News-Herald Week-End Photo-Magazine Page

How Did We Get That Way?

A Geological History of the Klamath Country

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(Editor's Note: Mr. Cleghorn prepared this article for the Klamath Mineral club, but its general interest has brought it to this page. Those with little or no geological training will find it as interesting as the "experts," for the writer has avoided technical terms or explained them when using them. It is recommended reading for all Midland Empire people with curious minds who would like to know something of the geological background of the fine country in which they live.)

How did the Klamath country get this way? The problem is to tell the story briefly; there is so much to tell about that of which we know so little. If what I say seems incredulous, anyone is welcome to dissent.

It is possible this story will whet the interest of many Klamath residents and stir them to take up a study of the geological background of the area. Believe me, if it does they will never run out of something to do.

THE RHYTHM OF THE ERAS

Continents, throughout geologic history, seem to have been subjected to periodic uplift, with cold climate and glaciation, then erosion and encroachment of the ocean until the land has been reduced to a plain with warm winds sweeping across; then a repetition. Age upon age these changes have recurred, and doubtless have had great affect upon life.

Geology is the study of the earth; historical geology seeks to write the history thereof or perhaps one should say read the record as written in the rocks. In writing this history, geologists have divided time into eras according to the dominant life at that time as evidenced by the fossil remains found in the rocks, from the lowest form of single cell to the largest and most complicated mammal or beautiful flower, as silt was piled upon silt and remains sank and became embalmed therein.

These eras have been separated by breaks in the record and jumps in evolution. During the high erosion periods few deposits were laid down on the continents and the record must be looked for elsewhere.

Another process which had a lot to do with our topography is the cycle of mountain building and wrecking. Shrinkage creates forces which cause great wrinkles in the earth's crust, usually parallel to the edge of the continents. Erosion on the ridges fills the troughs, sometimes to a thickness of several thousands of feet. Heat arises in this soft mass, and in the next shove the sea becomes the mountain and the former ridge the trough. Molten rock is forced up and volcanos, lava beds, minerals, agates and rock hounds result.

THE FOUNDATIONS

Oregon has two ancient domains the history of which reaches back to the earliest, even the dawn of life, the Pre-Cambrian, the bottom of the foundations. These are the Ashland and Baker areas, abounding in very old, folded and recrystalized rocks and many interesting minerals.

Looking back for the sea anti-dating the Cascades, through the pages of Chamberlin and Saulsbury college geology, it was necessary to go back to the middle of the Mezozoic era, the Age of Reptiles, to the Jurassic period. From Alaska to the Andes a great sea trough extended. At the close of that period a great chain of mountains was forced up and great intrusions of lava such as the Siskiyou Batholisk accounting for much of the gold production of the west, took place. During the Cretaceous, the closing period of the Mezozoic era, occurred a vast submergence, a wearing away of the continent and a planing off of the Cascades so that in the Eocene the sea rolled over Oregon to the Rockies with the exception of the two islands mentioned before. Deep deposits took place in Shasta and Tehama counties. Much of the western oil and coal come from deposits of this period. Where Klamath was when the riches were passed out is a problem. Most maps show we were high and dry. My guess is that volcanos have covered up the evidence, if not the swag. A lot could happen in ten million years. The national budget might be balanced.

The Mezozoic era was brought to a close by the periodic readjustment of forces. The Rocky mountains were thrust up in a line extending a third around the world and the chilly weather got the best of most of the large reptiles which came to a climax during that era.

THE CENOZOIC ERA

The Cenozoic era is divided by geologists into the Tertiary period and Quaternary period. The former was a complete geologic cycle and is thought to have been nine million years long; the latter is at least one million years old and probably older, and hardly begun. As compared to five billion years, the estimated age of the earth, it is not so long.

The Tertiary period seems to have treated Oregon in reverse order of climate to the usual. It was warm in the beginning. During the Eocene Hodge says a great crack opened on the line of the Cascades from Alaska to Cape Horn and the elevation of that range cut off the moist winds from the eastern part of the state. Deposits of that time are found west of the range and dip towards the east under the Cascades. They may be found at the foot of Green Springs grade.

A little later deposits were made in the John Day valley from which many remains of early mammals have been taken. At that time Puget sound, the Willamette and Sacramento valleys and gulf of California were almost connected seas.

During the middle of the Tertiary vast lava out-pourings covered 200,000 square miles from Yellowstone park to California, giving eastern Oregon its characteristic topography. Many forest trees were buried and petrified; much agate, tufa and thunder eggs formed by active hot waters.

Another extensive deposition, perhaps as a result of the impaired drainage, was that of the siliceous diatomaceous earth the familiar so-called chalk, laid down in lakes. Much of Klamath county was covered by this deposit interstratified with volcanic sediments.

The Cascades at this time was a broad arch of volcanic material upon the earlier sediments. The western Cascades were severely glaciated and eroded. In late Tertiary and even to the present the high Cascades have been erected upon the eastern base of the older range. Many volcanic cones, such as Crater lake and the Sisters, characterize this belt, and have been built, torn down, and rebuilt perhaps many times. The present elevation probably took place at the close of the Tertiary and was accentuated even later.

During the Tertiary period, America was mostly above the ocean; marine deposits occurred only in the border seas. In the interior most deposits were in fresh water lakes. At the close of the period mountain building was active, rivers became swift and left few deposits.

As the period wore away through countless centuries, plant and animal life took on more modern forms. Grasses developed, high dry plains became the home of the horse, the camel; elephant forms roamed the Klamath lakes, and many other forms now found only on other continents were common. Mammals became the dominant form and started to decline. Where most of these animals went, why they went, what killed them on this continent is a field for your speculation. Many land bridges must have aided the migration. Some animals, as the seals and whales, took to the ocean for a living.

THE QUATERNARY PERIOD

Day before yesterday, geologically, estimated to have been from one million to three million years ago, the Quaternary began with much disturbance and mountain building. The Rockies, the Cascades and the Coast ranges were further elevated. Seemingly as a result of the uplifted land, the climate in the world was much affected. The Glacial age had profound effects upon life in America.

The Glacial age. There seem to have been five main advances and retreats of the ice sheets, with long periods between when the climate warmed up and life advanced northward. There seem to have been two centers in Canada, one in Labrador and the other west of Hudson bay. The conditions were somewhat as they are today in Greenland. It is strange, however, that both these locations were on low ground; the ice must have built up to ten thousand feet thick and pushed over hill and dale as far south as southern Missouri and Nebraska. Another large field covered the Cascade range in Canada. The Quaternary is estimated to have been at least one million years, yet as a period it has hardly begun. The time since the last ice invasion has been estimated at from twenty to eighty thousand years with the ice in retreat yet.

There were extensive mountain glaciers on the Cascades and other mountains in the United States and Mexico, but the ice sheets from Canada did not reach much beyond the border in northern Montana and Washington. The Columbia river was shoved out of its bed and a vast flood of water poured over and cut the Grand Coulee and the dry falls where Uncle Sam is now building another irrigation project. If one wants to study glacial topography, I recommend a trip into Canada through the Lake 'Okanogan country. In Klamath county there is little glacial topography, although there is much of interest around the Cascade lakes.

BLOCK FAULTING

The most prominent feature in Klamath topography is perhaps the long high ridges running mainly north and south with flat valleys between. At the beginning of the Quaternary and perhaps many times since due to ice loading in the north, there must have been an uplift followed by a sluffing and subsidence towards the west with tension cracks opening up in all directions but generally north and south parallel to the seacoast. Great blocks were tilted up on edge and slipped one upon the other as cakes of ice. This structure is sometimes called Plateau Structure, in that elevation is attained not by folding but by blocks slipping a little on each fracture. A fracture of the earth on which movement has taken place is known by geologists as a fault. What is known as a normal fault has a high angle to the horizon and is thought to be caused by tension, in that the block above the fault has dropped down in relation to the block below. Reverse faults are usually flat and the upper block is shoved up on the lower one. Normal faults are the rule. Most all faults in the Klamath basin are high angle normal faults. The movement seems to have been accomplished by a rotation of the blocks; one edge rises to form the prominent fault scarps, the other edge drops on the fault plane between it and the next block, forming a valley. The top of the block is parallel to the bedding planes and slopes back from one fault scarp at a gentle angle to the next scarp. This structure is also known as the Basin Range structure because it is characteristic of a large area of the Great Basin in Utah and Nevada. It seems to play out north of Silver lake and west of the Cascades. Abert rim and Summer lake rim and the Modoc or Algoma Fault scarp are classic examples of this structure.

Between the ridges thus formed, long flat valleys with sluggish streams or lakes are found. Many of these are formed by a fault block slipping down between two other fault scarps. The Upper Klamath lake, Klamath valley, Langell valley, will be found bounded on each side by a succession of fault scarps facing the valley. To one used to a country of folded strata, it would appear that the upper part of a fold or anticline had worn away to a trough. The newness of the scarps and the lack of any cross drainage, besides the unlikelihood of a stream forming on top of a ridge makes this theory untenable. The answer is faulting which has destroyed drainage. Many of these lakes have been filled with debris, volcanic ash, and the remains of diatoms even now working in our lakes.

If any are interested, I recommend a visit to the Rabbit flat location. Contrary to my first supposition, the lake does not occupy the fault trough at that point. Blocks of mountain on the west side of the lake, on Buck island, and Plum hills east of the lake all incline up towards the east. The trough seems to pass through the gap now traversed by the railway.

Link river as it leaves the lake follows a fault valley some distance, then it cuts across into the California avenue trough and finally cuts back across many fault lines from the Great Northern bridge to Keno. There it dodges back and forth, making end runs, as it were, around the ends of fault blocks out of the valley.

It has always been my thought, because Tule lake is deeper at the south end, that the drainage of the Klamath valley was out into Pitt river. When this outlet was filled with the lava beds it was thought that the valley filled with water until it broke over the lip at Keno and cut down its canyon. Kenneth McLeod is authority for the statement that there are gravel beds over a sort of spillway south of Tionesta. After a visit to the Keno outlet and a consideration of the valley, it seems to me more in keeping with the facts to say that as the mountains arose the Klamath river cut down, dodging around the ends.

Beyond Warner valley and in Chewaukan valley one may see mile after mile of old gravel beaches. I know of none in Klamath valley. This would indicate to me that if the water ever came higher than now it must have hurriedly departed. This argument may not hold water.

I have always wondered if these mountains were thrown up suddenly. It would have been most unpleasant. Authorities seem to agree that the uplift, as all uplift with the exception of the New Deal, came very gradually over many thousands of years. Doubtless there were severe earthquakes at times. The newness of some of the fault scarps here suggest that the movement must have been recent and not so slow either.

Sprague River valley and Yonna valley seem to be due to erosion rather than faulting. Some of the oldest as well as some of the newest features of the country are the Miocene volcanos between Beatty and Bly, and the recent lava plateau north of Sprague river.

RECENT VULCANISM

Vulcanism has continued almost to the present day. Mt. Mazama had its head blown off some ten thousand years ago. The prevailing winds are west winds. The pumice was scattered for fifty miles to the eastward, varying in depth from six feet near the mountain to nothing at the edge at Chiloquin, and decreasing in coarseness. East lake and Paunina lake occupy the crater of an old volcano now called Newberry crater. Pumice from this volcano is spread east and south of it.

Hot Springs. Perhaps our second most notable feature in Klamath is our hot springs. What caused them? Is there still hot lava rock under Hot Springs addition? There are hot springs at Olene and Langell valley and Lower lake, there are many lukewarm springs and wells on Link river and many other places. The explanation seems to me to be found in the faults. Ground water at the surface has a temperature of about 50 degrees, the mean annual temperature of the region. Ground temperature increases with depth it is said from one degree in fifty feet to one degree in one hundred feet. A well at Vale in eastern Oregon has a temperature rise of 22 feet per degree. You can readily compute that water of 200 degrees has a superheat of 150 degrees and probably comes from 3300 to 15,000 feet depth. The city water supply at 70 degrees may come up 2000 feet after percolating downwards that far below the bed of the upper lake. We are fortunate in that our water is exceptionally soft, because deep waters are usually highly mineralized. The Tulelake city well water has some 1200 parts of mineral, while the sump water has 750 parts, which is considered about the limit for irrigation water.

Shallow well water supplies here on the flats are apt to be alkaline, due to an arid climate failing to leach out the soluble salts of sodium and potassium.

SPEAKER MUTE

MORRESTOWN, N. J., (AP)—Phillis Anderson's voice was good enough to make her the eastern winner of the American Legion's oratorical contest for high school students.

But when the hometown Legion honored her at a dinner and presented a pearl necklace and four US baby bonds, Phillis couldn't talk. She had been making so many speeches her larynx was strained.

CAN'T LOSE NOW

KANSAS CITY, (AP)—If good luck charms have anything to do with it, the Kansas City Blues are pennant-bound again.

Mrs. Henry Honick sent the league-leaders 250-four leaf clovers, and wrote:

"With that much luck behind you, you cannot lose."

She said it took her three days to find the clovers in her back yard.

View Looking Southeast at Stukel Mountain

Modoc Point Fault Scarp Facing the Lake, East Side

View North up Upper Klamath Lake From Moore Park, Showing the Fault Blocks Facing East

Auto Men Find Plane Engines Can't Be Built "a la Detroit"

By PAUL HARRISON

EAST HARTFORD, Conn., May 24 — Pistons, crankshafts, cylinders, gears — miles of 'em Crankcases, connecting rods, sleeves, supercharger fans, cotter pins, carburetors — mountains of 'em. Take 10,000 parts; grind, bore, cut and polish them on baybee 5000 machines; measure and weigh them to tolerances approximated by a gnat's whisker; fit them together, and you've got an engine to haul a warplane through the skies.

Charles E. Sorensen called it "a modern industrial miracle"—they way engines are made at the Pratt & Whitney plant here. And Sorenson knows as much about mass manufacture as anybody in the world because he is production chief of the Ford Motor company. He and Edsel Ford and a crew of their engineers came to East Hartford to study methods and make plans for the engine factory which now is being equipped at Dearborn.

Their conclusion was that automotive procedure didn't mean a thing in their new job. "We'll have to do it your way," they told Pratt & Whitney executives.

And that's probably the most authorative answer to a lot of loose talk indicating quick and easy adaptability of the motor car industry to requirements for national defense. Later, Buick engineers came to figure how to build Pratt & Whitney engines in Chicago. They left with blueprints of the factory here.

Placarded with a cardboard pass and a large celluloid button, this reporter was taken on a tour of the plant to see how aircooled aviation engines are made. We traveled in style, gliding along the aisles in an electric-driven "struggle buggy," a World's fair relic. And we needed it. The factory is the size of 43 football fields — a vastness accentuated by its being pretty much joined under one roof.

TREMENDOUS INCREASE IN PRODUCTION

In two years, factory floor space and employment have been multiplied five times (15,000 are on the payroll) and horsepower production has increased tenfold. The makers prefer to talk in terms of horsepower because it's a better index of work done. Engines themselves are of several different sizes, from 400 horse power for training planes to the 2000 horse power 18-cylinder, twin-row jobs. Of all kinds, though, Pratt & Whitney's output is about 1200 engines a month, and by early fall it will be 2000. The Ford and Buick factories will get into production this year.

"The reason we're getting out so much stuff, and are ahead of schedule," said the company representative as we rode, " is that more than a year and a half ago we set up a War Plans department. It looked ahead on buildings, tools, power, labor and the subcontracting for small parts. We were able to order machine tools ahead of anybody else. We even jumped the gun on contracts. In one case, before the contract was signed for a new building, we actually delivered some engines from it."

Almost half the cost of an engine goes to about 150 companies which manufacture parts. Many of the parts are rough forgings and castings which are then precision-machined by Pratt & Whitney workmen.

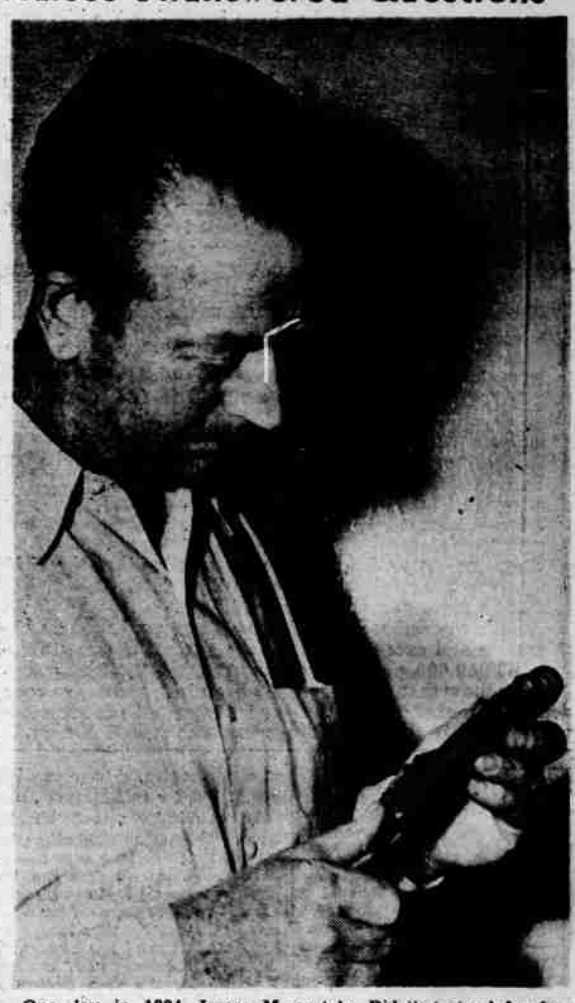
CHANGES DICTATED BY EFFICIENCY

Indicating the long, massed row of lathes, drill presses and milling devices, the factory official said, "Maybe you think that's a lot of machinery, but it isn't a patch on what we'd need for an automotive type of production line. The car people have a machine for every single operation, because they have standardization and tremendous volume.

"We can have only general-purpose machinery — with a few exceptions like that big one that's turning five cylinder heads at one time. Our tools have to be adaptable to various operations because changes are still being made in engines.

"There's a lot of gossip about the government messing up production with new specifications, but as often as not the changes are ours, and they're all dictated by efficiency. It was only a little while ago that 1000 horse power was tops in engine performance. What if designs had been frozen at that point and all engines made that way? It likely would have meant losing a war."

Old Gun Found At Barclay Raises Unanswered Questions



One day in 1934 James M. Brown, 1820 Lexington street, noticed a peculiar metal object imbedded in the moss at Barclay Springs while he was fishing for mullet. He stopped over and picked it up, and immediately his curiosity was heightened. It was a pistol, an ancient one.

The old weapon was a cap and ball muzzle-loader made of rustless bronze. Parts which may have been iron were no longer in evidence, and all that was left of the pistol was the barrel and a metal curve that once supported a wooden handle, long since rotted away in the marsh. But the bronze barrel, cannon-shaped, still remains little more than surface-tarnished.

When Brown realized his discovery and had made a closer examination of the weapon, puzzling questions arose which have never been answered, at least not authoratively. Whose gun was it? When was it dropped and under what set of circumstances? A friend told him he had seen similar guns in private collections which had been manufactured by hand in 1846. Perhaps General Fremont's men had weapons like it when they passed through this area. What did the carefully-filed knotches on the handle plate commemorate? There are five of them, four in one group and one separately. Did that stand for four Indians and one white man or one Indian and four white men?

Plainly discernable on the barrel are the letters E. L. G. and a star, enclosed by a circle. On the handle is inscribed S7 and D.

The old sightless pistol has been bothering Brown ever since he found it, and he would be thankful to anyone who could give him information about it. Brown sent a description of it to a friend, W. C. Tuttle, writer for Western Story Magazine. Tuttle said he thought the gun was hand-made in Luge, Belgium and that only a few like it been made.

UNFAIR EXCHANGE

OMAHA, Neb., (AP)—Max P. Cosgrove likes dogs but he wants his two pet New Zealand rabbits back anyway.

In their pen he found an airedale and a Boston bulldog, both of good breeding . The owners may have same, Cosgrove announced, by returning the rabbits.

SILENT REVEILLE

NEW BURNSIDE, Ill., (AP)—Pat, an airedale dog, has put an alarm clock out of a job in Mrs. W. C. Peterson's home. For three years the animal has been awakening her daily at about 4 a. m. by touching her cheek or arm with his cold nose.