

# STUDY of VOLCANOES



"Cauliflower Cloud" During Eruption of Sakurajima, Japan.

(Prepared by the National Geographic Society, Washington, D. C.)

**V**OLCANIC eruptions and earthquakes, which for ages man believed to be the work of malignant demons or wrathful gods, are gradually yielding the secrets of their causes and processes to scientific investigators. It is in an effort to extend still further science's ability to understand these forces of nature, and even to forecast their appearances, that the National Geographic Society is sending an expedition this spring and summer to study intensively the conditions in one of the world's greatest volcanic regions, the smoking vents of the Alaskan peninsula and the Aleutian Islands.

The studies will be conducted by Dr. Thomas A. Jaggar, who has lived for many years in an observatory on the brink of the crater of Kilauea, studying that mighty volcano's moods as shown in the waxing and waning of its pits of molten lava. How it has already been possible with present knowledge to prophesy a volcanic eruption and so to save thousands of lives, is seen in the circumstances surrounding the eruption of Sakurajima, Japan, in 1914.

This greatest eruption in the annals of the island empire resulted in the loss of only 35 lives and some millions of dollars in property. Scientific investigation is, in large measure, to be credited with the relatively few casualties, for it was through the prediction of the imminence of the Sakurajima outbreak that the inhabitants of a populous district were enabled to flee from the wrath about to come.

It was through a study of premonitory earthquakes in their relation to volcanic outbreaks that the Sakurajima eruption was definitely predicted; conversely, it is hoped that, in time, through exhaustive study of volcanic activities, earthquakes may be predicted with accuracy. The phenomena of the Sakurajima eruption, therefore, are proving of transcendent importance to the scientific world, and the measures which were taken to safeguard life at that time are being eagerly studied anew.

The volcano of Sakurajima, shaped much like Vesuvius, rises to a height of 3,700 feet, directly opposite the city of Kagoshima, in Kagoshima bay—a tongue of water extending some 60 miles into the southern end of Kyushu, the most southerly of the four main islands of the Japanese archipelago. Growth of young pine trees mark the course of old lava flows from the two main craters of the summit.

### Warning of Sakurajima Outbreak.

Prior to the eruption of 1914, 18 villages, with an aggregate population of 22,000 industrious farmers and fishermen, nestled on the shores of this small volcanic island, which nearly filled the bay between Kagoshima and the Osumi promontory. The channel between the volcano and the city was barely two and one-half miles wide, with a depth of from nineteen to seventy fathoms, while that on the Osumi side was only one-third of a mile wide, with an average depth of more than fifty fathoms. Kagoshima, the thriving capital city of the province, with a population of 70,000, is the center of Satsuma pottery manufacture and of a fertile farming region, producing tobacco, citrus fruit, and sugar cane.

Men of science had long known what lay in store for Kagoshima. Experience had taught observers that when "swarms" of earthquakes begin in the vicinity of an active volcano, the "underground dragon" is writhing and preparing to make trouble.

In 1900 and 1910 two writers published warnings that Sakurajima was likely to erupt explosively after violent premonitory earthquakes.

Rainfall during 1913 at Kagoshima had been unusually light, as had been the case ten years and twenty years previously, each of those dry years

having been followed by some activity in one or more of the volcanoes on the island of Kyushu. Violent eruptions began in 1913, not at Sakurajima, but on Kirishima, where there were three outbursts, the last two being on November 8 and December 9.

On Sakurajima, however, earthquakes began to occur in "swarms" and people began to jump. Three strong shocks were felt on the afternoon of January 10, followed in the evening by two more. The next morning there were three strong shocks, accompanied by rumblings, before sunrise. The earthquakes now became increasingly alarming. Growling noises preceded some and a roaring, as of escaping gas under pressure, followed others.

### People Flee From Eruption.

Four hundred seventeen earthquakes were recorded at Kagoshima between 4 a. m., January 11, and 10 a. m., January 12, after which the main eruption of Sakurajima began. Counting the shocks of the 10th, which had begun about 1 p. m., there was immediate forewarning in noises and shakes for 45 hours prior to the explosion.

These warnings were heeded. Every available sampan sculled with frantic speed back and forth across the channel all day Sunday, January 11, moving the natives of the island, their bedding, mats, rice bays, and canary birds, to the mainland. By Monday the army, navy and other government departments, railways and steamship lines were all helping. Sunday afternoon, about two o'clock, during a period of violent quaking, a report came from Tarumi, southeast of Sakurajima, that white smoke was seen rising from the middle of the volcano. The Monday period of seismic activity was strikingly terminated and relieved by the volcanic outbreak of ten o'clock.

The climax came at 10:05, when, in the middle of the side of the mountain toward Kagoshima, the awe-stricken people saw the hard profile of a swelling balloon of black smoke rise majestically from the ground where, an hour before, were orange orchards, terraced fields of sugar cane, and gardens of radishes. Ten minutes after the first outbreak a similar cauliflower column rose from the east flank of the volcano, but this was dwarfed by the towering western shaft with which it eventually merged.

With occasional lulls, but with ever-increasing violence, the booming concussions of the eruption grew more and more terrible. Flashes of lightning danced through the great billows of smoke and dust, and, in the lower portion of the great, black column, vertical lines of upward streaming rocks, bombs, sand, and smoke, curling as high as the mountain itself, could be seen from time to time.

### Fatalities in Kagoshima.

The crisis, which resulted in the only loss of life during the disaster, occurred at 6:29, when a terrific earthquake threw down walls and buildings at Kagoshima, dislodged bowlders from cliffs, and interrupted railway and telegraph services. Fugitives were trapped in landslides, and a tidal wave, with a ten-foot swing, caused serious damage to small boats in the harbor. Thirty-five persons were crushed to death and 112 were injured.

This quake is to be classed as a "world shaker," for it was recorded on seismographs in Europe.

The lava flows from the volcano had begun and the gas explosions had relieved the under earth of millions of tons of matter, so that this quake was probably the evidence of a deep movement, or settling, that had begun along the great chain of Ryu-Kyu volcanoes, extending from Kyushu to Taiwan (Formosa) in a string of islets 900 miles to the southwest.

Simultaneously with the occurrence of the big quake a sudden lava glow was observed on the smoke coming from the volcano. This continued for some time.

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By MAE MARTIN



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