Northwest Geologic History
Chris Mare – Geology 101 – Autumn 1998

This is a scientific report of the geologic history of the Frosty Creek drainage of the Aeneas Valley in Okanogan County, Washington.

This land originated in the Pacific Ocean somewhere as part of the drifting Okanogan subcontinent. Approximately 100 million years ago, the Okanogan subcontinent accreted onto the larger North American continent. Scientists are not certain whether North America rammed into the Okanogan or if the Okanogan rammed into North America; most probably they were both on the move and collided with one another.

Twenty to forty million years later, another subcontinent rammed into the, then, Okanogan coastline. As this new land mass was being assimilated, a new subduction zone formed and an arc of volcanic activity was created along the Okanogan highlands. Indeed, there is a large volcanic body north of the Aeneas Valley composed chiefly of lava of intermediate composition. This is part of a larger mass that extends into the adjoining quadrangle that is called the Klondike Mountain Formation. Included with the Formation are sedimentary rocks that underlie the volcanic rocks at two localities: southeast of Wauconda Summit and northwest of Aeneas, essentially rimming the Frosty Creek watershed. In fact, some of the best exposures to this sedimentary rock can be found along the road that climbs the gully carved by Frosty Creek. The rocks there consist of light brown, thin-bedded sandstone and olive to dark gray, thin-bedded siltstone and shale. These sediments were part of a massive flood plain that existed for millions of years before uplifting in the west with the associated volcanic activity.

As part of this uplifting and consequent weathering, several large metamorphic land masses ring the head of the Aeneas Valley: the Mount Bonaparte pluton to the northwest, the Moses Mountain pluton to the south, the Wauconda Summit pluton to the northeast, and the Okanogan Gneiss Dome to the southwest. Of these, the Wauconda Summit pluton is drained directly by Frosty Creek. This pluton of medium- to coarse-grained, porphyritic hornblende-granodiorite and quartz monzodiorite underlies about 15 square miles and adjoins the Klondike Mountain Formation to the north. Rocks of this pluton are distinguished from those of the two adjacent plutons by coarser grain size, a higher color index, and the presence of hornblende; subhedral, K-feldspar megacrysts are also common.

Glacial advances helped to further expose the plutons and shape the surrounding valleys. Toward the lower end of the Aeneas Valley and out into the Okanogan Valley, large, sandy, plateau-like berms can be seen as evidence of massive glacial outwash. These berms reveal a waterline 100-150 feet above the current waterline in some places. Further up in the highlands, around Frosty Creek, rifts of various sizes and shapes can be seen, especially on

grassy, southern-facing slopes. This part of the state has been heavily influenced and marked by glaciation.

The Frosty Creek watershed of the Aeneas Valley in Okanogan County, Washington has had a diverse and colorful history. It was originally floating out in the Pacific; then it was part of a flood plain draining the western edge of the, then, North American continent; then it was uplifted and vulcanized when a new subcontinent accreted to the west; then it was sculpted and eroded by the ice sheets and subsequent outwash ending some 12,000 years ago. It is important to remember that this drainage is still being shaped today – this time the major force is a group of iconoclastic back-to-the-landers.

Addendum

The Okanogan subcontinent slammed into the North American continent some 100 million years ago. At that time, the North American continent was heading westward after its separation from Pangaea. The Okanogan subcontinent was heading northeastward, ostensibly originating from somewhere in the large Pacific Ocean basin, perhaps itself a fragment of a larger continent positioned much further south.

This fragment possibility becomes even more plausible when considering that *another* subcontinent slammed into westward-heading North America some 20-40 million years after the initial contact. This new subcontinent accretion eventually would form the North Cascades and San Juan Islands. Where were all these subcontinents originating from, floating around in the Pacific?

Eventually, we are to conclude, North America encountered another obstacle: the Juan de Fuca plate. With each of these accretions, a new subduction zone would be created further out to sea. These dynamics would explain the presence of volcanic rock throughout inland Washington and Oregon. At one point, 40 million years ago, the subduction zone was situated such that it caused the uplift of the Cascades. This probably occurred with the arrival of the Juan de Fuca plate. Soon afterward, the situation must have gotten clogged in the subduction zone because yet another massive mountain range, the brand new Olympics, was lifted right up out of the sea and folded back upon the continent.

It's fascinating to consider that the living in Western Washington is taking place on top of bedrock that originated in the South Pacific! It is also very interesting to reflect that this accretion occurred repeatedly: along a massive western hemispheric front, the incorporation of new Pacific lands always happened along the same section of coast – what we call today the Pacific Northwest. What could be so special about this region?

These geological reoccurrences must surely have given this part of the country a unique destiny: energetically it is quite different from the rest of North America: we could say it resonates more closely with the South Pacific. This brings to mind the mythic land of Lemuria

which, according to legend, broke up in the Pacific a long time ago. The Lemurians differed from the Atlanteans in that they did not rely on external technologies. Instead, they developed *internal* technologies which required a strong identification, harmonization, and attunement with the subtle forces of Nature.

It is also interesting to note that the southern limit of the Juan de Fuca plate, currently subducting under the Mt. Lassen region, is also approximately the southern extension of the range of the Douglas fir. The boundary of this overlapping coincidence also marks the border of the Cascadian bioregion. In fact, the entire Cascadian bioregion is geologically composed of lands that originated in the South Pacific, that are not originally part of the North America that separated from Europe long ago. No wonder the concept Ecotopia was conceived here! In that book, the first act of independence is secession from the USA – we could say that this act is very 'geologically correct!'

From this perspective, wouldn't it be more growthful if the Californians and Texans and New Yorkers went home and quit attempting to impose their foreign imperial mandate? Then this land, the beautiful Pacific Northwest, and the people of this land, the peaceful Ecotopians, could achieve their unique potential: maintaining and enjoying a strong identification, harmonization, and attunement with the subtle forces of Nature, thus bringing forth a culture that resonates deeply with the ancient vibrations of this exotic place.