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**Note on the Eruptions of the Unsen-daké
in the 4th year of Kansei (1792).**

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The eruptions in the 4th year of Kansei (1792) of the Unsen-daké which stands on the peninsula of Shimabara, in the province of Hizen (Kyushu), extended over a period of nearly 4 months. They were preceded, for several weeks, by a number of small shocks, which caused some landslips from mountain slopes; the first eruption having taken place on Feb. 12, 1792, at midnight, near the top of the Fuken-san (1478m above the sea level), one of the highest peaks of the mountain. Subsequently there were several eruptions from different neighbouring places, attended by numerous detonations and earthquake shocks. Of the latter, those on April 21st and 22nd (March 1st and 2nd, Lunar Calendar) were the strongest, causing in the town of Shimabara some damage to buildings and cracks of the ground about 1 inch in width. The final catastrophe occurred at about 6 o'clock in the evening of May 21st, (April 1st, Lunar Calendar), when two violent earthquake shocks took place, and the entire southern slope of the Mae-yama (876m above sea level), which is opposite the town of Shimabara, slipped down, producing an immense avalanch of rocks and earth. The latter quickly descended into the sea of Ariaké, which separates the Peninsula from the province of Higo,

causing a considerable change in the topography of the harbour. Amongst others, three small islands were wiped out of existence, and several dozen others newly created. Simultaneously with the landslip, great sea waves were formed, which rolled in along the shore and attained at some places a height of 20 to 30 feet, causing devastations among 17 villages along the eastern coast of the Peninsula for a distance of 77 km. The number of the casualties on this side of the Ariaké Sea amounted to 9,745 persons killed and 707 persons wounded, besides 496 cattle and horses. The sea waves produced also a considerable amount of damage on the eastern shores of the Ariaké Sea, namely, in the counties of Akita, Udo, and Tamana, of the province of Higo, where the total number of persons killed amounted to 5,100. Along the coasts of the Amakusa Islands, 343 people were drowned. Earthquake shocks continued to happen for the next two months.

The local earthquakes which accompanied or preceded the eruptions of the Unsen-daké were not very destructive, but much severer than is usually the case with volcanic *explosions*. In these latter cases, as with the recent outbursts of Japanese volcanoes, namely, Bandai-san (1889), Azuma-san (1893), Adataro-san (1900), and Tori-shima (1902), the phenomenon is purely that of a steam explosion, and the volcanic force is mainly spent in blowing and projecting mountain masses, only a small amount of the energy being transformed into earthquake vibrations. On the other hand, in eruptions like those of the Unsen-daké, which were attended by no gigantic explosion, the subterranean volcanic energy would be in a great measure spent in causing mechanical vibrations, resulting in comparatively severe earthquake shocks.

The cause of the great Shimabara sea waves seems to have been the disturbances of the waters by the enormous quantity of

rock and earth masses thrown into latter. Thus the volume of the *debris* was roughly 0.55 cubic km, or equivalent to an area of 550 square km, with a thickness of 1 metre. Such an area is nearly equal to that of the Ariaké Sea, which is an inland body of water included between the two provinces of Hizen and Higo, and the volume of the *debris* thrown suddenly into the sea seems to be sufficient to produce an initial displacement of the surrounding water masses, the disturbances thereby created being propagated to the different parts of the shores, where tidal waves were formed. The great landslips from the Mae-yama was evidently the effect of the local but violent earthquake shocks.

Instances exactly similar to the Unsen-daké eruptions are not rare. Thus, the eruption in 1868 of Mauna Loa, in the Island of Hawaii, began on March 27 of that year. On April 2, there took place a severe earthquake shock, which did some damage to buildings in the vicinity, causing at the same time, a landslip of an enormous quantity of soft clay from the head of a ravine called Kapapala at the south-eastern flank of the mountain. This produced a mud stream, half a mile in width and about 30 ft. in depth at the centre, which descended into the sea in the interval of only a few minutes, over a distance of 3 miles. The result was the immediate formation of large sea waves, which rolled in along the shore of Kau district, attaining a height of 40 to 50 feet.

The sea waves attending the great eruptions of Krakatoa in 1883 were also probably caused in a measure by the ejection of the rock masses into the surrounding sea waters.