

A NEW VOLCANO ISLAND IN ALASKA.

RECENTLY the newspapers have contained references to the rise of a new volcanic island near Bogosloff Island in the Aleutian chain. Bogosloff itself is believed to be a recent development. Possessing some unpublished material and some sketches bearing on this topic, it has been suggested that a *résumé* of the subject would not be without interest for the readers of *Science*.

The island of Ioanna Bogoslova (St. John, the theologian), or Agáshagok of the Aleuts, is commonly known by the shorter name of 'Bogosloff' to the white residents of the region. Owing to its isolated and remote situation, it has been rarely visited, and hence is less widely known than other modern volcano-islands. It is, however, one of the few instances of the sudden and violent formation of land in the sea which have been witnessed in historic times. It is situated in latitude $53^{\circ} 58'$, and longitude 168° west, approximately some forty-two miles west of the northern corner of Unalashka Island of the Aleutian chain. At the

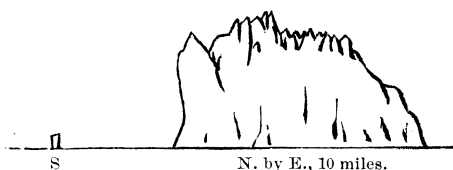


FIG. 1.

NOTE. — 'S' is Ship Rock.

time when it was observed by us it formed a sharp serrated ridge, about eight hundred and fifty feet in height, very narrow, the sides meeting above in a very acute angle, where they are broken into a number of inaccessible pinnacles. There is no crater, nor appearance of a crater. The shore-line formed a tolerably regular oval, pointed at the south-east end, having its longitudinal axis trending N. W. $\frac{1}{4}$ W. and S. E. $\frac{1}{4}$ E. by compass, and reaching about three-quarters of a nautical mile in length. The shores are mostly precipitous; but at the south-eastern extremity the waves have accumulated a small spit or pointed bit of beach, of talus, on which in perfectly favorable weather a landing may be had. With the least swell a heavy surf is formed here. Seen through a strong glass at a distance of four miles, it appeared of a light pinkish-gray color, devoid of vegetation or water, and covered with myri-

ads of birds. Less than half a mile north and west from the island is a perpendicular square-topped pillar, about one hundred and fifty feet high, called on modern charts 'Ship Rock.' Less than half a mile north and east from the island is a small rock rising only a few feet above the water. North, east, and south, and

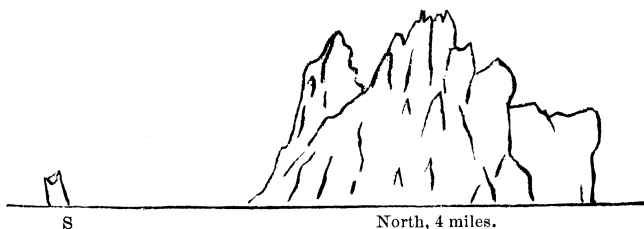


FIG. 2.

especially east-south-east from the point of the island, scattered breakers were observed, extending less than three-quarters of a mile from shore. The crags of the main island afford the most secure refuge to thousands of seaparrots, puffins, auks, and divers; and sea-lions (*Eumetopias Stelleri*) often rest on the talus point. It is visited in spring, if weather permits, by native egg-hunters from Unalashka; but in 1873 several years had passed since any one had been able to make a landing at the proper season. My own party attempted it unsuccessfully in 1872 and 1873.

Such was the condition and appearance of the island in 1873. The outline sketches here given are facsimiles of those taken on the spot as we approached the island from the southwest, and passed south of it eastward toward Unalashka. Their proportions were corrected by horizontal and vertical angles. The wind

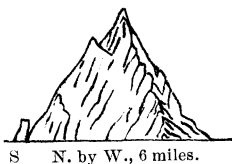


FIG. 3.

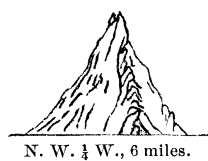


FIG. 4.

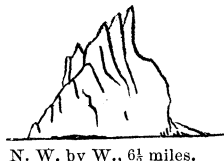


FIG. 5.

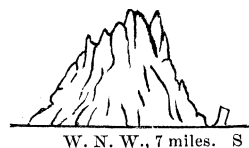
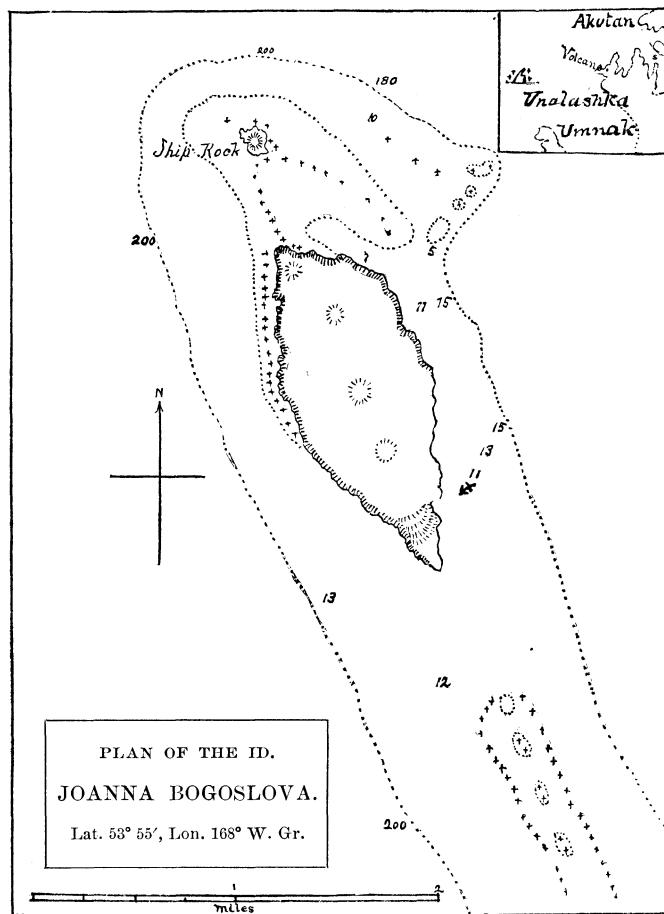


FIG. 6.

was light; but there was a heavy ground-swell, which broke on the rocks and the little spit at the south-east end, rendering a landing imprac-

licable. On the line of the supposed reef, which has ornamented the charts for so many years as connecting Bogosloff and Umnak, three miles from the island, we sounded in eight hundred fathoms without touching bottom. With the exception of a small reef near the north-east end of Umnak, and the rocks within a short distance of Bogosloff, there is water more than eight hundred fathoms deep

made in 1768-69. No reference to it appears in the abstract of their report which has been preserved for us by Coxe; but a little profile surrounded by rocks is represented off the end of Umnak on their chart, which evidently represents the rock which existed before the present peak was raised. A facsimile of this part of their map appears in the corner of the Krusenstern map on this page.



PLAN FROM KRUSENSTERN'S ATLAS, 1826.

on all sides of the island. The supposed reef was probably taken for granted by those who saw the white water of a tide-rip which eddies southward toward Umnak Pass on the ebb, in the wake of Bogosloff, as we ourselves observed to occur in a small way. Ship Rock is seen on several of the sketches, standing off to the northward. The earliest information in regard to this island is derived from the map of Krenitzin and Levasheff, prepared from surveys

The next information is given by Cook's voyage in 1778, when an elevated rock, like a tower, was seen Oct. 29, at a distance of twelve miles: 'The sea, which ran very high, broke nowhere but against it.' On Cook's chart it is called Ship Rock, but its identity with what is now known as Ship Rock is uncertain; and at that distance there might have been a number of adjacent rocks or breakers not visible.

We learn from Langsdorff, who visited this region from 1804 to 1806, that, previous to the appearance of the present peak of Bogosloff, a rocky islet had long stood in the same situation, which the Aleuts declared from the time of their forefathers had been a notable resort of seals and sea-lions. This could not have been the present Ship Rock, which is a huge perpendicular pillar.

In 1795 the islanders marked a local appearance, as of fog, in the neighborhood of this rock, which did not disperse even when the rest of the atmosphere was perfectly clear. This created much uneasiness, since the natives of Umnak and Unalashka had been used to regard this rock as one of their great sources of food-supply. After a long time, in the spring of 1796, one of the more courageous natives visited the locality, and returned immediately

in great terror, saying that the sea all about the rock boiled, and that the supposed fog was the steam arising from it. It was then supposed to have become the abode of evil spirits, and was avoided by every one without exception. The disturbances were accompanied by volcanic activity in the craters of Makushin on Unalashka and others on Umnak Island. The account given by Baranoff and Veniaminoff of what followed may be

summarized, it being remembered that the island is over thirty miles from the nearest land, and about forty from the nearest habitations on Unalashka.

On the 1st of May (old style), 1796, according to one Kriukoff, then the Russian American company's agent at Unalashka, a storm arose near Umnak, and continued for several days. During this time it was very dark, and low noises resembling thunder were continually heard. By daybreak on the 3d of May the storm ceased, and the sky became clear. Between Unalashka and Umnak, and northward from the latter island, a flame was seen arising from the sea, and smoke was observed for ten days about the same locality. At the end of this time, from Unalashka, a rounded white mass was seen rising out of the sea. During the night, fire arose in the same place, so that objects ten miles off were distinctly visible.



Pinnacle Island, W. S. W., 10 miles.

FIG. 7.

An earthquake shook Unalashka, and was accompanied by fearful noises. Stones, or pumice, were thrown from the new volcano as far as Umnak. With sunrise the noises ceased, the fire diminished, and the upraised island was seen as a sharp black crag. It was named after St. John the theologian, though it does not appear for what reason. It did not rise, according to the above account, on his day. A month later it was appreciably higher, and emitted flames constantly. It continued to rise, but steam and smoke took the place of fire. In 1800 the smoking appeared to cease, and in 1804 a party of hunters visited the island. They found the sea warm about it, and the surface, in some places at least, too hot to walk upon, even if the distorted fragments of lava, which formed its base, were accessible to a landing. It was said to be two miles and a half in circumference, and three hundred and fifty feet high.

¹ In 'Alaska and its resources,' by an accident in the historical chapter, the item relating to the rising of this volcano from the sea was misplaced ten years, and appears under 1806, though properly dated in the geological chapter. An agent of the census by the name of Petroff, believing apparently that a little imagination would enliven his statistics, and misled by this erroneous date, gives in his report an account of an eye-witness of the phenomenon, 'born in 1797,' and 'who was one of the individuals who first noted' it, and with such terror 'that his trembling knees could scarce carry him back to report!' (H. R. ex. doc. No. 40, p. 19, 1881.)

In 1806 fissures appeared, lined with crystals of sulphur. According to Langsdorff, who saw it in this year,¹ it did not exhibit any special activity, though steam and smoke arose more or less constantly. In this year three baidars visited the island. On the north side soft lava flowed into the sea, and it was too hot to approach closely; but on the southern end a landing was effected. The peak was too sharp and rugged to be ascended, and the rock was very hot. A piece of seal meat suspended in a crevice was thoroughly cooked in a short time. There was no soil nor fresh water.

The only map or survey of Bogosloff and vicinity known by us to exist is that of Krusenstern, published in 1826, a facsimile of which is here given, except that the evidently formal hachuring has been omitted. Since 1823, and up to the present year, the island has remained tranquil, and its form has not



Pinnacle Island, N. N. W., 6 miles.

FIG. 8.

changed. The close similarity to our own, of Lütke's profile taken in 1827, confirms this view. The widely differing estimates of its height and area given by Grewingk illustrate the futility of unchecked guessing rather than any change in the island itself; and even the map, which could have had no base-line except one measured by log on the water, though relatively correct, represents, according to our observations, a scale about one-quarter too large, the island being about a mile and a quarter long, instead of a mile and three quarters, as the map gives it.

We have not space here to discuss the detailed process by which our conclusions have been reached, but will briefly state them.

The site of Bogosloff was a low islet or cluster of rocks not identical with the present Ship Rock, and which were long known to the Aleuts, and mapped by Levasheff. In 1795-96 a series of progressive disturbances occurred by which, in May, 1796, a considerable mass of material was upheaved and the major part of the present island formed. The reports of exactly what occurred, as well as the dates assigned, are discrepant and all unsatisfactory, when we recollect the distance from which the alleged observations were made, and that they were not noted down until several years after-

ward. The reef shown on most charts extended only a short distance from Umnak or Bogosloff, and was never continuous between them.

Other islands of exactly similar origin are to be found in this region, notably Koniúgi and Kasátóchi in the western Aleutians, and Pinnacle Island near St. Mathew Island. Of the last, sketches are reproduced here, showing it 'end on' and from the side. It differs from Bogosloff in having the crest deeply channelled; and it has been reported, that within a few years light has been seen in this fissure by navigators passing at night, though there is no record of smoke or lava being ejected.

Of the latest addition to the list of Aleutian volcano-islands, we are not in a position to say much. The facts reported seem in brief to be these:—

During the past season, Bogosloff has been in a state of eruption, as was observed by Capt. Hague, of the steamer *Dora*, on two occasions, when passing it at a distance of a mile and a half. He describes it as entirely enveloped in smoke and flame, with red-hot lava issuing from its central portion, and great quantities of softer lava running down to the sea. This has continued up to the time of the latest reports. The natives state that the eruption began about six months ago, and has continued in an intermittent manner ever since. Makushin volcano, on Unalashka Island, remained quiet. On the 16th of October a dark cloud of indescribable appearance covered the sky northward from Unalashka, and hung very near the earth for some time, completely excluding the light of the sun, and accompanied by a rise of temperature in the air. In about half an hour this cloud collapsed, and covered the earth with dull gray, cottony ashes of extreme lightness. This was ascribed to the Bogosloff eruption which had been heard of, though not visible from Iliuliuk harbor, where these observations were made. Another account says the fall of ashes occurred Oct. 24, and that the amount has been exaggerated.

Subsequently Capt. Hague passed again in the vicinity of Bogosloff, and, to his astonishment, observed a new island which had appeared above the sea since his previous visit, and in a spot which he had previously sailed over. In the month of September Capt. Anderson, of the schooner *Mathew Turner*, had observed the new island, which was then a mass of fire and smoke, apparently not having taken shape. Capt. Hague reports the new peak to be situated half a mile north-north-westward from Bogosloff, to be cone-

shaped, with an irregular outline, rising five to eight hundred feet above the sea, and about three-quarters of a mile in diameter.

It is stated that no further information was obtained; and none is likely to be obtainable until next spring, as communication with Unalashka is not kept up during the winter months. To examine it, a special expedition from Unalashka would be necessary; as it cannot be much less than forty-five miles from Iliuliuk harbor, in the open sea, and would be little more than visible from the nearest land. I would suggest for it the name of Grewingk Island, in honor of the celebrated geologist who monographed in 1850 all that was known of Alaskan geology and mineralogy.¹

Since the above news was received, further intelligence has come to hand in regard to volcanic activity in Alaska, from an unexpected locality. From the entrance of Port Graham, sometimes called English Bay, at the mouth of Cook's Inlet on its eastern shore, may be seen the rounded summit of Augustin or Chernobour Island. It presented in 1880 the appearance of a low rounded dome without a peak, and measured about thirty-eight hundred feet in height by angles from different stations. The island of which it is the summit is about fifty miles from Port Graham in a south-west by west direction, is rounded and about eight miles in diameter, bluff to the north-west, and sloping to the south-east. There are many rocks about it, and it has been a noted haunt of sea-otters. It was known to be volcanic, but no description of it as active is on record so far as I can discover. According to information received from Capt. Cullie and Sands, and summarized for the press by Prof. George Davidson at San Francisco, the following observations were made at the Alexander Village at Port Graham. Smoke first arose from the peak in August. On the morning of Oct. 6 the inhabitants heard a heavy report, and saw smoke and flames issuing from the summit of the island. The sky became obscured, and a few hours later there was a shower of pumice-dust. About half-past eight o'clock the same day an earthquake wave, estimated at thirty feet in height, rolled in upon the shore, deluging the houses on the lowland, and washing the boats and canoes from the beach. It was followed by others of less height. The ash fell to a depth of several inches, and the darkness required lamps to be lighted. At night flames were seen issuing

¹ Capt. Hague proposed to name it New Bogosloff; but the derivation of the word 'Bogosloff' is such that a different name would be preferable.

from the summit, and the snow had disappeared from the island. After the first disturbances were over, it was found that the northern slope of the summit had fallen to the level of the cliffs which form the shore, and the mountain appeared as if split in two. Two previously quiet volcanoes on the peninsula of Aliaska began simultaneously to emit smoke and dust; and in the ten-fathom passage between Augustin Island and the mainland a new island, seventy-five feet high and a mile and a half in extent, has made its appearance. It is stated that subterranean noises had previously been heard by a party of hunters, some of whom are reported missing.

The volcano has not been approached nearer than ten miles since the eruption, at which distance the new island was distinctly seen north-west from Augustin Island. Its dimensions, therefore, are merely approximate. The morning of the eruption was perfectly clear, with a light south-west wind, and the tide extremely low. Three days before, all the fish are said to have disappeared from Port Graham. At last accounts smoke was arising from a point on Augustin Island, south from the cleft above mentioned, which crosses the island from east to west.

It would seem as if these events were local manifestations of an awakening of volcanic energy nearly world-wide. WM. H. DALL.

WHIRLWINDS, CYCLONES, AND TORNADOES.¹—IX.

TORNADOES differ from the storms thus far mentioned in their excessive violence over a very restricted area, and their visibly rapid advance. After a great deal of theorizing, it is now possible to explain them very satisfactorily and simply as whirls in the air, a little above the ground, into the vortex of which the surface-winds are drawn up with great velocity. Electricity has no essential share in their action.

Recent studies, especially the reports by Mr. Finley of the signal-service, have done much to show us the regions of, and general conditions preceding, tornadoes. They are most numerous in Kansas, Missouri, and Illinois, although they have been recorded throughout the states east of the Mississippi, except in the far north-east and on the central Alleghanies. So they have occurred in all the months, and at nearly all hours of the day; but their time of greatest frequency is in the afternoons of June and the months adjoining. Where

most fully studied, they seem to occur along the contact-line of warm southerly winds and cooler north-westerly or westerly winds. Local quiet and rather excessive warmth commonly precede them, and chilly winds come after their passage. Rain and hail fall in their neighborhood, but usually at a moderate distance away from the destructive wind-centre. Their advance is nearly always to the north-east, at about thirty miles an hour.

When first perceived, the tornado is generally described as a dark, funnel-shaped mass, hanging from heavy, dark, agitated clouds (fig. 23). Its roaring sound is heard as it comes nearer; and the whirling funnel is often seen to swing from side to side, and to rise and fall. Within its dark column, various objects snatched from the ground may be seen rising and turning round and round in the eddying winds: pine-trees appear like bushes, and barn-doors are mistaken for shingles. At a certain height these fragments are thrown laterally out of the power of the ascending current, and then fall to the ground, often with violence, from their lofty flight. If such a cloud appear in the west or south-west, one should make all possible haste to the north or south of its probable track; but there is seldom time to escape. The rapidity of the storm's approach, the noise of its roaring, the fear that its darkness and destruction naturally inspire, too often serve to take away one's presence of mind; and, before there is time for reflection, the whirl has come and passed, and the danger is over for those who survive. The force of the wind is terrific. Heavy carts have been carried, free from the ground, at such a velocity, that, when they strike, the tires are bent and twisted, and the spokes are broken from the hubs. Iron chains are blown through the air. Large beams are thrown with such strength that they penetrate the firm earth a foot or more. Children, and even men, have often been carried many feet above the ground, and sometimes dropped unhurt. A velocity of wind exceeding one hundred miles an hour is required to produce such effects. Strange examples of the wind's strength are found in the treatment of small objects: nails are found driven head first firmly into planks; a cornstalk is shot partly through a door, recalling the firing of a candle through a board. More than this, the wind shows signs of very unequal motions in a small space: bedding and clothing are torn to rags; harness is stripped from horses. Nothing can withstand the awful violence of the tornado's centre; and yet, at a little distance one side or the other, there is not only no harm

¹ Concluded from No. 50.