**Wonders of the Deep: Microbial ecology and evolution in deep-sea hydrothermal vents**

Deep within our oceans, hydrothermal vents create oases of marine life that are powered by chemical reactions deep below the seafloor. At the base of these ecosystems are microbial communities that are able to create energy from compounds made by these chemical reactions. Some have also argued that these microbial communities, which inhabit environments that have existed since Earth’s beginnings, could provide key insights into the origin and early evolution of life on Earth. Yet we know little about the factors that drive the evolution of hydrothermal vent microbial populations. To examine the drivers of evolution in these habitats, we examined DNA sequence data sampled directly from the microbial and viral communities inhabiting these environments. Through these analyses, we have found that both the physical environment (through geochemistry) and the biological context (through viral infection) have played important roles in molding the evolutionary trajectories of microbial populations in the deep subsurface. Through this work, we hope to gain insight into evolutionary processes in the deep sea, with possible implications for the origin and early evolution of life.