



# CSPG

Canada's Energy Geoscientists

cspg.org

Basin Analysis & Sequence Stratigraphy Technical Division

## **Cyclical and Non-Cyclical Stratigraphy in Early Rift-Basin and Foreland Lakes**

Presenter: Dr. Jennifer Jane Scott, Associate Professor at Mount Royal University

Location: CSPG Classroom, +15 level, 540- 5<sup>th</sup> Avenue SW, Calgary, Alberta

Date: Tuesday October 11<sup>th</sup> 2022

Time: 12:00-1:00pm (MST)

*This talk will also be available online*

### ABSTRACT

Lake-basin stratigraphy records the evidence needed to reconstruct the history of basin development, climate influence on sediment supply and regressive-transgressive events, and to recognize and predict the positions of potential reservoirs and organic source rocks. Lakes in general are more distinctly influenced by cyclical climate change on scales of 10s to 100s of years than marine basins, which affects the distribution of coarser-grained reservoir-scale deposits (~10–30 m thicknesses) as well as intercalated organic-rich mudstones from deep-lake settings. Recognition of the cyclical climate-influenced stratigraphic record can help to differentiate longer-term basin-scale non-cyclical changes that lead to variable chemical conditions (i.e., pH, salinity) — and variable organic sources and authigenic sediments — through thicker packages.

This presentation will explore outcrop and sub-surface examples from Pliocene-Pleistocene rift lakes in East Africa (Kenya, Ethiopia) and Cretaceous and Eocene foreland-basin lakes in North America (Wyoming, Alberta) to demonstrate the cyclical and non-cyclical nature of the lacustrine stratigraphic record. In highlighting the key lines of evidence needed to help reconstruct the evolution of each lake basin, sedimentology, trace fossils, mineralogy, XRF geochemistry, and well-logs are used to recognize the sequence stratigraphic packaging in the examples. This is then applied to the interpretation of the lake-type basin, essential for understanding both the reservoir-scale and basin-scale distribution of deposits, as well as major changes in chemical conditions across “xenconformities”, which affect organic source type (i.e., Type I or Type III kerogen).

Examples from East African rift basins will focus on sedimentology and stratigraphy, integrated with XRF geochemistry, diatom paleoecology, zeolite mineralogy, and a Bayesian age-model from the Pliocene Chemeron Formation, Baringo Basin, Kenya. Multiple long cores retrieved as part of the Hominin Sites and Paleolakes Drilling Project (HSPDP) have been studied in exceptional detail by international teams of researchers; we will also draw on data from Lake Magadi and Olorgesailie, Kenya and Northern Awash, Afar, Ethiopia.

Examples from the Cretaceous foreland basin of Alberta and the Eocene “broken” foreland basin of Wyoming integrate similar datasets and consider outcrop and sub-surface evidence relevant for distinguishing lacustrine strata from other non-marine depositional systems.



# CSPG

Canada's Energy Geoscientists

[cspg.org](http://cspg.org)

## BIOGRAPHY



Since 2001, Jenni Scott has focused her research on the stratigraphy, sedimentology, and ichnology of lake basins in East Africa and North America, as well as other non-marine and marginal marine depositional systems in Alberta (e.g., Belly River Group). Her MSc and PhD research in Kenya (Lake Bogoria and Lake Magadi) and the Green River Formation of Wyoming, with Robin Renaut and Luis Buatois (University of Saskatchewan), led to ongoing involvement with the Hominin Sites and Paleolakes Drilling Project (HSPDP) in several basins of East Africa. Post-doctoral research with Murray Gingras and George Pemberton (University of Alberta) focused on the coastal plain in the badlands of Alberta (Dinosaur Park Formation). Jenni uses stratigraphy, sedimentology, and ichnology integrated with mineralogy, XRF geochemistry, and paleoecology (e.g., diatoms) from outcrop and the sub-surface to interpret tectonic and climatic influences on the stratigraphic record in active rift-basin and foreland-basin successions. Ongoing research includes stratigraphy from core and outcrop in Kenya (Baringo area, Magadi area) and Ethiopia (Afar region) as well as the Cretaceous of Alberta in the badlands and foothills. She is an associate professor in geology at Mount Royal University, and an adjunct professor at Simon Fraser University and the University of Saskatchewan.