

NOTES FROM THE UNDERGROUND

Fault helps tell history of Pacific Northwest

By **BENNETT HALL**
Corvallis Gazette-Times

CORVALLIS — On a recent sunny afternoon, a small knot of retired geologists and soil scientists stood beside a road cut in northwest Corvallis having an argument.

The exposed hillside above them, just across Walnut Boulevard from the Timberhill Shopping Center, was mostly light-brown dirt and sandstone, with chunks of dark-colored rock mixed in.

Bob Lillie, a former Oregon State University geology professor, pulled several rolled-up diagrams out of a map tube and began pointing out various rock formations while the others leaned in to look.

Phil Sollins, whose specialty at OSU was forest ecosystems and soils, quickly lost patience. “Let’s look at the rocks,” he suggested. Then he charged up the hill and started whacking away at an outcrop with the business end of a claw hammer.

Ralph Nafziger, a geochemist who worked at the U.S. Bureau of Mines in Albany, and Courtney Cloyd, an ex-Forest Service geologist, were hard on his heels, and a slightly disgruntled Lillie followed after rolling up his maps. Soon everyone was peering at Sollins’ newly collected sample, wrangling over crystalline structure and trying to decide if they were looking at basalt or gabbro.

Geology can be like that. The earth reveals itself in small glimpses, often in ways that are ambiguous, if not downright confusing. That can be especially true in places like the Corvallis Fault, a half-mile-wide swath that runs along the boundary between the Oregon Coast Range and the Willamette Valley.

“It’s a chaotic zone,” Lillie said. “It’s jumbled.”

And that’s precisely what makes it so interesting to geologists: This unassuming little rift in the earth’s crust marks the spot where titanic forces have come together to shape this part of the world, and will continue to shape it in the future. Though it’s not an active fault, it’s a



Andy Cripe/The Corvallis Gazette-Times

This piece of vesicular basalt was found at a road cut near Northwest Highland Drive and Lewisburg Road in Corvallis. Four retired scientists were retracing the route laid out in “Field Guide to the Geology of Corvallis and Vicinity, Oregon,” a scientific paper published in 1977 that remains the standard work on the subject.

rich repository of evidence that helps to tell the tale of how the Pacific Northwest came to be.

Earlier this month, the four retired scientists toured the fault zone, looking for clues to the region’s geological history. They were following a route laid out nearly four decades ago in “Field Guide to the Geology of Corvallis and Vicinity, Oregon,” a scientific paper written by R.D. Lawrence and three colleagues from the OSU geology department. The monograph was published in the April 1977 edition of The Ore Bin, the newsletter of the Oregon Department of Geology and Mineral Industries, and is still considered the standard work on the subject.

Each stop on the tour opened a fascinating window on the past.

Ice age flooding

The trek began at Avery Park, where the meandering Marys River pools into a popular swimming hole.

Low summer flows have exposed a section of riverbed composed of baseball-sized cobbles, rounded and smoothed by centuries of flowing water and cemented together in a matrix of sandstone. Lillie speculated these rocks might be part of a formation known as the Linn gravels, eroded fragments of the Cascades that were washed down into what is now the Willamette Valley between 28,000 and 36,000 years ago.

Just above this layer, the riv-

erbank is made of fine-grained silt. It’s an even more recent deposit, laid down in one of the most dramatic episodes in the region’s history: the Missoula Floods.

Toward the end of the last ice age, a lobe of the continental ice sheet creeping down from Canada would periodically block the Clark Fork of the Columbia River, impounding enormous volumes of water in a virtual inland sea geologists call Glacial Lake Missoula. But ice dams are inherently unstable structures, and this one would burst every century or so, sending an estimated 50 cubic miles of water roaring toward the Pacific.

Forty or more such floods occurred over several thousand years and shaped the Northwest’s topography in dramatic ways, such as scouring out the rugged Channeled Scablands region of eastern Washington. When the wall of water hit a sharp bend in the Columbia at Portland’s West Hills, the flow would back up into the Willamette Valley as far south as Eugene, submerging all but the highest hills for days at a time.

“The ice dam would break in Montana and bring in 300 feet of water up the Willamette Valley,” Lillie said. “Imagine that: 300 feet of water in the Willamette Valley.”

When the floodwaters receded, they left behind a gift: a deep layer of silt that is largely responsible for the valley’s famed fertility.

gion’s geology, all jumbled together: the Siletz River Volcanics, a type of basalt formed in ocean-floor eruptions some 55 million years ago; Tye Sandstone, a layer of compressed marine sediments that dates back about 41 million years (there’s also a slightly younger layer of marine sandstone in the region known as the Spencer Formation); and intrusions of gabbro, a volcanic rock that started out as underground magma and rose toward the surface between 30 million and 35 million years ago.

How did all these different kinds of rocks get here? And why are they mixed together in unexpected ways?

The answer, as Lillie explains in “Beauty from the Beast,” his just-published book on Northwest geology, is plate tectonics.

Here’s the short version: The earth’s crust is not a solid, spherical shell but rather an assemblage of plates that fit together like mammoth puzzle pieces, floating atop a semisolid layer called the mantle. Driven by heat rising up from deep within the earth, different plates move in different directions; here in the Pacific Northwest, a slice of oceanic crust known as the Juan de Fuca Plate is running head-on into the North American Plate.

Oceanic crust tends to be heavier than continental crust, so for the most part the Juan de Fuca Plate is diving beneath the North American Plate in a process called subduction. Over the last 200 million years, this process has been responsible for creating most of what we know as Oregon, Washington and British Columbia, adding millions of acres of land to a continental margin that used to end somewhere in the vicinity of Idaho.

As the oceanic crust burrowed deeper under the continent, heat and pressure squeezed out the moisture content, sending superheated water upward to melt portions of the continental crust, which erupted at the surface and created the volcanic Cascade Range. The most recent example occurred just 35 years ago, when Mount St. Helens exploded in a tremendous blast that killed 57 people and lopped more than 1,000 feet off the top of the peak.

And in some cases, the original geologic sequence is reversed. The hills northwest of the Corvallis Fault, outliers of the Coast Range, are a good example of this mixed-up process.

“The hills are being thrust over, the hard material is being shoved over the sediment,” Lillie said.

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061.....	Bankruptcy
EMPLOYMENT	
060.....	Babysitters, Child Care
070.....	Help Wanted
080.....	Work Wanted
INSTRUCTION	
095.....	Schools & Education
408.....	Music Lessons
FINANCIAL	
105-106.....	Business For Sale-Sales Op
120.....	Money To Lend
REAL ESTATE	
130.....	Open Houses
150-200.....	For Sale
160.....	Lots & Acreage
195.....	Homes Wanted
205-275.....	Rentals
285-290.....	RV/Trailer Space
MISCELLANEOUS	
300.....	Jewelry
310.....	Tools & Heavy Equipment
350.....	Appliances
360.....	Furniture & HH Goods
365.....	Antiques & Collectibles
375.....	Misc. For Sale
379-395.....	Swap Meets & Garage Sales
400.....	Misc. Wanted
410.....	Musical Instruments
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ANIMALS/LIVESTOCK	
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470.....	Feed-Hay-Grain
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