Olympic

Olympic National Park

Geology of the Olympic Peninsula

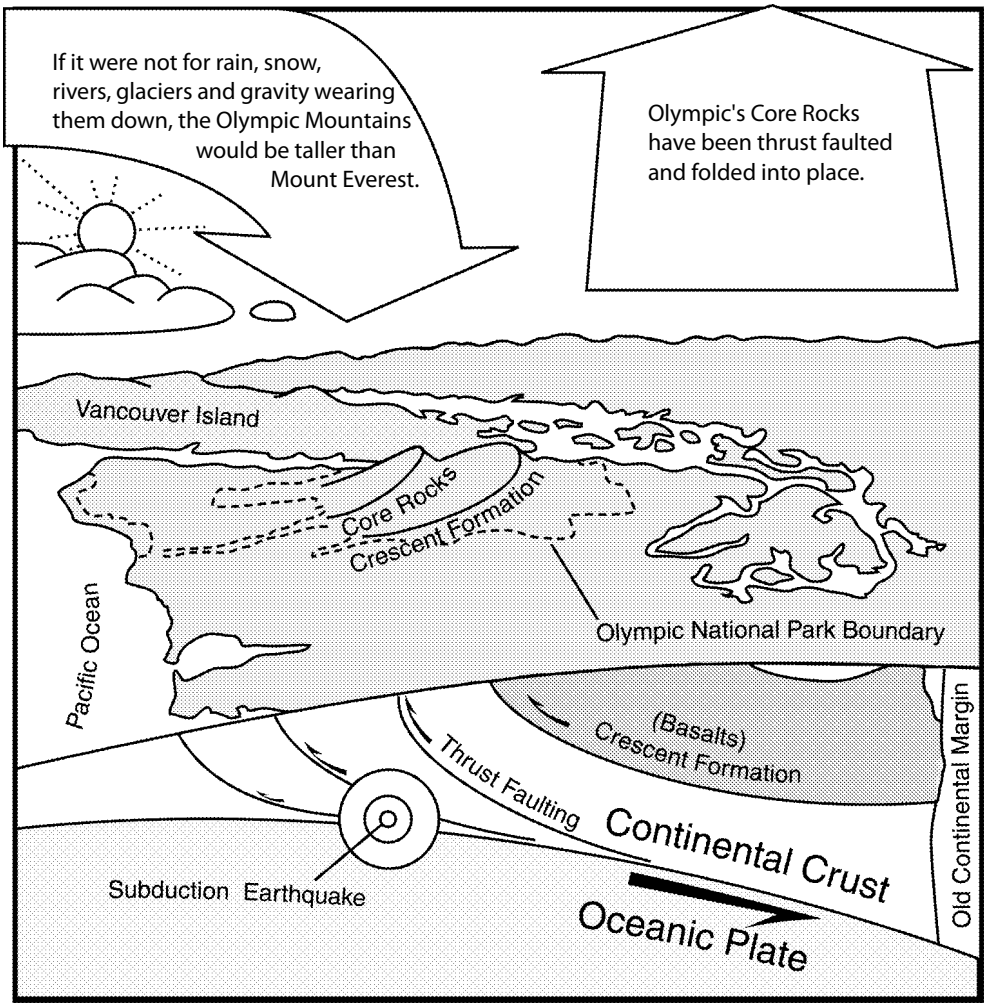
Three Stones, One Story

Examining the Ages of Olympic

Sitting on the cobbly bank of the Elwha River, I drink from my water bottle. The water teems with untold stories of its journey through the Olympic Mountains. The sip of water that soothes my hike-weary body has also smoothed countless river rocks and carved away at mountains that tower over 7,000 feet above sea level. Rain, snow, rivers, and glaciers––water in its many forms is the master sculptor.

Water would have no rock to sculpt, if it were not for this land's incessant push toward the sky. Driven by tectonic forces as one of Earth's crustal plates moves toward and dives beneath the continent, Olympic rocks began thrust faulting and folding upward about 45 million years ago. They continue to rise at about the same rate as water tears them down (about 0.04" or 1 mm per year). So though its foundation is rising, 7,980-foot Mount Olympus, the highest peak in the Olympic Mountains, is not getting any taller.

Below me, in the clear waters of the Elwha, I see three river rocks: one blackish; another, grey sandstone; the third, an oddity, white with large crystalline speckles. Let's examine each rock and search for 55 million years of Olympic Mountains history.



Igneous Rocks *Undersea Volcanism*

I follow the trail of blackish rocks upriver like a salmon in search of its home. After passing river bends and countless fallen logs, I find remnants of an ancient landslide where basalt rocks once blocked the river. After a three-hour climb to the ridgetop, I find myself near Hurricane Ridge looking from peak to peak along the curve of the Crescent Formation. With a few exceptions, these are the oldest rocks in the Olympics, dating to over 55 million years ago. During that time, lava poured from the seafloor in various forms, including "pillows," creating a series of basalt flows as much as 12 miles deep that stretch from Coos Bay, Oregon north to Victoria (on Canada's Vancouver Island), and from the coast east to Seattle. These Crescent Formation basalts form a horseshoe-shaped series of ridges and peaks along the northern, eastern, and southern margins of the Olympics. The story of how these ocean basalts became mountains continues with the next rock I examined.

The Core Rocks

Sandstones, Mudstones, Conglomerates and Shales

Again, I travel up the Elwha, this time for three days, searching for the home of the grey sandstone. This rock might feel at home in many places: Mount Carrie, Dodger Point, Mount Seattle. Geologists tell us that the grey sandstones in the Olympic Mountains originated as turbidites––underwater landslide deposits that flow many miles offshore. These flows, which may be triggered by subduction earthquakes, still occur today, though they are hidden under hundreds of feet of water. Such undersea avalanches, called turbidity flows, spread mud, sand, and gravel onto the deep ocean floor. After years of compression and cementation they become sedimentary rocks: shales, sandstones and conglomerates. Further pressure creates slate. As the ocean plate subducts to the east beneath the continental plate, the sedimentary rocks are continually being scraped off. The sedimentary rocks are wedged under older Olympic Mountain rocks, forming the core of the central Olympics.

Where the oceanic crust meets continental crust, north and eastward movement also causes buckling and folding, pushing the combined basaltic and sedimentary rocks of the Olympics upward. Rocks laid down on the ocean floor now stand vertically!

Erratics

Clues to Continental Glaciation

In all my travels through Olympic's interior, I have never seen a mountain composed of the third light-colored rock in my hand. To show you its home, we must travel far up Canada's Fraser Valley. This chunk of granite was carried here over 13,000 years ago by an ice sheet thousands of feet thick. The ice scoured the northern and eastern edges of the Olympic Mountains, filling what is now the Strait of Juan de Fuca and damming many river valleys, including the Elwha. Behind the ice dam, ancient Lake Elwha and other valley lakes backed up thousands of feet deep. Icebergs carrying granitic rocks calved off into the lakes and sailed to the farthest shores. As the icebergs melted, these exotic rocks, called erratics, were deposited on mountain slopes. Now that the ice has receded and the ancient lake drained, the Elwha River sometimes carries these transplanted rocks downstream for you to examine today.

These three rock types are the most commonly found, but there are others and the story continues as geologists explore and debate the complex geologic history of the Olympics.