

MONDAY

THE OMAN DRILLING PROJECT

8:00–10:00am V11B Marriott Marquis - Marquis 6
10:20am–12:20pm V12B Marriott Marquis - Marquis 6
1:40–6:00pm V13E Convention Ctr - Hall A-C (Poster Hall)

The Oman Drilling Project is a **collaborative multinational investigation of the Samail Ophiolite**, the world's largest, best-exposed block of oceanic crust and upper mantle. By studying this block, which formed by seafloor spreading at an oceanic spreading ridge, scientists are addressing a diverse range of scientific questions relating to melting and transport of magma in the upper mantle, the formation of igneous oceanic crust, submarine, hydrothermal alteration of the crust near the spreading ridge, geochemical fluxes across the subduction zone beneath the block relevant to the global carbon cycle, and biotic and ongoing abiotic weathering of oceanic lithosphere on land. Over the course of two field seasons in Oman and two summers logging cores on the scientific drilling vessel *Chikyu*, an extensive and multidisciplinary science team has made progress on many fronts. In this daylong session of talks and posters, they will share news of their ongoing analysis of approximately 3 km of pristine cores from Oman.

VERENA HEUER | 11:35am U12A-04 Convention Ctr - 202A

Scientific ocean drilling has led to the astonishing discovery of a deep subseafloor biosphere with microorganisms living in basaltic rocks and nutrient-limited, old, and deeply buried sediments. To date, we have not reached the point at which the subsurface can no longer support life. The factors that ultimately limit deep Earth's habitability remain elusive. In this talk, International Ocean Discovery Program Expedition 370 (T-Limit of the Deep Biosphere off Muroto) co-Chief Scientist Verena Heuer will talk about **past, present, and future challenges of ocean drilling-based investigations into the deep biosphere**.

ROBERT POCKALNY | 8:00am–12:20pm V11E-1305
Convention Ctr - Hall A-C (Poster Hall)

How big is the microbial community living below the seafloor? Previous estimates of the amount of subseafloor life vary by two orders of magnitude, sequestering anywhere from 1.5 – 200 gigatons of carbon. In this presentation, Pockalny and colleagues provide a more comprehensive **estimate of the size of the submarine deep biosphere**. The group of researchers used a modeling approach, which takes into account the age, temperature, and porosity of subseafloor rocks, and suggest a range closer to the lower limits of previous studies.

MARSHALL BOWLES | 8:00am–12:20pm V11E-1306 Convention Ctr - Hall A-C (Poster Hall)

The first step in accurately linking microorganisms and global elemental cycles is to understand how many microbes there are on Earth. Microorganisms influence chemical element forms and movements and therefore must influence global oxygen and carbon cycles. Bowles and colleagues used plate tectonics and modern estimates of how many microbes live in the seafloor to model **the number of microorganisms worldwide** from 230 million years ago to present. The total number of microbes in the seafloor has almost doubled in that time.

TUESDAY

ROBERT HAZEN | 8:30am V21A-03 Marriott Marquis - Liberty I-K

Upon discovery and description, newly discovered minerals are submitted to the International Mineral Association for verification. This process serves to catalog minerals by type, and maintain a record of all discovered minerals on Earth, but lacks crucial information regarding how these minerals formed. Hazen outlines a new method for a complementary mineral database that takes into account mineral chemistry and structure, while incorporating information about formation conditions and timing. Such a database is critical to **mineral evolution and ecology**, nascent fields which investigate the co-evolution of Earth's geosphere and biosphere.

TULLIS ONSTOTT | 2:04pm P23B-03 Convention Ctr - 206

Is there life on Mars? Maybe, beneath the hyperarid, frigid surface, suggest Onstott and colleagues. Years of investigating Earth's continental deep biosphere has led to estimates of the size of this expansive ecosystem, and to a deeper understanding of the kinds of microbes that survive deep underground. By studying the DNA of microbes living in a variety of deep environments, the authors found multiple examples of cells using the energy available in the rocks around them, rather than relying on sunlight and photosynthesis. These metabolisms also are ancient, arising early in the evolution of life on Earth, implying similar **underground life had the time and resources to evolve on Mars** more than 3 billion years ago.

STEVEN D'HONDT | 1:40–6:00pm B23E-2549
Convention Ctr - Hall A-C (Poster Hall)

A key question in the search for life in our solar system is "can non-photosynthetic reactions generate enough energy to support life?" In this presentation, D'Hondt and colleagues argue that slow (roughly 10000 times slower than photosynthesis) **radiolysis can generate enough energy for microbial life to survive**. Radiolysis, the process of radioactive decay in rocks splitting water into hydrogen and oxygen, has been proven to sustain subsurface life beneath Earth's ocean. The same process could realistically support life on watery worlds like Saturn's moon Enceladus, Jupiter's moon Europa, or even beneath the surface of Mars.

EMMA LIU | 1:40–6:00pm V23D-0111
Convention Ctr - Hall A-C (Poster Hall)

Volcanoes constantly spew carbon dioxide and other gases into the atmosphere. Estimates exist for how much volcanoes contribute to atmospheric carbon dioxide levels, but they vary widely and rely on extrapolations and modeling. To obtain a more accurate picture of this piece of the deep carbon cycle, scientists need more direct measurements of degassing from different volcanoes. So, Liu and colleagues **used drones to fly their equipment into the volcano's gaseous plume**. Villarrica volcano in Chile was an ideal volcano to test this pioneering approach, as it continuously releases large amounts of gases from an open lava lake at its summit. Their comparisons of novel drone-based data to that collected through established ground-based techniques provide a nuanced view of degassing at this volcano, with cyclical variations in carbon dioxide degassing in the tens of seconds to minutes time frame.

