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VOLCANIC ERUPTIONS: THE PIONEERS' ATTITUDE ON THE PACIFIC COAST FROM 1800 TO 1875

By Michael M. Folsom*

Volcanic eruptions, floods, earthquakes, and other hazards of nature can strongly influence the lives of people. Even the possible threat of such an event may alter the decisions people make. This paper is a short survey of the perception that American pioneers on the West Coast had of an environmental hazard: volcanic eruptions. The time interval to be investigated has been limited for reasons of practicality and coherence of treatment to the first 75 years of the 19th century.

Western Oregon and Washington, and much of northern California, are rather effectively walled off from the rest of the nation by the Cascade Range. Any overland routes of approach from the East would bring the traveler into close proximity to these steep and rugged mountains. Many of these high peaks are of volcanic origin and still exhibit on their flanks and foothills evidence of recent activity. The American pioneers migrating westward across these mountains cannot have escaped viewing this evidence and many must have considered its message. However, before any sort of conjectural sketch of historical ideas and attitudes can be developed the solid basis of fact must be attempted. Where and when were volcanic eruptions reported and how many of these reports represent real events?

From the earliest obscure story by the Indian, John Hiaton, in 1820 to the newspaper comment in the Washington Standard of Olympia in 1873 (Hopson and others, 1962, p. 635-637), there have been at least 40 reported volcanic events involving seven western mountains. Table 1 lists these mountains and the reported periods of activity. The locations of these mountains are shown in figure 1.

Mount Baker

The eruptions of Mount Baker, to start with the northernmost mountain, are generally only mentioned in the reports, and very little detailed information given. However, Professor Davidson's account of the eruptions of

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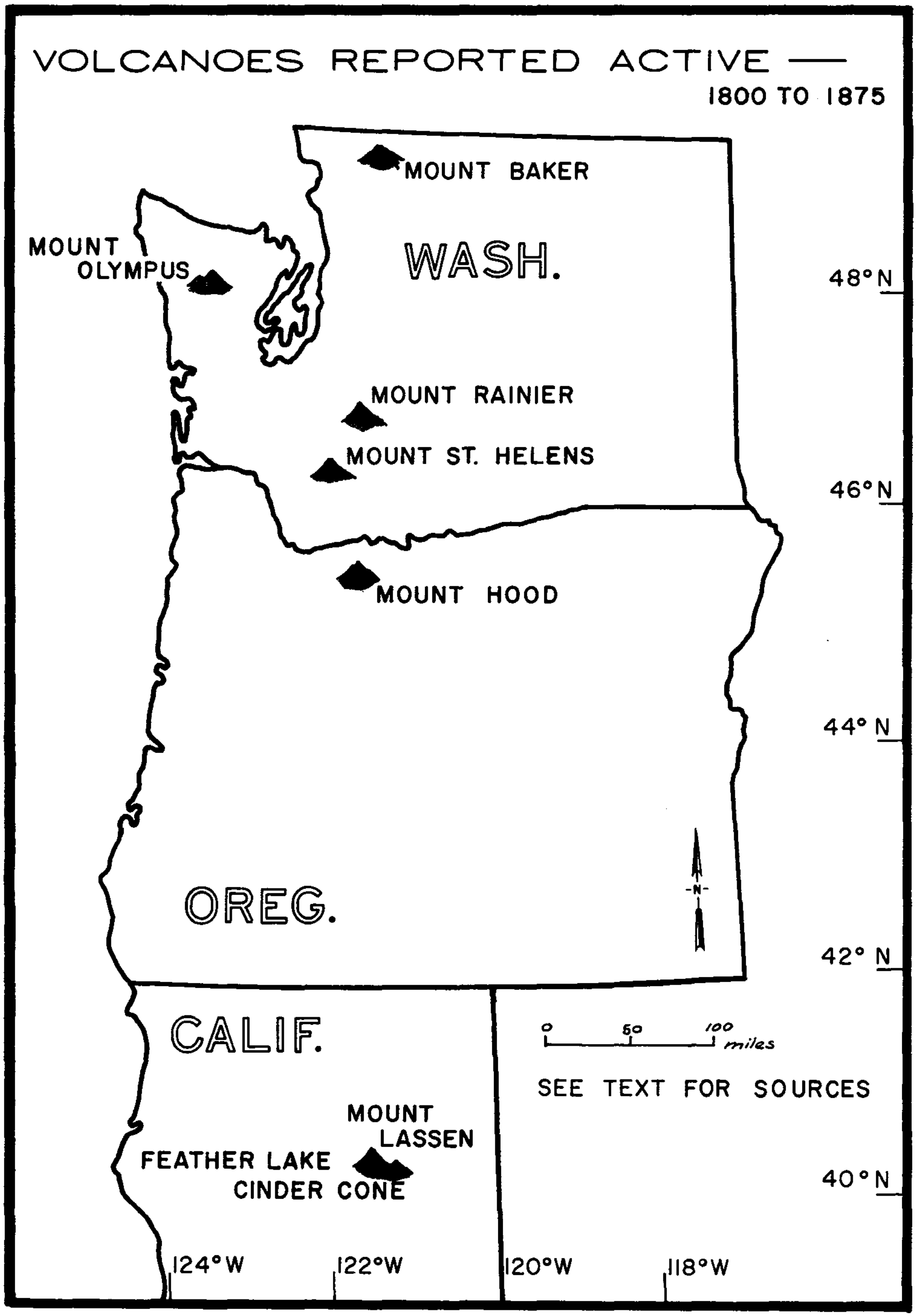


Figure 1. Sketch map showing location of reported active volcanoes during the period 1800 - 1875 in Oregon, Washington, and northern California.

Table 1. Reported volcanic events from 1800 to 1875.

Mount Baker	1842, 1843, 1846, 1847, 1853, 1854, 1858, 1859, 1860, 1870
Mount Olympus	1861
Mount Rainier	1820, 1841, 1843, 1846, 1854, 1858, 1870, 1873, plus an undetermined date between 1820 and 1854
Mount St. Helens	1802+, 1831, 1832, 1835, 1842 to 1848, 1852 to 1854, 1857
Mount Hood	1831, 1846, 1854, 1859, 1865
Feather Lake Cinder Cone	circa 1851
Mount Lassen	1857

Sources: Coombs and Howard (1960), Crandell (1969), Davidson (1885), Diller (1899), Dutton (1885), Jillson (1915), Hopson (1962), and Plummer (1898).

1854, 1858, and 1870 includes sufficient information, apparently based on personal observation, to give it a distinct aspect of credibility (Davidson, 1885, p. 262). Professor Davidson of San Francisco was one of those practical, empirical scientists who, along with others like Powell, Gilbert, and Richthofen, explored and measured much of the scope and detail of the natural world during the course of the 19th century. Davidson personally saw Mount Baker in eruption on these three occasions while on surveying expeditions along the north Pacific coastline. He mentions the shape, height, and color of the smoke clouds, the amount of snowmelt, and the conditions of the atmosphere through which he viewed the eruption. Concerning the latter he professes distinct disappointment and frustration about the frequency of obscuring cloud cover.

Mount Olympus

The 1861 event on Mount Olympus is either pure fancy or a case of incorrect conclusions from the available evidence (Plummer, 1898, p.26-27). This mountain is part of an eroded dome structure and does not owe any of its relief to volcanism in historical time. Perhaps smoke from forest fires or wind-blown dust from a landslide is what was really seen; in any case it was not an eruption.

Mount Rainier

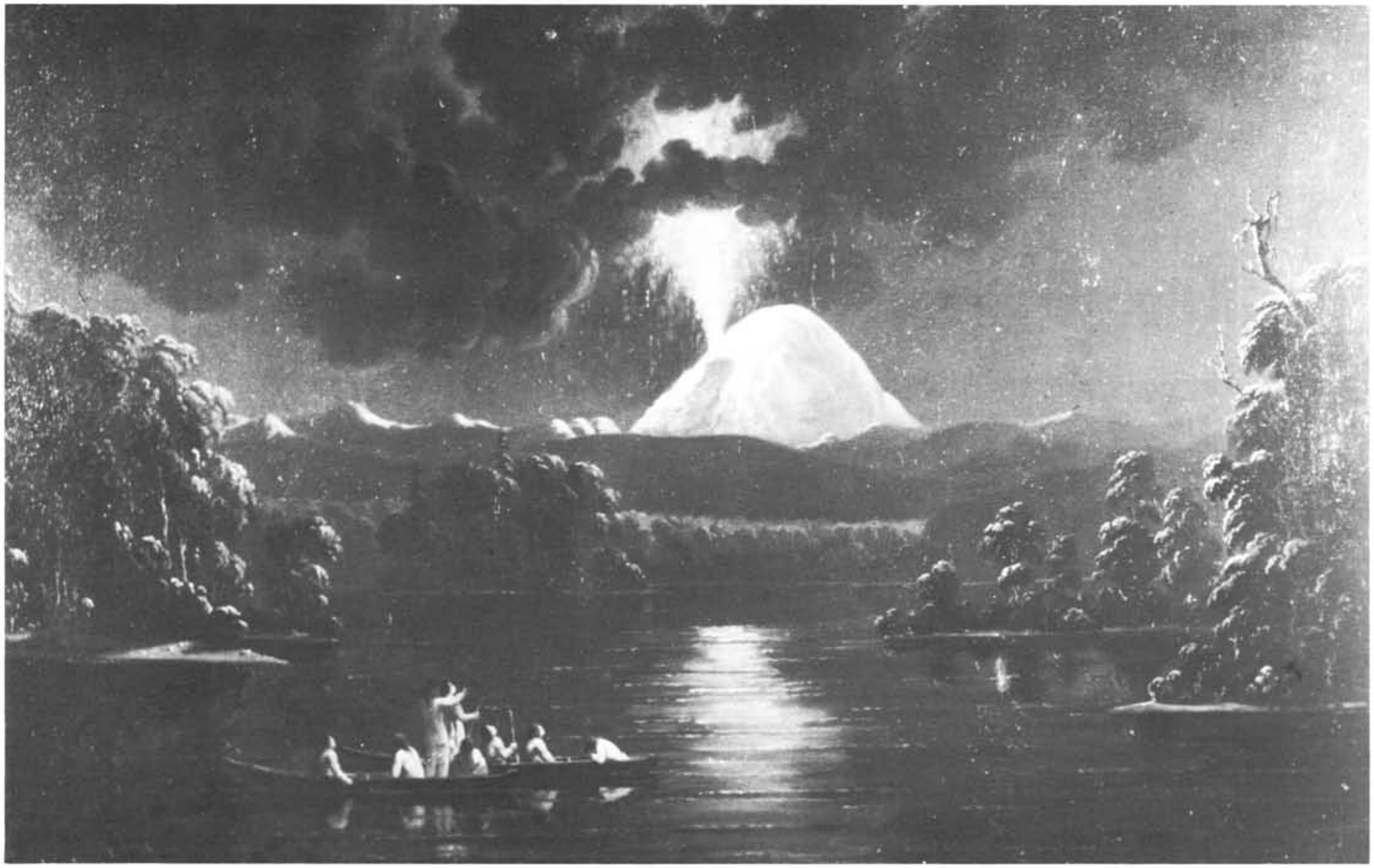
The probability of recent volcanic events on Mount Rainier was investigated prior to 1962 and it was suggested then that no significant eruptions have happened for many thousands of years (Hopson and others, 1962, p. 635-637). More recently another researcher has concluded, on the basis of a fresh ash cover on glacial moraines of a known age, that Mount Rainier was mildly active sometime between 1820 and 1854 (Crandell, 1969, p. 22). The 1820 information (table 1) comes from an otherwise unidentified Indian John Hiaton, and mentions fire, noise, and shaking of the earth (Hopson and others, 1962, p. 635). The accounts of 1841 and 1843 come from a French chronicler of earthquakes, A. Perry, writing in the Memoirs de l'Academie de Dijon in 1851. Holden summarizes these comments with the phrase "violent eruptions of Mt. Raynier, Oregon (sic)" and simply appends a brief editorial question mark (Holden, 1898, p. 96). The early missionary Father De Smet provides the evidence for the 1846 event by saying that at that time Mount Baker, Mount St. Helens, and Mount Tacoma "became volcanoes" (Hopson and others, 1962, p. 636). This last mention of "Mount Tacoma" refers to an alternate appellation for this mountain which is still current in some parts of the Pacific Northwest. The 1873 report is from Plummer's list of 1898 and mentions an exact starting time and duration of seven days. This date exactly corresponds to that of a small earthquake felt in the Seattle area, and the reported "clouds of smoke pouring from the highest peak of Mt. Rainier" (Holden, 1898, p. 96) are quite possibly just wind-blown masses of dust billowing up from rockfalls from the oversteepened cirque headwalls on the north side of the peak.

Many of these early observations possibly suffer from some flaw; perhaps a confusion of the different high mountain peaks in the region, of which there are many; perhaps an ignorance of the basic geologic knowledge which could have helped to explain what was seen; or perhaps an odd sort of local boosterism and wishful thinking.

Based on the evidence provided by a dated ash layer near the mountain, at least one of these several reported events actually was volcanic. Even today Mount Rainier retains some relict form of its earlier extrusive activity. A climbing party on Mount Rainier in 1966 descended into the east summit crater and found active fumaroles and areas of hot rock which had caused melting of ice deep in the summit ice field (Crandell and Mullineaux, 1967, p. 18).

Mount St. Helens

Mount St. Helens has probably had more eruptions in historical time, and had them better recorded, than any of the other mountains ever reported as active. The eruption of 1831 ejected enough ash to leave a significant layer on the slopes of Mount Rainier 50 miles away (Hopson and others, 1962, p. 646). The 1832 event is from Plummer's list and no details are available (Plummer, 1898, p. 26). Perhaps the two dates have become confused and actually refer to the same eruption, but it is more probable that the mountain was in truth active for intermittent periods starting with



Mount St. Helens erupting in 1847, by Paul Kane, Canadian artist, who sketched this scene from the mouth of the Lewis River in March 1847 and later painted it. Original in Ontario Museum of Archaeology, Toronto, Canada.

these two events, and finally became quiescent in 1857. The eruption of 1835 was witnessed by many people at Fort Vancouver, among them an Edinburgh physician and student of geology, Meredith Gairdner. He states in a letter that "we have recently had an eruption of Mount St. Helens, one of the snowy peaks ... about forty miles to the north of this place," and continues on to give details of ash fall, snow melted off the mountain, and streams of lava viewed "through the glass" (Holmes, 1955, p. 202). One of the quaint aspects of the literature concerning this subject is the frequent references to an anonymous "old French Canadian voyageur" who is supposed to have witnessed a huge explosion on the mountain during the winter of 1841-1842 (Diller, 1899, p. 640). Very probably he did, but if he let his memory move the date a year or so backward as some suspect (Holmes, 1955, p. 198), the substance of the old traveler's tale need not be doubted.

On November 23, 1842 Mount St. Helens burst into active eruption and scattered ash at least as far away as The Dalles in the Columbia River Gorge, where John C. Fremont later received a specimen of it (Jillson, 1917, p. 482). The mountain remained active for more than a year and many persons have recorded their observations of "immense and beautiful scrolls of steam" (Jillson, 1917, p. 482), "days memorable for the shower of sand (sic) supposed to come from Mt. St. Helens," and for "huge columns of black smoke" (Holmes, 1955, p. 204-205). The rest of the eruptions are equally well documented in diaries, letters, and newspapers. The eruption of March 26, 1847 was even sketched by an artist who eventually used the event as background in a painting (Holmes, 1955, p. 206) (see photograph).

Mount Hood

Mount Hood, the next possibly active peak to the south, is more poorly documented. The first three reported eruptions are in Plummer's list and are presented without comment of any sort (Plummer, 1898, p. 26-27). What was considered to be an eruption was witnessed by hundreds of people in Portland and was commented on in the Weekly Oregonian on August 17, 1859. This same event, or one very near it in time, was seen from the opposite side of the mountain by W. F. Courtney, who indicates that the activity was very short lived (Jillson, 1917, p. 482). In 1865 the night guard at Fort Vancouver reported seeing "Mt. Hood enveloped in smoke and flame," along with "rumbling noise not unlike distant thunder" (Jillson, 1917, p. 483). There are no additional reports of activity, but there are still active fumaroles and areas of hot rocks near the summit.

One of the most recent interpretations of the volcanic history of this mountain is that, except for the fumarole gas emissions, no extrusive activity has taken place for the past 2000 years (Wise, 1968, p. 85).

Mount Lassen Area

Those five peaks just considered encompass most of the reported volcanic events on the Pacific Coast between 1800 and 1875; the only other loci of activity during this 75-year period are a cinder cone in the wilderness near Feather Lake, in the vicinity of Mount Lassen, California (Dutton, 1885, p. 46), and Mount Lassen itself, which had a steam emission in 1857 (Coombs and Howard, 1960). So far as is known, no one witnessed the eruption on the smaller peak, but the accompanying lava flow was visited in 1854 by Dr. H. W. Harkness, who reported that there was evidence for very recent activity, probably about 1851 (Harkness, 1893, p. 408-412).

Influence of Volcanic Hazard

With this information now established, it is possible to trim the list of eruptions and mountains down to a size which is probably a better representation of reality (table 2). This table lists "probable" eruptions and was compiled from sources of varying reliability. The three most active peaks are all in the Cascade Mountains of the old Oregon Territory; only the Feather Lake Cinder Cone and Mount Lassen are not in this region. It remains, then, to relate these relatively well-substantiated events to their perception by the pioneers in the area.

The large number of reports, of both real and imagined eruptions, indicates that the settlers were very much aware of volcanoes and what they could do. Some of the reports give details of very mild activity like steam emissions lasting just a matter of minutes. That such a minor event would be noted indicates a distinct consciousness of the high snowy peaks to be seen on the horizon whenever weather conditions permitted; and, if modern weather conditions are any guide, that might have been an infrequent situation.

Table 2. Probable volcanic events from 1800 to 1875.

Mount Baker	1843, 1854, 1858, 1859, 1870
Mount Rainier	1843, 1854, 1858, 1870, and an undetermined date between 1820 and 1854
Mount St. Helens	1802+, 1831*, 1835*, 1842, 1844, 1845, 1847, 1854
Feather Lake Cinder Cone	circa 1851
Mount Lassen	1857

Sources: Coombs and Howard (1960), and Crandell (1969).
* Other probable events not reported by Coombs and Howard or by Crandell.

The tone of this consciousness can best be indicated by short excerpts from contemporary accounts. William Fraser Tolmie, a doctor at Fort Vancouver, wrote to William Hooker in England in 1835 that "A proposal to climb Mt. St. Helens, then in volcanic eruption, had to be abandoned," because of the health of one of the participants (Holmes, 1955, p. 202). A Methodist missionary, John H. Frost, noted in 1843 that:

> I observed a column of smoke to ascend from the N.W. side of Mount St. Helens, towards the top; of which I thought at the time that it was a perfect resemblance of a volcanic eruption, but as I had no one but Indians with me, consequently no one with whom I could reason on the subject, I dismissed it from my mind (Holmes, 1955, p. 204).

When Professor Davidson's ship called at Vancouver, British Columbia, during the 1858 eruption of Mount Baker, he reported that the citizens were completely aware of the eruption and almost as completely unconcerned (Davidson, 1885, p. 262). And from the Weekly Oregonian of August 20, 1859:

> Eruption of Mt. Hood--On Wednesday last, the atmosphere suddenly became exceeding hot about midday. In the afternoon the heavens presented a singular appearance, dark, silvery, condensed clouds hung over the top of Mt. Hood. The next day several persons watched the appearance of Mt. Hood until evening. An occasional flash of fire could be distinctly seen rolling up. On Thursday night, the fire was plainly seen by everyone whose attention could be drawn to the subject. Yesterday, the mountain was closely examined by those who have recently returned from a visit to the summit, when, by the naked eye or a glass, it was seen that a large mass of the northwest side had disappeared, and that the quantity of snow which, two weeks since, covered the south side, had also disappeared. The dense clouds of steam and smoke constantly rising over and far above its summit, together with the entire change in its appearance heretofore, convinces us that Mt. Hood is now in a state of eruption, which has broken out within a few days. The curious will examine it and see for themselves.

This was tucked away in a general interest column on the second page along with an account of the great number of butterflies seen in the area lately, and a comment on the great lengths that newspapers often go to to dig up news to fill pages (Oregonian, August 20, 1859, p. 2)! Even if this event may not be verified by present-day investigators, the observation of it by citizens in 1859 still yields valid indications of actual attitudes.

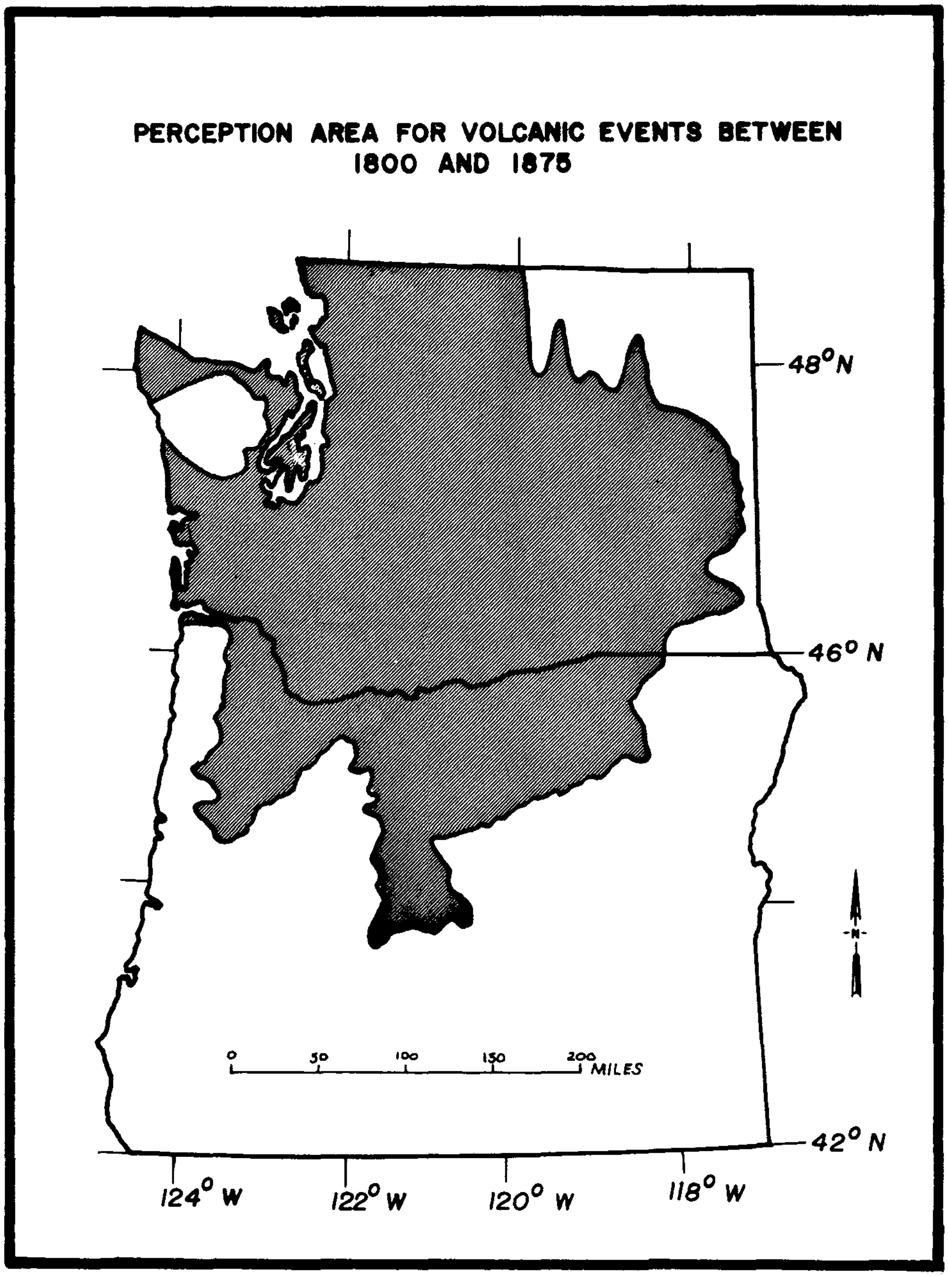


Figure 2. Sketch map of Oregon and Washington showing the region from which early settlers might have witnessed volcanic events between 1800 and 1875.

The observers perceived this to be a real eruption.

The perception of volcanoes, then, was an amalgam of the intense curiosity shown by the educated man of science, the mild interest shown by the educated man of letters, and the general disinterest shown by the man on the street. No one, it seems, was alarmed.

That part of the old Oregon Country from which it was generally possible to view at least one of the three active volcanic peaks (figure 2) includes two sections of the Puget Depression: the Willamette Valley and the Puget Lowland. These two areas were the most densely populated, and were the areas of most active settlement in the Oregon Country between 1800 and 1875. This coincidence of volcanic visibility with relatively high population density should have maximized whatever effect the eruptions were to have on the pioneers in this region. Cinder Cone and Mount Lassen, in Lassen Volcanic National Park, however, are in a region that is even yet little used and of very low population density. Those eruptions could have had very little effect on the pioneers of 1800-1875.

The volcanoes of the Pacific Northwest, even though easily visible on clear days, were far distant from the inhabited valleys and presented no threat to the pioneers. The mountain peaks were often obscured by the low banks of strato-cumulus clouds that come inland with frontal systems from the Pacific Ocean, and so would have generally been out of mind during most of the long, wet winter. The eruptions when they did actually happen were on such a small scale that it was usually necessary to be looking at the mountain to be aware of them. We can probably attribute a higher awareness of natural phenomena to these pioneers than we could to urban men of the 1960's and 1970's, but it seems unlikely that settlers in a new and raw land would spend much time in idle contemplation of a mountain.

Through all of this 75-year period, during which there were possibly as many as 20 events of active eruption, there is only one account of an injury by volcanic activity, and this tells of an Indian hunting on Mount St. Helens who attempted to leap across a stream of lava but instead stepped into it and burned his foot (Holmes, 1955, p. 206). This kind of evidence indicates that the eruptions were, at their most important, just interesting but essentially immaterial occurrences that happened rarely, were more rarely observed, and affected almost nobody.

We have, then, an ambiguous situation. It can be shown that there was a distinct interest and awareness of events on the mountains and a high degree of scientific curiosity about them. It can also be shown that a calm, almost bland attitude of business-as-usual prevailed, and that no one was particularly excited or concerned about the eruptions. No doubt both attitudes existed contiguously, but the common aspect of both is that no one was afraid. No one was likely to move away and abandon a hard-won clearing or a newly started business just because of miniscule rumblings on a couple of remote mountain peaks. The converse of this is also true; no one is likely to move into a region just to be near the nice volcanoes. Even

Professor Davidson's observations were strictly an unexpected addition to what was essentially a surveying expedition (Davidson, 1885, p. 262).

If the many personal observations upon which the substance and conclusion of this paper are based are truly representative of the mood of the times, and we have no reason to assume that they are not, it is apparent that the decision of the pioneer families to settle or not to settle in any specific place in the Pacific Northwest was not materially influenced by their perception of volcanic hazard.

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OREGON GROUND WATER RESOURCE ESTIMATED

The U.S. Geological Survey in a recently issued publication (Professional Paper 600-A) reports that "Oregon is the first Pacific coast region State whose total ground water resource has been estimated. A compilation of all available data, supplemented by estimates, suggests that in its 18 major drainage-basin regions, Oregon is underlain by more than 250 million acre-feet of ground water at depths of less than 500 feet. Additional potential subsurface storage capacity is estimated to be between 55 and 60 million acre-feet, a significant part of which can be developed by artificial recharge if need arises.

"Ninety percent of ground water samples from the Willamette River basin in northwestern Oregon contained less than 500 mg/1 of dissolved solids. This suggests that water of good quality is available throughout most of the basin, although local water-quality problems do exist. The dissolved-solids content consists primarily of calcium, sodium bicarbonate, and silica. Iron concentrations in many wells north of Salem are greater than 0.3 mg/1. Orthophosphate was found in varying concentrations throughout the basin, and high arsenic concentrations were reported from wells tapping the Fisher Formation near Eugene.

"Water containing more than 1000 mg/1 of dissolved solids (predominantly sodium, calcium, and chloride) is found in deep aquifers underlying Portland, in parts of the Tualatin Valley, in the Willamette Valley north of Salem, and at Gladstone. "Salty" water, too highly mineralized for most uses, has been reported from bedrock wells in several parts of the Coast Range on the west side of the basin." (Oregon State Univ., Water in Oregon, no. 4, November 1969.)

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KLAMATH AND LAKE COUNTIES BULLETIN PUBLISHED

"The Reconnaissance Geology and Mineral Resources of Eastern Klamath County and Western Lake County, Oregon," by N. V. Peterson and J. R. McIntyre, has been issued by the State of Oregon Department of Geology and Mineral Industries as Bulletin 66. The 80-page bulletin describes a large region of continental Cenozoic volcanic rocks and sediments whose mineral resources are mainly uranium, mercury, copper, lead, zinc, silver, diatomite, pumice, perlite, and peat. The area is believed to have a potential for geothermal power development. A multicolored geologic map and a mineral-resource map at a scale of 1:250,000 accompany the abundantly illustrated text. Bulletin 66 can be purchased from the Department's offices in Portland, Baker, and Grants Pass. The price is $3.75.

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THE NAMING OF MINERALS

By Lloyd W. Staples*

The rules for the selection of names for newly discovered minerals are of interest not only to the professional mineralogist but also to the much larger group of hobbyists who are amateur mineral collectors and "rockhounds." It has come as a matter of surprise to some members of the latter group that there exists a formal code for the naming of minerals. It is necessary to understand and follow carefully the rules of this code in order to prevent confusion in mineralogical nomenclature. In the past, there has not always been strict adherence to rules of mineral nomenclature, but progress is being made in enforcing better cooperation. It is probably true that nearly as much time is now spent in correcting earlier errors and confusion, and in discrediting improperly named or invalid species, as in describing and naming new valid species. Each issue of The American Mineralogist has a list prepared by Michael Fleischer of new mineral names, new data, and discredited minerals, and frequently the contributions in the latter two categories outnumber those in the first.

The gratitude and respect of mineralogists go to James Dwight Dana for the part he played in the development of rules for mineral nomenclature. In the first editions of the System of Mineralogy, Dana followed the suggestions of Friedrich Mohs (Staples, 1964) and Linnaeus by adopting the binomial latin nomenclature, using genus and species. Later, in the third edition of the System of Mineralogy (1850), Dana broke away from Mohs' Natural History Classification and adopted a classification based on chemical composition as recommended by Berzelius, with a single-word name for minerals. For minerals, unlike organic materials, the binomial nomenclature was without scientific basis and conservation of space and effort highly recommended the change. As an example, such a difficult name as "barulus ponderosus" was changed to "barite."

Although there was a simplification in the types of names used for minerals, neither Dana nor anyone else attempted to limit the choice of names to any particular category. This has led to a wide variety of name types, which some people of orderly minds have decried as producing an unacceptable potpourri, with names difficult to memorize, and in some cases even more difficult to pronounce. Because mineral names are necessarily international in origin, there will always be difficulty in pronunciation for people of different nationalities. As an example, most English-speaking people have difficulty in pronouncing the phosphate mineral, "przhevalskite," the sulfide, "dzhezkazganite," or the vanadate "tyuyamunite."

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Derivation of Mineral Names

The mineralogist who first describes a new mineral has almost complete freedom in the selection of a name. The practice of naming minerals after distinguished people of many different callings has been very common. This practice was initiated in 1783 by A. G. Werner, who named prehnite after the Dutch Colonel Prehn, who is reported to have obtained the mineral at the Cape of Good Hope. Other examples are "goethite" after Goethe the German poet; "wernerite" after the famous German mineralogist, A. G. Werner; "scheelite" after K. W. Scheele, a Swedish chemist; "uvarovite" after Count Uvarov of Russia, who was an amateur mineral collector; "alexandrite" after Alexander II, Emperor of Russia.

A problem has arisen when the discoverer of a new mineral has found that the surname of a person he wanted to honor is already in use for a mineral. In that case the given name may have to be used. As an example, the writer wished to name a new calcium zinc arsenate after Professor Austin Flint Rogers of Stanford University (Staples, 1935). The name "rogersite" was already in use, so the mineral was named "austinite." Recently (Gaines, 1969) a mineral was named "cliffordite," after Prof. Clifford Frondel of Harvard University, using his given name, because he previously (1949) had the mineral frondelite named after him. There are also examples of full names being used, as in the case of the mineral "tombarthite." The name "barthite" was already in the literature (1914). Using the given name, when it is as short as "Tom," would not have been satisfactory, and so mineralogists are happy to have the great Norwegian geologist, Tom F. W. Barth, honored by using his full name (Neumann and Nilssen, 1968).

It is also common practice to name minerals after the locality inwhich they are found. For example, countries have been honored, as in the name "brazilianite," states as in the case of "oregonite," counties as in "benitoite," and towns or localities as "franklinite" for Franklin Furnace, N.J. Physical properties were used frequently as illustrated by "azurite" for color; "amblygonite" for the Greek word indicating a blunt angle between the cleavages; and "scorodite" from the Greek word for "garlic," which is the odor given off when the mineral is heated. The mineral tetrahedrite was named after its crystal form (the converse is also true for pyrite where a crystal form, the pyritohedron, was named after the mineral). Several minerals have been named after the principal metal present, as in "zincite"; and as a special warning the name "sphalerite" meaning "treacherous" was given because of the difficulty in identification.

When Werner started the practice of naming minerals after people he was criticized as being guilty "of creating a paternity, and providing the childless with children to hand down their names to posterity" (Dana, 6th Ed., p. xli). To get away from the objection, and at the same time to provide a crutch for the student to use in remembering the chemical composition of a mineral, one can use a mnemonic name. An example of this is the new calcium vanadium silicate named by the writer "cavansite" from the first letters of the chemical constituents (Staples, Evans, and Lindsay, 1967).

Rules of Mineral Nomenclature

The rules of nomenclature which were used by J. D. Dana and later updated are stated in the introductory section of the System of Mineralogy, sixth edition, and a further discussion of them is given in volume one of the seventh edition by Palache, Berman, and Frondel. A Committee on Nomenclature and Classification of Minerals of the Mineralogical Society of America made several important recommendations (American Mineralogist, v. 8, 50 [1923]; v. 9, 60 [1924]; v. 21, 188 [1936]), most of which have been generally adopted by mineralogists. In 1933 considerable progress was made in obtaining agreement on usage by the American and British Mineralogical Societies. Later, international agreements on nomenclature have been delegated to the Commission on New Minerals and Mineral Names of the International Mineralogical Association. An index of new mineral names was compiled by Michael Fleischer in 1966, based on papers published in the American Mineralogist.

It has been generally agreed that new mineral names should end with the suffix "ite." In 1923, a minority of the Committee on Nomenclature made the suggestion that all mineral names be required to end in "ite," while the majority of the committee recommended changing only 43 mineral names. This resulted in names such as "cinnabarite" and "galenite." Some textbooks followed this suggestion, although not always consistently. For example, Moses and Parsons, Mineralogy, Crystallography, and Blowpipe Analysis (5th Edition), use "galenite" and "metacinnabarite" but retain "cinnabar." Most texts now have logically dropped the "ite" from metacinnabar, as well as from all those names of long historical standing which did not originally end in "ite."

Other less common endings for mineral names are "ine," as in "olivine," "ase" as in "dioptase," "ime" as in "analcime," "ole" as in "amphibole." There are advantages in the use of such a variety of suffixes in making the nomenclature less monotonous. The obvious advantage in using "ite" to indicate that the reference is to a mineral is lost, in part, because of the use of the ending on rock names, for example, "andesite." It has been recommended that all rock names end in "yte," as "trachyte," but this suggestion has not been generally adopted.

Priority in Nomenclature

In the naming of minerals, those names which have priority are generally accepted over names subsequently proposed for a mineral. Dana's System (6th edition, p. xliii) gives 11 rules for setting aside or revoking a mineral name, even though it has priority. Most important of these are an inadequate or incorrect original description of the mineral, a description which gives a false impression of the physical properties, or the loss of the name of a mineral for more than 50 years.

Examples of the problems raised by the law of priority are numerous and two of them with which the writer has been involved will be briefly reviewed here. As mentioned above, the writer named the mineral "austinite" in 1935 (Staples, 1935). F. Ahlfeld had called attention in 1932 in the Neues Jahrbuch für Mineralogie to a mineral from Bolivia that he called "brickerite," which was a nomen nudum because he only indicated its general composition. In 1936, brickerite was analyzed chemically, but incorrectly, and it was not until 1938 that W. Brendler of Hamburg, Germany carefully analyzed the material and determined that "austinite" and "brickerite" were identical. He stated that priority should be given the name "austinite." To go back even further, the name "barthite" was proposed in 1914 for a mineral which later proved to be austinite, but as stated by Fleischer (1945) "the description of barthite, especially the chemical analysis, was so faulty that priority may be set aside and the name barthite (=cuprian austinite) should be dropped." The name "austinite" withstood these two challenges and it is now internationally accepted.

A priority problem that had a happy ending is illustrated by the case of erionite. This zeolite, first discovered by Eakle (1898) from Durkee, Oregon, had its occurrence, unit cell, and structure described in detail by Staples and Gard (1959), when the writer rediscovered the locality which had been "lost." As a result of the potential commercial use of erionite for "molecular sieves," and its occurrence in large quantities as a diagenetic mineral, the name became well established not only in mineralogy, but also in the literature of chemical and industrial minerals. In 1962, the British mineralogists, Hey and Fejer, in studying the little-known mineral offretite, found it to be identical with erionite. Because offretite was first described in 1890 by Gonnard, the name had priority and Hey and Fejer believed it should replace "erionite." On the other hand, offretite had been inadequately described, it had been lost sight of for more than 50 years, and the name "erionite" was so thoroughly entrenched in the literature that replacing it would cause great confusion. Many letters were written expressing strong viewpoints on the matter of replacing "erionite," and when the Commission on New Minerals and Mineral Names voted on the matter there was a split which seemed irreconcilable. At this time, good fortune entered the picture when it was determined by Bennett and Gard (1967) that the c cell dimension of offretite is half that of erionite. This indicated that offretite and erionite are distinct species, and both names should be retained, thus solving a problem in nomenclature that otherwise would have defied a happy solution.

The New-Mineral Dilemma

The above material has been written to underline the difficulties involved in naming a new mineral. The problem is really threefold: (1) determining if it is a new mineral; (2) adequately describing it; (3) naming it. As has frequently been pointed out by the writer (Staples, 1948 and 1962), to name a mineral without properly completing the first two steps can only lead to confusion. Fleischer (1966) has stated that during the period 1941-1960 about half the new mineral names proposed were considered unnecessary. This leads to listing more minerals as discredited minerals. According to Permingeat (1961) the ideal description of a new mineral requires a listing of macroscopic properties, crystallographic properties, physical properties, optical properties, chemical properties, physical-chemical properties, methods of synthesis, description of the deposit, nomenclature and classification, location of the depository of the material, and a bibliography. To provide this data it is necessary to have an adequate library and laboratory facilities which may include x-ray diffraction equipment, differential thermal apparatus, polarizing microscope, universal stage, x-ray fluorescence, analytical chemical apparatus, absorption spectrometer, and other equipment.

It is evident that only a professional mineralogist is capable today of determining whether a specimen is a new mineral, and then describing it properly. Consequently, any suspected new mineral material should be sent to a properly equipped laboratory or university for examination. If the material turns out to be a new mineral, the description of it may take several years, depending on the problems involved. Only after carefully determining the properties of the new mineral will a name be recommended for it and the mineralogist will then submit the name to the Commission on New Minerals and Mineral Names for approval before publication takes place. The amateur collector's role in this is the searching for and finding of new material, and his ability to advance the science of mineralogy in this way should be a great source of satisfaction. The chances of attaining success for the amateur are actually much greater than making contributions to other fields of science, such as physics and chemistry. Part of the thrill of mineral collecting for the amateur, as well as the professional mineralogist, is the chance that the next outcrop may yield a mineral which has never been found before.

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MINING LAW SUMMARY AVAILABLE

A "Mining Law Summary for Oregon Prospectors" has just been published by the State of Oregon Department of Geology and Mineral Industries. The 4-page summary discusses the more pertinent aspects of the mining law as it pertains to the location and filing of claims and to subsequent assessment requirements. The information encompasses both Federal and State statutes and is presented in a question and answer format. Copies are free upon request from the Department's Portland, Baker, and Grants Pass offices.

* * * * *

WHAT TO DO WITH A HOLE IN THE GROUND

To much of the public, a mine is nothing more than a "hole in the ground," and an unsightly one at that. Few people realize that practically everything we use in our everyday lives originally comes from just such "holes." Automobiles, airplanes, and TV sets are made almost entirely of metal and glass; buildings are made from gravel, rock, limestone, and clay; and even the clothes we wear are woven from synthetic fibers made from petroleum products, which originally came out of a hole.

The sand and gravel industry in Oregon, being concentrated in the Willamette Valley near the population centers, is becoming hard pressed to provide the raw materials needed to build our highways, bridges, and airports. There is a potential shortage of this valuable product for the coming years, because many of the better deposits are being overrun by housing or other incompatible developments. What happens to a gravel pit after it is mined out? Can the land be reclaimed or put to other uses?

We are printing the following editorial which recently appeared in the Missouri Mineral Industry News, published by the Missouri Geological Survey. Even though the Missourians are primarily concerned with coal mining in their state, we believe that their comments and ideas could apply to the problems of our sand and gravel industry.

R.E.C.

MINE WHERE THE MINERALS ARE*

We need no crystal ball to see what will be written about us when this editorial appears. We'll be accused of siding with the miners in an unholy alliance to strip-mine coal within the city limits of Columbia ".... in calculating disregard for the well-being of the community." If there's one thing we don't need, it's adverse publicity at a time when operating funds for State agencies are woefully short, but we cannot stand idly by when principles are at stake; we _must_ become involved.

Mineral deposits are where you find them; sometimes they're in convenient places, sometimes not, but wherever they are they can only be recovered by mining. Once highways, homes and industries are built over mineral deposits, they are lost and must be sought elsewhere. The Geological Survey has long advocated sequential use of lands underlain by mineral deposits. First, mine the minerals _with a plan_ toward reclamation and reuse of the land. Second, reclaim the land so that it may well yield more than was gained from the mining. And third, reap the benefits in increased

* Reprinted from: Missouri Mineral Industry News, Vol. 10, no. 3, March 1970.

tax revenues from land that might have been rendered worthless without forethought.

Is this practical? The city of Mexico, Mo. has schools built on land that once was a "worthless" clay pit; the clay that was once there financed the reclamation and part of the school construction and the upbringing of many of the kids who go there, while serving the nation in such capacities as boiler linings and launch pads for space vehicles. Last month the Nation's First Lady toured a reclaimed coal strip mine that will eventually bring its developers more money than the coal brought the mining company. Underground mines in Kansas City and Springfield provided cheap concrete aggregate and road stone for many years; now the mined space houses instrument factories, computer centers, warehouses and terminals that will provide profit for the owners and taxes for the cities far in excess of the value of minerals that were once there, and are now used.

The Columbia coal mining problem is an excellent example of how mining's poor public image and the public's uninformed outlook combine to saddle the citizens with higher utilities costs and lower tax revenues from unattractive developments. Some time ago, Peabody Coal Co. leased acreage outside Columbia for strip mining of coal. Subsequently the city annexed the area and immediately a hue and cry arose to stop the proposed stripping.

It happens that Peabody supplies Columbia City Utilities and the University with coal, and the beauty of this particular coal field lies in its proximity to the coal-fired electric generating plant. The savings in trucking costs can be passed on to the people of Columbia in the form of lower electric bills.

But this is not the only reason for advocating coal stripping in Columbia. The technology is already available for reclaiming mined lands; it is now possible to plan mining in a way that will give an end product of attractive landscape with recreational lakes, etc. that can be a part of the normal mining expenses. The great shovels that expose the coal need not be the monsters they've been portrayed as; people made them, people can control what the machines make.

We can think of no better way to have one's cake and eat it too. Why not work out a plan with the mining company for imaginative reclamation of the mined lands? While the mining is under way, the utilities have a supply of cheap coal. When it's used up, attractive lands with lakes and hills remain to be developed. Why be bound by whatever topography there is when you can design it yourself?

Surely, this is anything but "....calculating disregard for the well-being of the community"!

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