Marine sediments are of crucial importance to the redox balance and climate of our planet but the regulating role of the deep biosphere remains of the great puzzles in biogeochemistry. The unique and diverse sedimentary archaea with no cultured representatives, so-°©-called *benthic archaea*, are key to understanding this system. Recent molecular work based on membrane lipids and DNA suggests that *benthic archaea* comprise a sizeable, if not dominant, fraction of the live biomass in marine sediments, possibly due to their unique capability to cope with conditions of extreme energy stress. Archaea are increasingly recognized as globally abundant organisms that mediate are important processes in the global carbon cycle. For example, only Archaea are capable of methanogenesis, a process of crucial environmental significance in modern and ancient environments. Archaea likewise play a key role in the consumption of methane under anaerobic conditions and thus have been involved in the regulation of this powerful greenhouse gas over geologic time. Recent work suggests that *benthic archaea* in the deep subseafloor biosphere are largely heterotrophic, i.e., they are probably involved in the slow degradation of up to many tens of millions of years old organic matter in the sediments. The details on how *benthic archaea* utilize the highly refractory organic matter and which fraction thereof need to be explored and are relevant to our understanding of the deep biosphere in the carbon cycle and possibly to biotechnology. The lecture will review recent evidence on the distribution of *benthic archaea* in marine sediments, highlight their potential relevance in the carbon cycle, and discusses their impact on widely applied lipid proxies for the reconstruction of paleo sea-surface temperatures.