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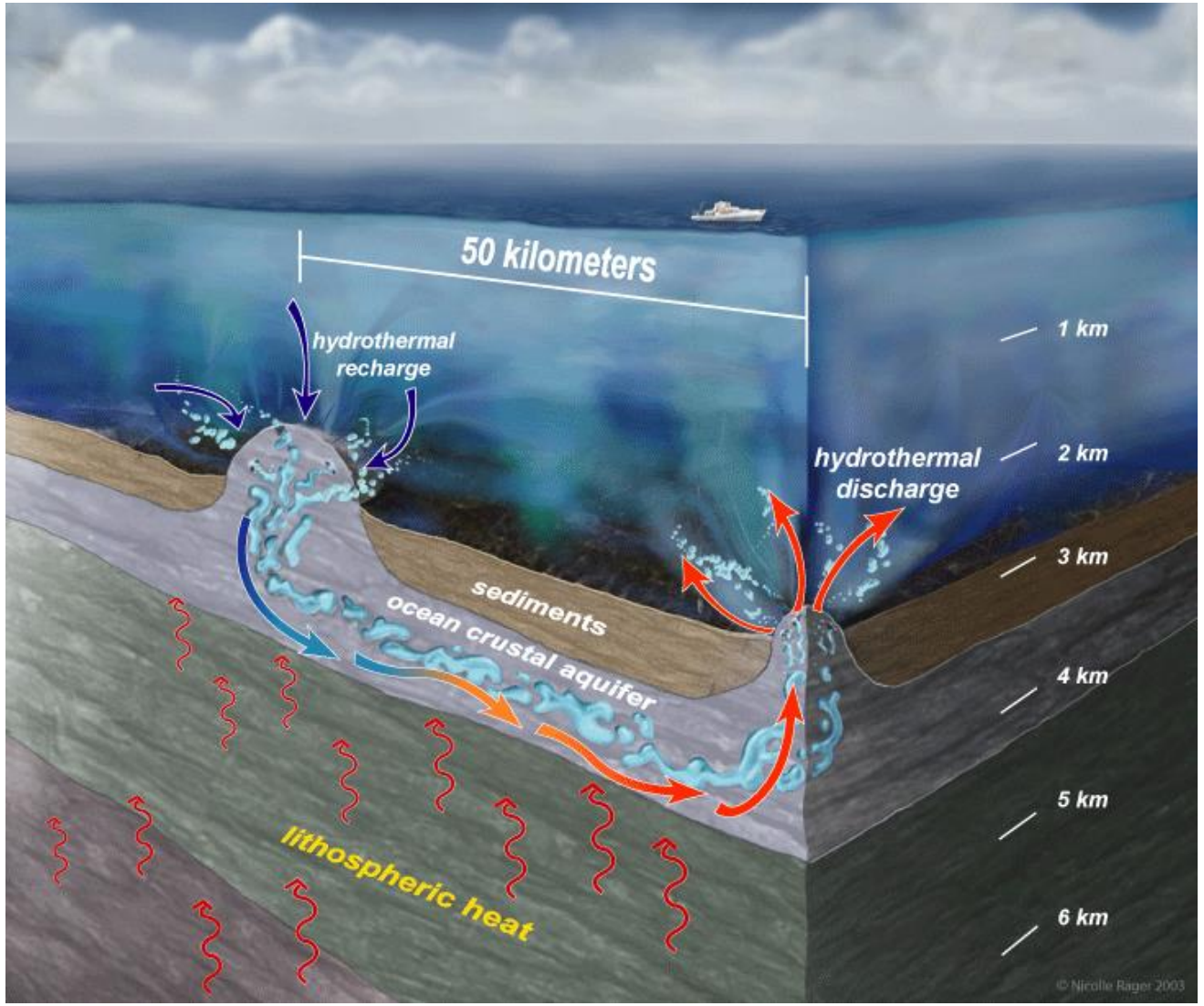
Seawater moves through the subseafloor basement aquifer

Why should the oceanography community care?

- at any one time, ~2% of seawater is moving through volcanic rock exposed at mid-ocean ridges or residing below sediments
- this means that the entire volume of the ocean cycles through subseafloor basement roughly every 200,000 years
- while moving through basement, the seawater is altered by microorganisms and water-rock reactions, having implications for ocean chemistry



Courtesy of Andy Fisher, UCSC

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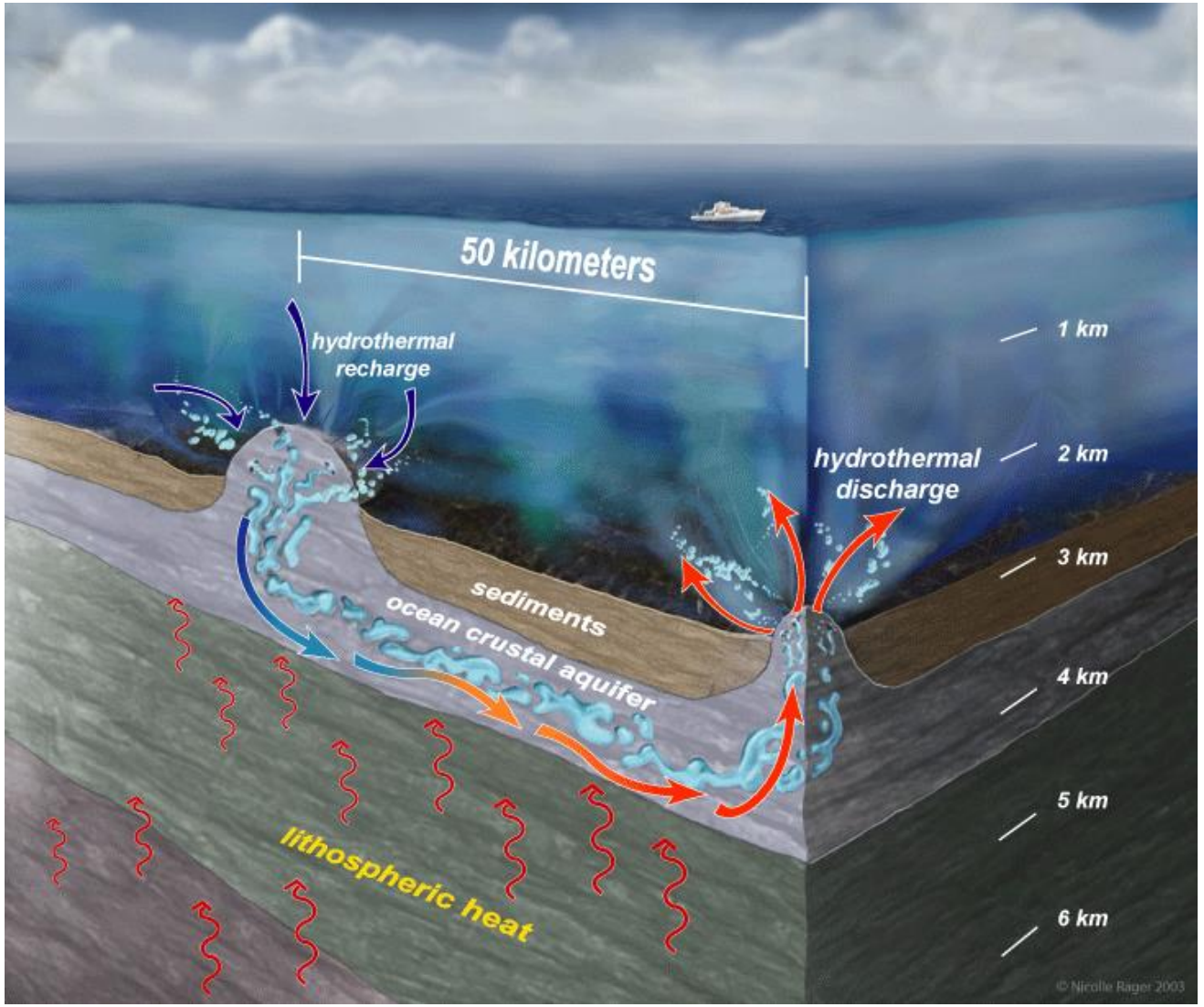
This work addresses the 2015 Decadal Survey of Ocean Sciences objective:

"What is the geophysical, chemical, and biological character of the subseafloor environment and how does it affect global elemental cycles and understanding of the origin and evolution of life?"



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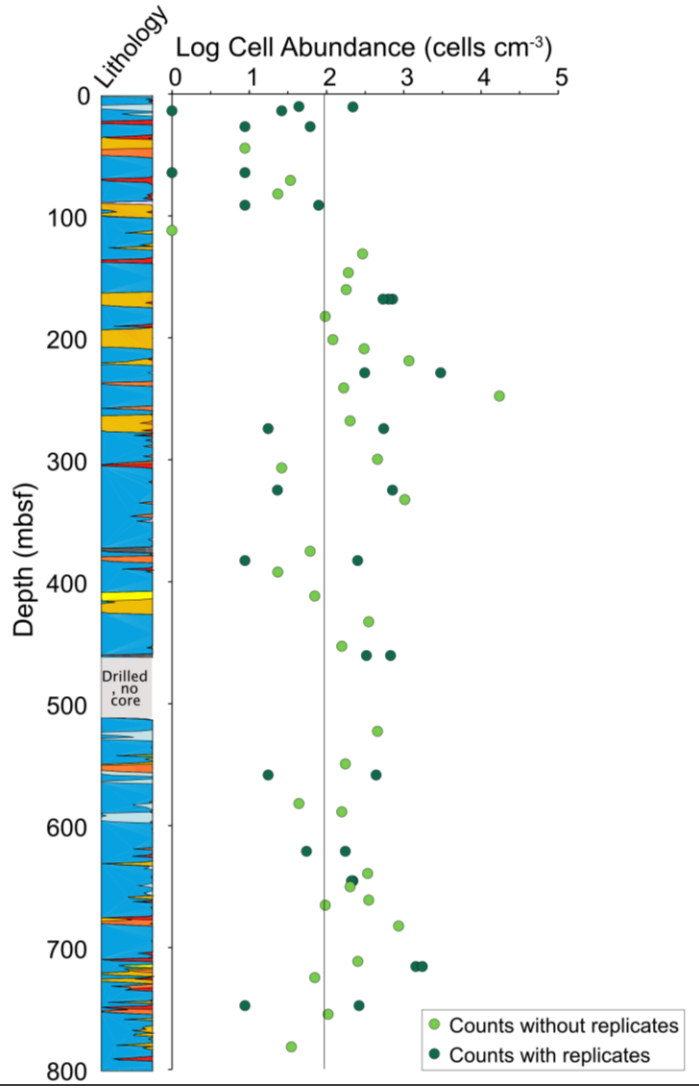
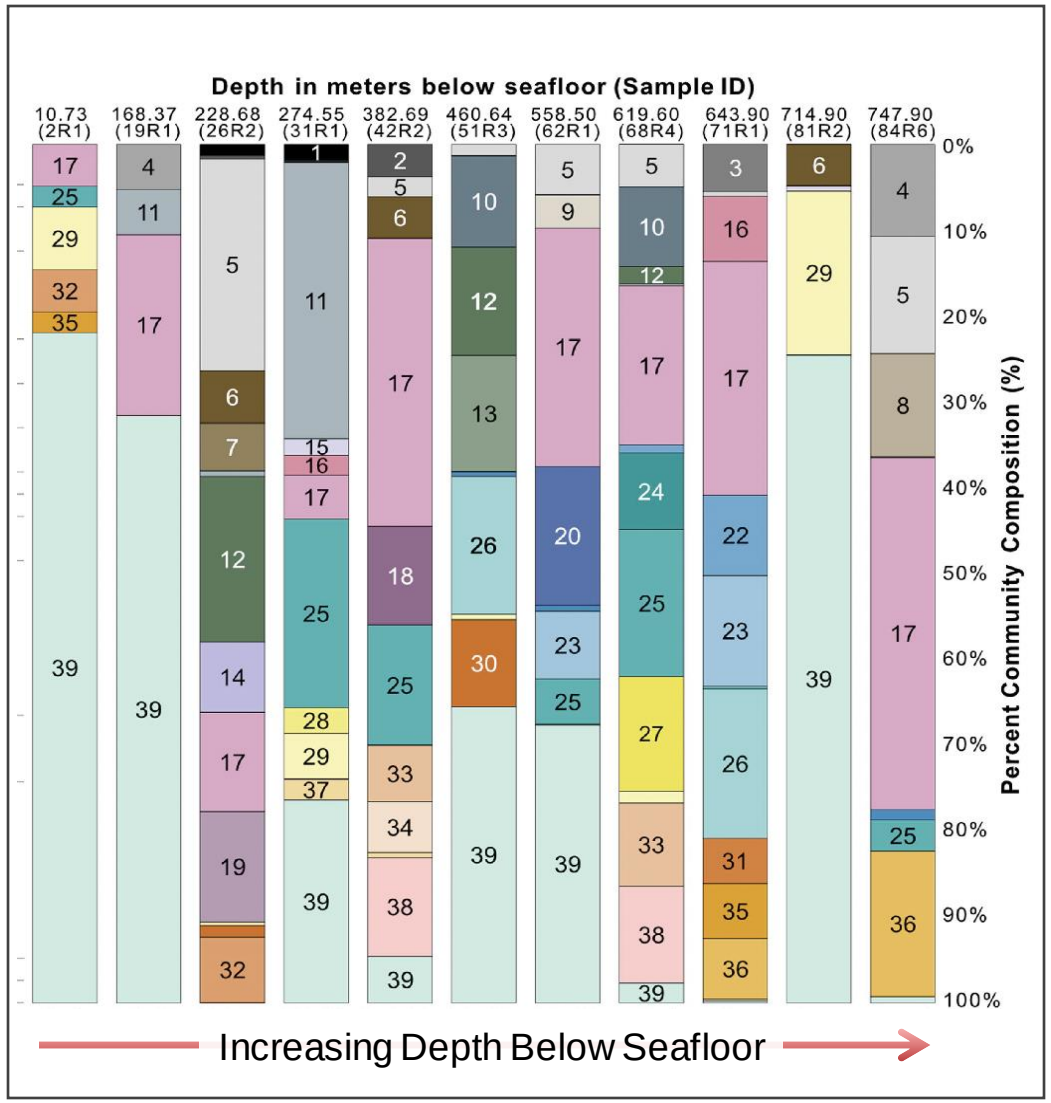
how many microbes are there?



Cell concentration in Hole U1473A to 792 mbsf reveals controls on subseafloor biomass in basement

Wee et al., 2021, *Applied & Environ. Microbiol.*

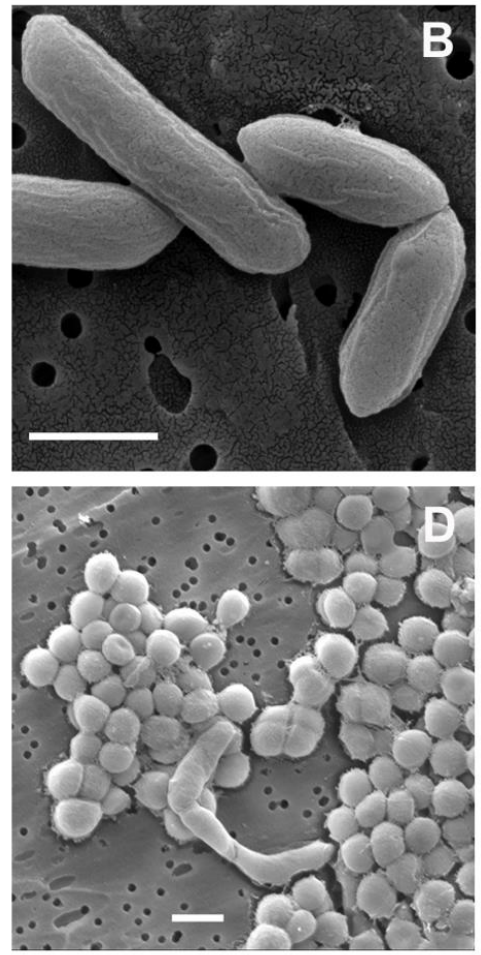
what microbes live in subseafloor basement?



Diversity of Bacteria+Archaea in Hole U1473A from surface to 792 meters below seafloor (mbsf)

Li et al., 2020, *Nature*

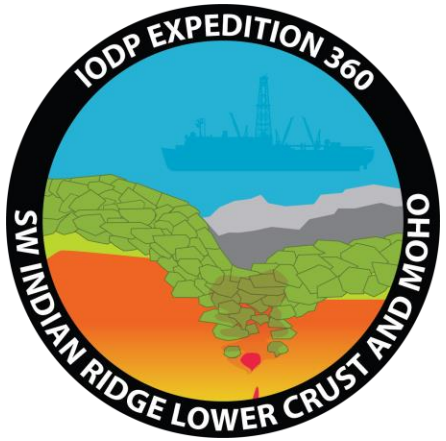
can we isolate new species in the lab?

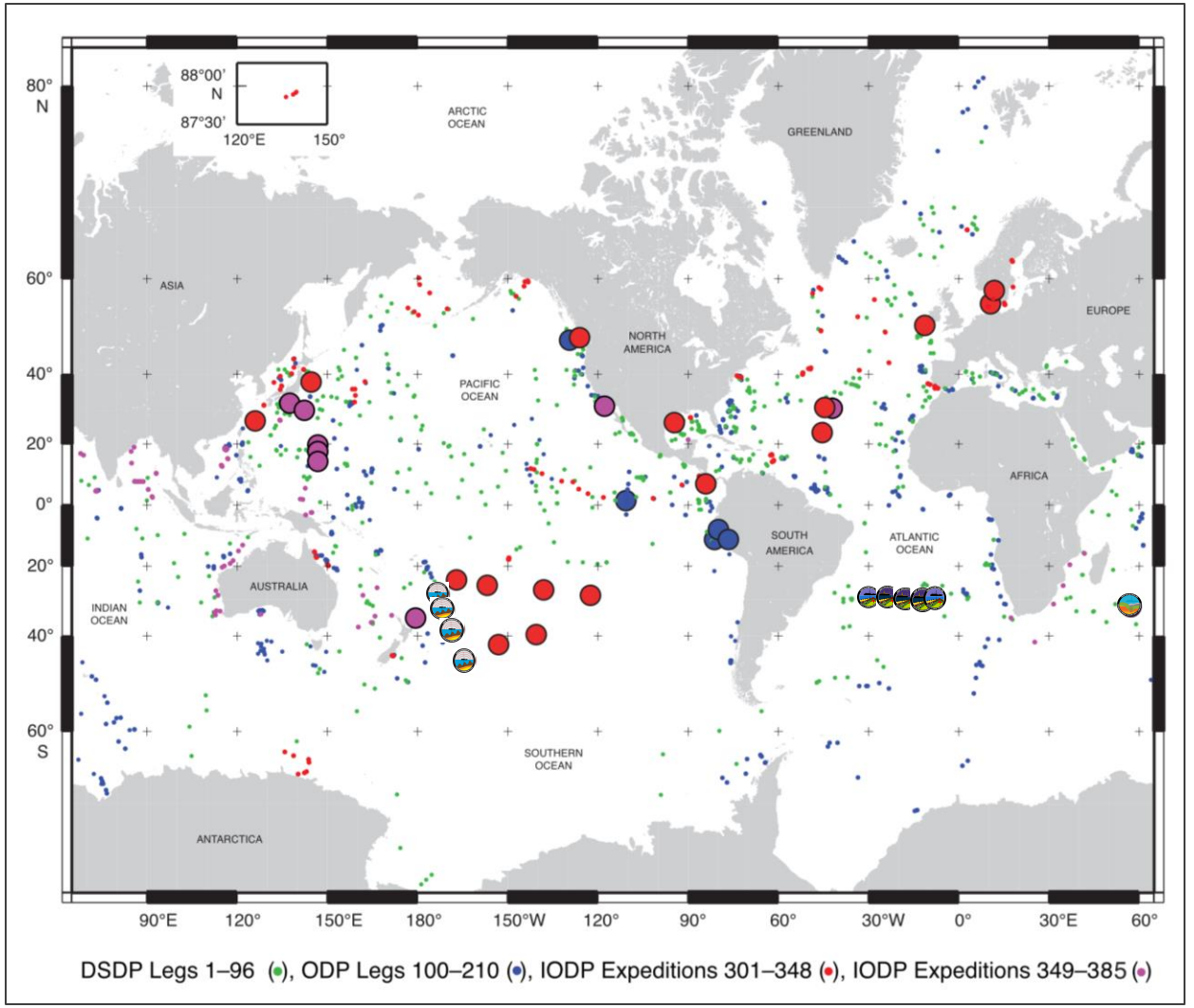


Bacillus rigiliprofundi, isolated from 392 mbsf, was the first bacterium isolated from basement

Sylvan et al., 2015, *IJSEM*

This work requires new scientific ocean drilling





modified from: Coggon, Sylvan et al., 2022, Expedition 390 Preliminary Report