EXPLORATION and DISCOVERY

Curiosity

TESTING IDEAS

Beth Orcutt is a marine microbial biogeochemist. She studies tiny bacteria that live in rocks and sediments deep in the ocean floor. She wants to understand how microbes thrive in deep sea environments and how their lives impact the cycling of elements on Earth.

"MY INSPIRATION IS A LOVE OF CHEMISTRY AND WANTING TO KNOW WHAT LIVES IN THE ROCKS AT THE BOTTOM OF THE OCEAN."

EXPLORATION and DISCOVERY

This particular scientific journey of Beth’s began with a question that other researchers have also been asking...

What lives below the sea floor?

By making water samples and examining them, and then observing the ocean floor, Beth has learned that there are many different types of microbes living below the sea floor in a variety of different environments. Some like hot springs or areas near hydrothermal vents. In these places the chemistry and temperatures vary greatly from conditions that we are used to on Earth. Beth’s scientific mission was to begin to answer these questions that she hopes will provide insight for many more studies.

TECHING IDEAS

Testing ideas begins with the question:

What factors influence where certain microbes live?

Beth’s curiosity led her to develop some ideas. She proposed some thought experiments, such as...

• Some microbes, such as the Gamma-Proteobacteria, thrive in the high pressure environments at these vents. These are the farthest away from any major landmasses. The ocean water has an extremely high pressure near these vents.

• Some microbes, such as members of the Aquificae, are found at shallow hydrothermal vents. These vents are closer to land, and the water pressure is lower than at the deep sea vents.

• Some microbes, such as the Bacteroidetes, are found at deep sea basalt regions. The basalt regions are under a steel-like pressure, but they are much lower pressure than the hydrothermal vents.

What did the data reveal?

Finding patterns in the data is complicated. There is some evidence that suggests...

• Some ideas, such as members of the Aquificae, are found in habitats that are very low in oxygen levels.

• Some ideas, such as the Bacteroidetes, are found in habitats that are very low in temperature.

What these researchers learned is that life in the sea floor is more complicated than expected. Some microbes are adaptable to different environments and can thrive under a variety of conditions. Others tend to stick to one region no matter what the conditions, and still others are cosmopolitan and can be found in a variety of places and conditions!

BENEFITS and OUTCOMES

These data also inspire Beth to come up with some new hypotheses and ideas for new investigations.

These researchers discover that no single hypothesis is completely supported by the evidence, but that...