

# State-of-the-Art Oil Field Geobiology: Implications for Exploration and Production

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## Abstract

The enhanced production of unconventional hydrocarbons, the mitigation of biosourcing, and the advancement of carbon capture and storage, now combine to create significant financial and technical challenges to the global oil and gas industry. Emerging and especially promising Geobiology approaches to these issues include utilization of the physical and biogeochemical activity of microorganisms that inhabit deeply buried hydrocarbon reservoirs.

We will evaluate the most recent advances in:

1. extracting microbes from core and subsurface fluids;
2. determining the biodiversity and metabolic activity of the deep microbial biosphere using genome-enabled molecular techniques;
3. determining biogeochemical capabilities from enrichment cultures of subsurface microorganisms;
4. tracking microbe-water-rock-oil interactions in real-time using advanced experimental microfluidics;
5. quantitatively linking reservoir sedimentology, stratigraphy, mineralogy, and burial and migration history with the molecular and biogeochemical microbiology analyses; and
6. establishing a theoretical and practical framework for future field-scale strategies.