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17.5 pts.

OCEAN 101 **LAB 8: WASHINGTON'S GEOLOGIC HISTORY**

QUESTION OF THE WEEK:

What lies beneath our feet? Are the rocks we see in the Cascade Mountain Range similar to those in the Olympics? Has Washington always looked the way it does today?

INTRODUCTION:

Deep within the Earth's core heat is released through the radioactive decay of unstable heavy atoms like uranium, providing a constant source of energy. One layer outward from the core, the mantle is composed of molten rock that is subject to convection: a slow overturning process that transfers heat from the core outwards toward the surface. This slow churning within the asthenosphere ("weak sphere", including the upper and lower mantle) pulls and pushes on a relatively thin layer of solidified rock at the Earth's surface, which we call the lithosphere ("rocky sphere") or crust. The effects of this constant forcing from below can be seen today in the motion of tectonic plates (enormous sections of crust which float on the asthenosphere). New oceanic plate material is continuously being formed from cooling mantle magma at mid ocean ridges where tectonic plates diverge, while older denser crust slowly subducts (slides beneath) less dense continental plates to descend and melt in the asthenosphere where its material is recycled. In some cases, two continental plates collide spectacularly to create immense mountain ranges so tall that they can even influence global weather patterns.

The area that makes up the state of Washington did not always look the way it does today. Five hundred million years ago, the eastern half of the state was a shallow sea bounded by low-lying coast. Some of the first organisms representing several of the major aquatic animal groups were seen in the waters just off the coast after the Cambrian explosion (a massive diversification event for the tree of life), and their remains have been preserved in marine sediments in eastern Washington.

Over western Washington, vast sheets of ice over a mile thick once covered much of the landscape. These great moving masses of frozen water were so heavy that they depressed the land beneath them. Over large portions of the northern United States and central Canada, the land is still rebounding (rising up) after having the bulk of the last ice sheet removed thousands of years ago. The land we see today making up our state is in constant transition, and the geologic history of the region is still being written.

READING QUESTION:

(1 pt.) The thickness of the Earth's crust is not uniform; it varies based on the thickness and density of rocky material. Is the crust thicker in the middle of the ocean, or under a mountain range? Why?

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PROCEDURE & OBSERVATIONS – EARLY NATURAL HISTORY:

As you explore the exhibits on Earth's early natural history and the evolution of life, pay close attention to the placards that describe tectonic processes. The state of Washington did not always resemble what we see today, and actually has a wildly colorful geologic history. For this portion of the lab, you'll be able to see some of the most successful large organisms that have ever lived on our planet. Some may seem strangely familiar, while others will appear to have come from a truly alien world.

1) All of modern Washington State belongs to the North American Plate (North American Continent), but this has not always been the case. Briefly describe the series of major tectonic events that helped to form our state starting with the breakup of Pangaea around 500 million years ago.

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2) Throughout this exhibit, you will see many displays showing the fossilized remains of ancient sea and land creatures that may once have inhabited the terrestrial and aquatic environments of early Washington. In the tables below, describe some of the unique fauna that inhabited the land and sea before the Mesozoic mass extinction, and some that evolved afterwards (list **at least two** from each period). Do some of these animals look familiar to you?

Before the Mesozoic mass extinction:

Organism	Major characteristics (Benthic, hard shell, vertebrate)	Unique adaptation (Feeding appendage, defense mechanism…)	Resemblance (Does this animal look like any modern fauna?)
Triceratops	Large, herbivorous, terrestrial, vertebrate	Armored skull, three long horns (up to a meter in length) for defense	Rhinoceros, although they are not at all related.

After the Mesozoic mass extinction:

Organism	Major characteristics (Benthic, hard shell, vertebrate)	Unique adaptation (Feeding appendage, defense mechanism…)	Resemblance (Does this animal look like any modern fauna?)