

# **‘New Light through Old Windows’: a Geochemical and Petrographic Review of the Upper and Lower Bakken, Southern Saskatchewan**

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*Over the last ten years, the Bakken has received increased attention by industry and government geoscientists alike, particularly the Middle Bakken. This interest is driven, in part, by an increase in production, from 945 bbl per day to over 70,000 bbl per day, largely due to the application of enhanced oil recovery techniques and also driven by optimistic estimates of oil in place (e.g., United States Geological Survey; North Dakota Department of Mineral Resources).*

*Oil from the Middle Bakken, within southern Saskatchewan, has a reported average specific gravity of 0.835 (38 API°), but typically exhibits a wide range of chemical and physical properties, such as pour point and sulphur content. The origin of the oil produced has received varying degrees of analysis and attention due to reported low levels of thermal maturity of organic matter within the Upper and Lower Members of the Bakken within southern Saskatchewan.*

*This presentation will review recent geochemical and petrographic research that has been conducted on the Upper and Lower Bakken at the University of Regina, as part of the Saskatchewan Phanerozoic Fluids and Petroleum Systems project (SPFPS). This is an integrated research approach that describes and characterizes temporal and spatial variations in organic matter beyond that of a simple assessment of source potential or thermal maturity.*

*This presentation will also present the results of an investigative approach that is based upon the high-resolution sampling of drill-core, combining organic petrography and organic geochemistry with that of basin modeling. Furthermore, an open-minded critical evaluation of those techniques and methodologies typically employed to routinely assess source and generative potential will shed new light on the enigmatic Upper and Lower Bakken shales, with far-reaching consequences.*

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**Stephen Bend** is a Professor at the University of Regina, Canada, teaching undergraduate classes in resource geology, petroleum geology and petroleum systems geology, and graduate classes in petroleum geochemistry and basin modeling at the Department of Geology. Prior to entering academia, Stephen worked in industry as a petroleum geochemist and, in the early part of his career, as a field-based petroleum geologist, typically on overseas assignments in South America, Europe, the Middle East, Scandinavia and North America. Over the last 25 years Stephen has developed a long-standing research interest in the Phanerozoic of the Williston Basin; particularly in the complexities of the numerous petroleum systems of the Williston Basin and various aspects of coal characterization and utilization. Current and recent research projects include the Saskatchewan Phanerozoic Fluids and Petroleum Systems Assessment project, the evaluation of the CO<sub>2</sub> sequestration potential of Saskatchewan coals, coal oxidation, hydrocarbon source potential of the Cambrian and Lower Ordovician within the Williston Basin, ‘unconventional hydrocarbon plays’ (e.g., Bakken and Souris Formations), Lower Palaeozoic oil families within the Williston Basin and the artificial (laboratory) maturation of source rocks.

Stephen earned his PhD and MSc at the University of Newcastle upon Tyne (UK) from the Department of Physical Chemistry (Northern Carbon Research Unit) and the Department of Geology’s Organic Geochemistry Unit respectively. He has served on numerous national and international committees, including The Society for Organic Petrology, The International Committee for Coal Petrology, the United Nations Committee for Europe and the American Association of Petroleum Geologists. He has served as an Expert Witness in Canada for the Crown and in the United States (Amoco Production Co. v Southern Ute Tribe). He is the single author of the American Association of Petroleum Geologists’ ground-breaking first textbook (eTextbook) on Petroleum Geology that is currently used in numerous Colleges and Universities. He is Fellow of the Royal Microscopical Society, a member of the American Association of Petroleum Geologists, The Society for Organic Petrology, the Saskatchewan Geological Society and the Association of Petroleum Engineers and Geoscientists.