

ORGANIC STRATIGRAPHY AND ITS APPLICATIONS WITH EXAMPLES
FROM THE NORTH AMERICAN WESTERN INTERIOR AND ANTARCTICA

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Both insoluble (particulate) and soluble (molecular) sedimentary organic matter carry signatures of physical, chemical, and biological processes. These signatures may reflect (a) primary age-diagnostic, organism-specific, and environmentally-sensitive processes; (b) secondary factors related to mode of transportation, deposition, and preservation; and (c) tertiary agents that indicate post-burial alteration of the organic matter. Application of any or all organic matter data recorded in rocks can be used to solve geologic problems.

Organic stratigraphy may be applied to hydrocarbon exploration. Our example uses both particulate and molecular data to reconstruct the age relations of Cretaceous-Lower Tertiary sediments in Wyoming, to determine the age of thrust fault motion, and to demonstrate constraints on the timing of upward petroleum migration to available trapped reservoirs.

Another perspective helps establish chronostratigraphic frameworks for correlations of global sea-level change. Our example from Antarctic sediments that span the Cretaceous-Tertiary boundary reflects perturbations in relative sea-level and the consequential changes in the distribution of organic particulates from marine and terrestrial regimes. These data can be compared to age-equivalent data from other parts of the world, and test global sea-level change.

Both of these applications demonstrate the versatility of organic matter in solving geologic problems. Data from contemporaneous land plants, freshwater and marine organic-walled micro-organisms provide clues on their lifestyle and subsequent afterlife alteration. Organic stratigraphy represents a long anticipated integration of several paleontological disciplines. It combines aspects of palynology, organic geochemistry, paleobotany, and coal petrography into a coherent science, with an enhanced capability to provide significant applications in the future.