

SEMINAR

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Hosted by Assoc. Prof Sanjay Swarup

Microbial Life in the Deep Earth Crust beneath the Deccan Traps, India

By **Pinaki Sar**

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The subsurface biosphere, concealed beneath the Earth's terrestrial expanse, represents an enormous, yet, cryptic repository of prokaryotic life. Our study delves into the unexplored continental realm beneath the ~65 Ma old Deccan Traps, India, where recent scientific drilling operations reached the Archean basement (3,000 meters below surface). Massive sequencing of rock-DNA elucidates the microbiome of extreme, oligotrophic crustal provinces, with stratification of microbial assemblages. Major environmental constraints of deep life are defined. Existence and biogeochemical significance of an endemic community, strong interactive roles of poly-extremotrophic Actinobacteria, H₂, CO₂, and CH₄ metabolising organisms are noted. Shotgun metagenomics, followed by selective enrichments identified 'hot acetogenesis' as the major CO₂-assimilation process along with other metabolic attributes. The study extends beyond scientific exploration, illuminating the potential applications of these subsurface microorganisms in astrobiology, industrial biotechnology, and CO₂ valorization. In conclusion, this investigation unveils the intricacies of the deep biosphere beneath the crystalline, hot, Earth crust, providing vital insights into its composition, metabolic pathways, and potential applications, thereby advancing our understanding of subsurface ecosystems.



About the Speaker

Prof Pinaki Sar is an environmental microbiologist investigating environmental microbiomes and their biotechnological potentials using a combination of multi-omics and geo-analytical approaches. He is a professor of Biotechnology at Indian Institute of Technology Kharagpur, Kharagpur, India.

Prof Sar has obtained his Ph D from Banaras Hindu University, Varanasi, India and joined the prestigious Dr K S Krishnan Research Associate program of the Department of Atomic Energy, Govt. of India at Bhabha Atomic Research Centre, Mumbai. He has started his independent academic and scientific career at Birla Institute of Technology and Science, Pilani, India; and subsequently moved to IIT Kharagpur, Department of Biotechnology in the year 2004. He has worked as an international researcher at the Rice University, Houston with the BOYSCAST fellowship from Govt. of India. His current areas of work include Microbial genomics and Metagenomics; Deep Biosphere; Geomicrobiology; Microbial CO₂ capture and utilization; Biodegradation of plastics and bioremediation of landfill wastes.

For more information:

