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Geobiology looks ahead

Geobiology, the study of interactions between living organisms and the solid Earth, is characterized by fluid scientific borders allowing flexibility to ask questions unfettered by disciplinary boundaries. In collaboration with *Communications Biology, Communications Earth and Environment, and Scientific Reports, Nature Communications* has launched a collection focused on advances made in the field of geobiology.

Geobiology is a relatively new field that bridges disciplinary divides and brings together strong teams with innovative combinations of tools, methods, and experiments that take place in the field, lab, and computer. Propelled forward within the last decade by programs such as the Deep Carbon Observatory (DCO) and the Center for Dark Energy Biosphere Investigations (C-DEBI), the field of geobiology has come into its own. These programs fostered the development of breakthrough technologies to provide windows into the vast subsurface microbial world, the limits of which remain largely unknown[1,2].

These programs also seized on steeply declining molecular sequencing costs and growing accessibility of omics techniques in the last decade, such as metagenomics, transcriptomics, and proteomics. By partnering with software developers, bioinformaticians, and data scientists, geobiologists routinely apply state-of-the-art molecular approaches alongside geochemical techniques. Such interdisciplinary collaborations allow researchers to undertake uncommon studies into the global nature and distribution of microbial life in some of the world's most inhospitable habitats, such as hot springs, hypersaline lakes, and hydrothermal vents. Pairing molecular data with geochemistry has allowed geobiologists to examine the chemical evolution of Earth's mantle[3], untangle the complex co-evolution of atmospheric chemistry, carbon metabolisms, metalloenzymes throughout geological time[4,5], and reconstruct the genomes of our potential ancient microbial ancestors[6].

Though now ended, the legacy of these programs lives on in the work that continues, ushered forward by the next generation of geobiologists. In 2019, the NextGen workshop (put on by C-DEBI) advocated for a focus on underexploited biotechnological innovations and synthesizing knowledge across subdisciplines. The Crustal Ocean Biosphere Research Accelerator (COBRA) program is doing so by shedding light on the harm that commercial deep-sea mining may cause in deep-sea ecosystems[7]. Understanding the environmental impacts of commercial exploitation of marine ecosystems is crucial and timely, as such environments and their microbiomes are gaining more attention for their bioprospecting[8–10] and bioremediation[11] potential.

With the launch of this Collection, we invite original research, Perspectives, and Comments that showcase the newest advances in the field of geobiology. Also welcome are Reviews that synthesize the pioneering geobiological efforts that have facilitated the latest endeavors in geobiological research. Authors wishing to submit to this Collection should select the "Next Generation of Geobiology" option upon submission of their manuscript.

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