characterization, rezonation and production augmentation; stratigraphic prediction in exploration; and, as an aid to seismic interpretation.

Formal Education

- Ph.D. (1976) University of Southern California (Geology). Dissertation: "Changing patterns of Cenozoic igneous activity in the western United States: Relation to absolute North American plate motion"
 M.S. (1969) The University of Michigan (Geology). Thesis: "The Mississippian Lake Valley Formation of the Sacramento Mountains, New Mexico: An environmental interpretation"
 B.A. (1967) Oberlin College (Geology). Honors Thesis: "Taxonomy, distribution and ecology of living benthic foraminifera, Barbados"

Professional Experience

- | | |
|-----------------|---|
| 9/86 – present | President, Strategic Stratigraphy, Inc . |
| 9/01 – 10/03 | Senior Scientist, Platte River Associates, Inc. |
| 10/01 – present | Emeritus Professor of Geology, Colorado School of Mines |
| 1/90 – 6/90 | Professeur Invité, Université Louis Pasteur, Strasbourg, France |
| 8/84 – 9/01 | Professor of Geology, Colorado School of Mines |
| 6/83 – 7/84 | Research Associate, EPR Co. |
| 4/81 – 5/83 | Senior Research Specialist, EPR Co. |
| 6/79 – 3/81 | Research Specialist, EPR Co. |
| 6/78 – 6/79 | Associate Professor of Geology, Purdue University |
| 9/75 – 5/78 | Assistant Professor of Geology, University of North Dakota |
| 9/72 – 8/75 | Graduate studies, University of Southern California |
| 1/70 – 8/72 | Exploration Geologist, Texaco, Inc. |
| 5/69 – 1/70 | Development Geologist, Texaco, Inc. |

Professional Interests and Specialization

- SEDIMENTOLOGY:** process-response sedimentology and high-resolution facies analysis of carbonate and siliciclastic sedimentary rocks from all environments; geology of sedimentary rocks associated with petroleum, coal and oil shale.
- BASIN ANALYSIS:** sedimentation and subsidence of rift, intracratonal and foreland basins; origin and development of the foreland fold and thrust belt and basement-involved uplifts of the Rocky Mountains; integration of well log, core, and seismic data for improved understanding of stratal geometries and basin architecture.
- STRATIGRAPHY:** development and application of genetic stratigraphic concepts for stratigraphic prediction; forward and inverse numerical stratigraphic models; stratigraphic prediction for petroleum exploration and

production through stratigraphic inverse modeling; reservoir characterization, zonation and production enhancement; field verification of stratal architecture and facies distributions in sedimentary basins.

Industry Activities and Affiliations (reverse chronological order)

- Stratigraphic analysis and reservoir characterization, several blocks in Llanos basin, Colombia (Hocol)
- Stratigraphic analysis and reservoir characterization, San Francisco field, Colombia (Hocol)
- Stratigraphic analysis and reservoir characterization, Costayaco field, Putumayo basin, Colombia (Gran Tierra)
- Stratigraphic analysis and reservoir characterization, FuYu Formation, Daqing Anticline, China (Daqing Oilfield Company)
- Core and stratigraphic analysis of the Capella oilfield, Colombia (Emerald Energy)
- Stratigraphic analysis, reservoir characterization and stratigraphic inversion, FuYu Formation, Daqing oilfield, China (Daqing Oilfield Company)
- Rezonation of Statfjord Field, North Sea (Statoil)
- Rezonation of Snorre Field, North Sea (Statoil)
- Regional stratigraphic analysis of Oriente basin, Ecuador (Occidental)
- Reservoir characterization of Occidental fields, Oriente basin, Ecuador (Occidental)
- Director of the CSM Geoscience Inversion Consortium
- Developed and applied world's first stratigraphic inverse modeling technology and high-resolution correlation strategies to carbonate strata of the Mission Canyon Fm., Williston Basin, North Dakota (USA)
- Scientific Advisor (Stratigraphy, Sedimentology, Stratigraphic Modeling) for Elf Exploration Production, Pau, France
- Scientific Advisor (Stratigraphy, Sedimentology, Stratigraphic Modeling) for Statoil, Stavanger, Norway
- Developed and applied high-resolution stratigraphic correlation techniques for continental and shallow marine strata at exploration and reservoir scales to Cusiana Field, Llanos Basin, and Middle Magdalena Basin, Colombia (sponsored by Ecopetrol and ICP)
- Established correlations and reservoir zonation for Cusiana field, Llanos basin, Colombia (sponsored by Ecopetrol)
- Developed and applied world's first stratigraphic inverse modeling technology and high-resolution correlation strategies to continental and shallow marine strata of the Brent Group (North Sea) and Mesa Verde Group (San Juan Basin, USA) under the sponsorship of Statoil, Saga, Mobil, Conoco and Elf Exploration Production
- Developed and applied high-resolution stratigraphic correlation techniques for deep-marine strata, Tertiary, North Sea (sponsored by Statoil)
- Developed and applied high-resolution stratigraphic correlation techniques for deep-marine strata, Pennsylvanian, Anadarko Basin, USA (sponsored by Amoco)
- Applied high-resolution stratigraphic correlation techniques in shallow marine tidal strata for reservoir zonation and behind-pipe oil identification of the Carito Field, Venezuela (sponsored by PDVSA)
- Developed correlation strategies for aggrading braided stream strata and applied to the Sincor field, Orinoco heavy oil belt, Venezuela (sponsored by Sincor).

Recent Publications

- Feng Zhi-qiang, Zhang Shun, Cross, Timothy A., Feng Zi-hui, Xie Xi-nong, Zhao Bo, Fu Xiu-li, and Wang Cheng-shan, Lacustrine turbidite channels and fans in the Mesozoic Songliao Basin, China: *Basin Research*, v. 22, p. 96-107.
- Feng Zhi-qiang, Jia Cheng-zao, Xie Xi-nong, Zhang Shun, Feng Zi-hui, and Cross, Timothy A., 2010, Tectonostratigraphic units and stratigraphic sequences of the nonmarine Songliao basin, northeast China: *Basin Research*, v. 22, p. 79-95.
- Kjemperud, A.V., Schomacker, E.R., and Cross, T.A., 2008, Architecture and stratigraphy of alluvial deposits, Morrison Formation (Upper Jurassic), Utah: *American Association of Petroleum Geologists Bulletin*, v. 92, p. 1055-1076.
- Gerhard, L.C., and Cross, T.A., 2005, Measurements of the generation and distribution of carbonate sediments of Buck Island Channel, St. Croix, U.S. virgin Islands, with observations about sediments in fringing lagoons: *Atoll Research Bulletin*, no 536, p. 157-176.
- Gardner, M.H., Cross, T.A., and Levorsen, M., 2004, Stacking Patterns, Sediment Volume Partitioning, and Facies Differentiation in Shallow-Marine and Coastal-Plain Strata of the Cretaceous Ferron Sandstone, Utah: *AAPG Studies in Geology*, v. 50, p. 5-124.
- Anderson, D.S., and Cross, T.A., 2001, Large-scale cycle architecture in continental strata, Hornelen basin (Devonian), Norway: *Journal of Sedimentary Research*, v. 71, p. 255-271.
- Horn, B.W., Cross, T.A., Hornbeck, J.A., Vielma, M., and Zavala, M., 2001, Stratigraphic controls on reservoir strata: A comparison of fluvial and tidal reservoirs in the Almond Formation, Coal Gulch, Wamsutter, Echo Springs and Table rock fields, Washakie Basin, Wyoming: *Wyoming Geological Association Guidebook*, 52nd Field Conference, p. 149-161.
- Cross, T.A., 2000, Stratigraphic controls on reservoir attributes in continental strata: *Earth Science Frontiers*, v. 7, p. 322-350.
- Cross, T.A., and Lessenger, M.A., 1999, Construction and application of a stratigraphic inverse model, in J.W. Harbaugh, W.L. Watney, E.C. Rankey, R. Slingerland, R.H. Goldstein, and E.K. Franseen, eds, *Numerical Experiments in Stratigraphy: Recent Advances in Stratigraphic and Sedimentologic Computer Simulations*: SEPM Special Publication 62, p. 69-83.
- Cross, T.A., and Lessenger, M.A., 1998, Sediment volume partitioning: rationale for stratigraphic model evaluation and high-resolution stratigraphic correlation, in F.M. Gradstein, K.O. Sandvik, and N.J. Milton, eds., *Sequence Stratigraphy Concepts and Applications*: Norwegian Petroleum Society Special Publication 8, p. 171-195.
- Cross, T.A., and Homewood, P.W., 1997, Amant Gressly's Role in Founding Modern Stratigraphy: *Geological Society of America Bulletin*, v. 109, p. 1617-1630.
- Cross, T.A., and Lessenger, M.A., 1997, Correlation strategies for clastic wedges, in E.B. Coalson, J.C. Osmond, and E.T. Williams, eds., *Innovative Applications of Petroleum Technology in the Rocky Mountain Area*: Rocky Mountain Association of Geologists, Denver, p. 183-203.
- Deng Hongwen, Wang Hongliang, and Cross, T.A., 1997, Application of high-resolution stratigraphic correlation approaches to fluvial reservoirs: *Proceedings of the 30th International Geological Congress*, v. 11, p. 55-59.
- Ramon, J.C., and Cross, T.A., 1997, Characterization and prediction of reservoir architecture and petrophysical properties in fluvial channel sandstones, Middle Magdalena Basin, Colombia: *Ciencia, Tecnologia y Futuro*, v. 1, no. 3, p. 19-46.
- Lessenger, M.A., and Cross, T.A., 1996, An inverse stratigraphic simulation model—Is stratigraphic inversion possible?: *Energy Exploration & Exploitation*, v. 14, no. 6, p. 627-637.
- Cross, T.A., 1994, Applications of high-resolution sequence stratigraphy to reservoir analysis: *The Interstate Oil and Gas Compact Commission 1993 Annual Bulletin*, p. 24-39.

- Gardner, M.H., and Cross, T.A., 1994, Middle Cretaceous paleogeography of Utah, *in* M.V. Caputo, J.A. Peterson, and K.J. Franczyk, eds., *Mesozoic Systems of the Rocky Mountain region, USA: Rocky Mountain Section SEPM (Society for Sedimentary Geology)*, Denver, p. 471-502.
- Cross, T.A., 1993, The geosciences in review: *Coal: Geotimes*, v. 38, p. 12.
- Cross, T.A., Baker, M.R., Chapin, M.A., Clark, M.S., Gardner, M.H., Hanson, M.S., Lessenger, M.A., Little, L.D., McDonough, K.J., Sonnenfeld, M.D., Valasek, D.W., Williams, M.R., and Witter, D.N., 1993, Applications of high-resolution sequence stratigraphy to reservoir analysis, *in* R. Eschard, and B. Doligez, eds., *Subsurface Reservoir Characterization from Outcrop Observations: Proceedings of the 7th IFP Exploration and Production Research Conference: Paris, Technip*, p. 11-33.
- Gardner, M.H., and Cross, T.A., 1993, Incorporating depositional and preservational process systems in reservoir characterization: Examples from the Upper Cretaceous Ferron Sandstone, Utah, USA, *in* R. Eschard, and B. Doligez, eds., *Subsurface Reservoir Characterization from Outcrop Observations: Proceedings of the 7th IFP Exploration and Production Research Conference: Paris, Technip*.
- Sonnenfeld, M.D., and Cross, T.A., 1993, Volumetric partitioning and facies differentiation within the Permian Upper San Andres Formation of Last Chance Canyon, Guadalupe Mountains, New Mexico, *in* R.G. Loucks and J.F. Sarg, eds., *Recent advances and applications of carbonate sequence stratigraphy: American Association of Petroleum Geologists Memoir 57*, p. 435-474.

Books and Book Contributions

- Cross, T.A., 2002, *Genetic Stratigraphy*: Geological Publishing House, PRC, 253 p. (in Chinese).
- Cross, T.A., Dodge, R.L., Howard, J.C., and Siraki, E.S., 1995, *Basin Analysis*: IHRDC, Boston, 210 p.
- Cross, T.A., 1993, Foreword to *Subsurface Reservoir Characterization from Outcrop Observations: Proceedings of the 7th IFP Exploration and Production Research Conference: Paris, Technip*, p. v-x.
- Cross, T.A., and Reynolds, R.G., 1993, *Illustration of Correlation Techniques, Facies Prediction and Reservoir Compartment Identification through Genetic Stratigraphy—Gallup Sandstone and Mesa Verde Group (Cretaceous), Four-Corners Region, USA: Rocky Mountain Association of Geologists 1993 Fall Field Trip*, 45 p.
- Cross, T.A., 1993, *Applications of High-Resolution Sequence Stratigraphy in Petroleum Exploration and Production—Short Course Notes: Canadian Society of Petroleum Geologists, Calgary, Alberta, August 15, 1993*, 290 p.
- Cross, T. A., 1990, ed., *Quantitative Dynamic Stratigraphy*: New Jersey, Prentice Hall, 622 p.

Patents

- Cross, T.A., and Lessenger, M.A., 2001, Method for predicting stratigraphy: U.S. Patent **6,246,963**
- Cross, T.A., and Lessenger, M.A., 2004, Method of predicting three-dimensional stratigraphy using inverse optimization techniques: U.S. Patent **6,754,588**

Professional Service

- Editor-in-Chief, *Contributions to Sedimentary Geology* (1997-2006)
- Associate editor, *Journal of Sedimentary Research* (1992-1998)
- Associate editor, *Sedimentary Geology* (1988-current)
- Associate editor, *Geological Society of America Bulletin* (1995-1999)
- Associate editor, *Bulletin of Canadian Petroleum Geology* (1993-1996)
- Associate editor, *Geological Society of America Bulletin* (1992-1995)
- Associate editor, *Basin Research* (1990-1995)
- Associate editor, *Sedimentology* (1986 - 6/91)

Professional Society Affiliations

American Association of Petroleum Geologists
Geological Society of America (Fellow)
International Association of Sedimentologists
Rocky Mountain Association of Geologists
Society of Economic Paleontologists and Mineralogists
Coal Geology Division, Geological Society of America
Sedimentology Division, Geological Society of America