

Subsurface microbiology: the life below our feet

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Just as in the classic novel of Jules Verne *A Journey to the Centre of the Earth*, mankind currently experiences an increasing urge to venture into the subsurface. Mostly not in the true sense, but intellectually, in sampling and exploitation campaigns. This directly relates to an increased awareness of the importance of subsurface systems, or a need of the resources and services it provides us with. Fossil and geothermal energy, mineral and metal deposits, possible systems to dispose CO₂ or nuclear waste, and certainly not least, clean drinking water, are just a few to be named here. Therefore, scientific and societal interest in the subsurface is currently reaching an unprecedented intensity.

As an ecosystem and habitat, the subsurface is distinct from most other systems. Although not completely devoid of larger organisms, the subsurface can be considered as a biome truly governed by microorganisms. For the understanding of important processes in the subsurface, an in-depth microbiological understanding of this realm is clearly essential.

Motivated by fundamental scientific curiosity, rising societal demand, and unparalleled recent technological advances, the 8th International Symposium of Subsurface Microbiology (ISSM 2011) was held on 11–16 September 2011 in Garmisch-Partenkirchen, Germany. It was chaired by Rainer U. Meckenstock and organised by the Institute of Groundwater Ecology of the Helmholtz Zentrum München, on behalf of the International Society of Subsurface Microbiology (www.issm.org). The congress brought together over 200 subsurface scientist and students of interdisciplinary expertise, and was supported in part by FEMS and the VAAM (German Association for General and Applied Microbiology).

This thematic issue of *FEMS Microbiology Ecology* brings to you a selection of the most interesting and challenging topics of research presented or discussed at the ISSM in Garmisch, supplemented with other articles on subsurface microbiology. Our journey to the subsurface opens with a comprehensive MiniReview of acidophilic microorganisms and their activities in underground mines. The diverse range of subsurface systems addressed in the research

papers that follow include caves and karst, pristine and polluted aquifers, the deep terrestrial subsurface, mines, gas and coal formations, waste deposition sites, shallow and deep marine sediments, as well as methane hydrate deposits. Processes and microbiological issues tackled cover the oxidation of methane and ammonia, chemolithoautotrophy, mineral weathering, anaerobic respiration, fermentation and methanogenesis, anaerobic degradation of aromatic compounds, radionucleotide reduction, bioremediation, and even fracking. Several exciting methodological innovations are also presented, including enhanced methods to study subsurface bacterial transport, to detect microbial biomass in oligotrophic mineral samples, and to analyse microbial community structure and function using next-generation microarrays, pyrosequencing, or protein-based stable isotope probing.

We invite the readers of *FEMS Microbiology Ecology* to embark with us on this venture into the subsurface, and thank all authors and reviewers that have contributed to this thematic issue. Information on the next ISSM to be held in 2013 in the San Francisco Bay area will be announced via the web in due course.

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