

Biogeochemical reactions driven by organic matter

MARKUS KLEBER

Oregon State University

Presenting Author: markus.kleber@oregonstate.edu

Biogeochemical reactions occur in aqueous systems containing mineral and organic phases. The latter include living organisms, their metabolites as well as inanimate floral and faunal residue. Early attempts to conceptualise the organic phase struggled with this complexity and have now yielded to more dynamic views, such as the famous definition by John Hedges, who called organic matter “a **thermodynamic anomaly** atop a free energy precipice that drops off on all sides to dispersed, stable ingredients such as carbon dioxide, water, nitrate and phosphate”. Emphasizing the role of organic matter as a source of both energy and nutrients for the -mostly prokaryotic-inhabitants of the subsurface helps us delineate pathways for reactions that may occur in the highly compartmentalised matrix provided by the mineral phase. We find that minerals may serve as adsorbents, reactants and as catalysts as they interact with organic matter, requiring those in pursuit of mechanistic understanding to be poised for unexpected insights as they explore the inner workings of the subsurface bioreactor.