

intensity in their overtones. There may be a difference in number, but this does not appear to affect the question of whether the tones of the string form an appreciable part of the consonant note of the violin.)

If a vibrating tuning-fork is placed in contact with the wood of a violin, the instrument reinforces the tone of the fork; but the vibrations of the wood are here much less powerful than in the case of the string, and consequently the instrument only feebly asserts its own *timbre*. A very ordinary violin will reinforce the tone of a fork almost as perfectly as a masterpiece of Cremona.

I therefore take it that the reinforcement of the tone of the fork is chiefly the result of resonance, and that the intensity of the tone of the violin is due to the reinforcement of the tones of the string itself by resonance, *plus* the reinforcement contributed by the tones of the pine and sycamore, and that the latter determine the *timbre* of the instrument.

The tones of the pine and sycamore are also reinforced by resonance, in the same way as those of the string.

June 2.

W. B. COVENTRY.

The "Armorl" Electro-Capillary Relay.

ON p. 129 of vol. lxxv. of NATURE, a description is given of an electro-capillary relay. The writer states that the actual apparatus was not seen by him, "but only a working model." It would be highly interesting to know the exact meaning of this expression. Does it mean a model which *will work*, or only a model in which the different parts of the apparatus are shown, say, in wood or cork or any other substance. In the illustration, the mercury when acted on electrically is shown as moving the lever of a relay. A well-made capillary electrometer is highly sensitive to a small change of potential, but the movement of the mercury column is so minute that it is very difficult to see how any lever of a relay could possibly be worked by means of its movement. Some further information about the "Armorl" relay would, I feel sure, be acceptable to many, showing the potential difference required to cause the mercury to work the lever *k*, and also the approximate E.M.F. set up at, say, ten miles from the sending station of a wireless telegraphic system.

J.-S.

Prehistoric Pygmies in Silesia.

UNDER the above heading, Prof. G. Thilenius, of the University of Breslau, has recently (*Globus*, Bd. lxxxi. No. 17) made an important contribution to European ethnology. His deductions result from an examination of a quantity of osseous remains preserved in the Museum of Silesian Antiquities at Breslau, consisting of four groups obtained at different sites in the region between Breslau and the Zobten. They are, unfortunately, very fragmentary; but it has been ascertained that they are the remains of a number of persons of both sexes, all adult and all of very short stature. The mean height of one group is about 4 feet 8 inches (1.429 m.), of two others about 4 feet 11 inches (1.496 m.; 1.506 m.), and of the fourth about 5 feet (1.523 m.). With these Prof. Thilenius compares the remains of the Swiss pygmies described by Prof. Kollmann, of Basel, who estimates their height as ranging between 4 feet 5½ inches (1.355 m.) and 4 feet 11 inches (1.499 m.), and comparison is also made with the similar remains found at Egisheim (in Lower Alsace, near Colmar), which belonged, according to Herr Gutmann, to people whose stature ranged from about 3 feet 11 inches (1.200 m.) to something under 5 feet (1.520 m.). Further, the museum at Worms furnishes the remains of an individual of the estimated height of 4 feet 9 inches (1.445 m.). In all these cases, the bones show no trace of any pathological degeneration, and the consequent inference is that they represent a special race of low-statured men, or dwarfs. Profs. Kollmann and Thilenius seem to prefer the term "pygmy" as most appropriate in denoting a special race, "dwarf" (*Zwerg*) being regarded as applicable to abnormal specimens of a race of ordinary size. Most writers, however, make no such distinction; and, indeed, "pygmy" is far from being strictly accurate when applied to people of 4 or 5 feet in height. Prof. Windle states that a people may be described as "pygmy" in which the average male stature does not exceed 1.450 m. (4 feet 9 inches).

Prof. Thilenius gives a wide range for the period in which those little people lived. While those of the Rhine valley are placed far back in time, some of the Silesian dwarfs are

NO. 1702, VOL. 66]

assumed to have been contemporaneous with the Romans and the Slavs, the most recent being placed at about a thousand years ago. But, before arriving at anything like a final conclusion on any of the questions relating to the mid-European pygmies, Prof. Thilenius desires a much greater accumulation of evidence in the shape of skeletal remains, and there is good reason to hope that this will be forthcoming in due time. Most of our information on the subject has been obtained within recent years, and fresh evidence can hardly fail to present itself to investigators in the future.

DAVID MACRITCHIE.

Flames from Mud on a Sea-Shore.

WE should like to draw your attention to the following spectacle which some of us witnessed on the sea-shore at Blundellsands on Thursday evening, June 5, at about eight o'clock.

The evening was dull and grey, a strong north-westerly wind was blowing in from the sea and the tide was flowing in. In the distance we first saw smoke with frequent jets of fire bursting forth from the mud of a shallow channel. Drawing near, we perceived a strong sulphurous odour, and saw little flames of fire and heard a hissing sound as though a large quantity of phosphorus was being ignited. It was impossible to detect anything which caused the fire, only the water where the flames appeared had particles of a bluish hue floating on the surface. The area over which the tiny flames kept bursting forth was about 40 yards.

A gentleman present stirred up the mud with his walking-stick, and immediately large yellow flames nearly 2 feet in length and breadth burst forth. The phenomenon lasted some time, until the tide covered the part and quenched the fire. As we returned from our walk the atmosphere was impregnated with a strong odour of sulphur. An old resident of Blundellsands, who also witnessed the sight, said he had never before seen anything of a similar nature.

H. T. DIXON.

9 Agnes Road, Blundellsands, near Liverpool, June 8.

Cuckoo's Egg Thrown out of Bunting's Nest.

ON the morning of May 25 I found a nest of the reed bunting (*Emberiza schoeniclus*) with a cuckoo's egg in it besides three eggs of the bunting itself. When I took some friends to see it two or three hours later, the hen bird was sitting on the three eggs, but the cuckoo's egg was lying smashed outside the nest. It is impossible that any person could have broken it, for there were no traces of bootmarks in the soft mud on the side of the dyke where the nest was, besides it being very unlikely for anyone to have passed the spot during the short time I was away. It would interest me to know if any of your readers are acquainted with cases of small birds pitching the cuckoo's egg out of the nest instead of hatching it in the orthodox style.

Higham, May 27.

T. G.

VOLCANIC ERUPTIONS IN THE WEST INDIES.

IN the notes already published relating to the disasters which so recently overwhelmed Martinique and St. Vincent, reference has twice been made to the possible connection between seismic efforts and displays of volcanic activity. In connection with this, it has been suggested that had the sudden movements which on April 19 shattered cities in Guatemala been postponed, Mont Pelée and La Soufrière might still have been quiescent. By this it is not intended to convey the idea that if we take earthquakes generally and compare the registers of the same with the registers of volcanic eruptions we shall recognise any direct connection between the two. In Japan there are annually at least 1000 distinct earth shakings, but years may pass without the record of a volcanic eruption. Mount Fuji in that country has remained quiescent for the last 195 years, during which period it has been shaken at least 15,000 times, but in spite of this repeated aggravation the *mons excelsus et singularis* of Dai Nippon still watches peacefully over thirteen provinces round its base.

Like many other mountains in the world, if we may rely upon the records of its past history, it is yet engaged in raising steam, and when by this process the volcanic strain has sufficiently increased, some unusually large relief in seismic strain—even at a distance—may be the ultimate cause of a renewal of its activity. Volcanoes, like mines, require to be charged before they can be exploded, and the final cause of such explosions seems at times to be connected with bodily movements of their foundations, which movements may originate locally or be the *propter hoc* of corresponding disturbances originating at a distance. The shiverings which constitute local earthquakes, which are so frequent throughout the world, play but little part in these violent awakenings, and the giants sleep whilst humanity may be terrified.

To see how far such a view is sustained let us turn to the volcanic history of the West Indies. First of all attention may be directed to the fact that the volcanic activity of these islands is confined to the Lesser Antilles, from St. Martin in the north to Grenada in the south. In the larger islands, which run approximately east and west, like Cuba, Jamaica, Dominica and Puerto Rico, although there are volcanic rocks and hot springs, volcanoes proper do not exist. What we have to deal with are the peaks of "Antillia," now represented by a suboceanic ridge about 500 miles in length.

The following notes, derived from Fuchs' "Vulcane und Erdbeben" and other sources, may be taken as a summary of what is generally known respecting the vulcanicity of these outcrops. Although it is imperfect, yet it may suffice to illustrate the hypothesis that world-shaking earthquakes may be closely followed by volcanic outbursts.

Grenada.—The island is practically built up of two mountains which are joined together. The crater of Grand Etang is filled with water. Morne Rouge is built of ashes. The greatest height is 2749 feet. It contains hot chalybeate and sulphurous springs.

St. Vincent.—In 1718, on the night between March 6 and 7, a piece of land rose from the sea and then sank. There was a furious hurricane on April 24, and Morne Garou (La Soufrière) erupted. From 1718 to 1812 this mountain was quiescent, but in the latter year it erupted, changed the form of its crater, and its ashes fell in Barbados. The last violent eruption was on May 7, 1902. The intervals between eruptions have, therefore, been ninety-four and ninety years.

St. Lucia.—Qualibou, 1800 feet. At present this is in the solfataric stage. In the large crater there are small lakes, and sulphurous gas and steam escapes. It erupted in 1766. The highest peak is 2117 feet.

Martinique.—Mont Pelée, 4438 feet. It erupted at the end of the eighteenth century, on August 5, 1851, and lastly on May 8, 1902.

Dominica.—Here there are many solfataras. The highest peak is 4747 feet.

Guadeloupe.—The "Grand Terre," or the eastern side of the island, is not volcanic. Soufrière de Guadeloupe (4869 feet) erupted in 1778, 1797, February 1802, 1812 and 1836.

Montserrat.—The Soufrière is volcanic. On November 29, 1896, 20 inches of rain fell, and this was followed by many small earthquakes. For forty years before there had been but few noticeable shocks. Since the rainfall the springs give off more gas, and silver is blackened three miles away.

Nevis.—Sulphurous vapour escapes from the crater.

St. Christopher (St. Kitts).—Mount Misère erupted in 1692. At present there is a lake in the crater.

St. Eustatius.—The volcano is apparently extinct and covered with vegetation.

The eruptions we have to consider are therefore those of the years 1692, 1718, 1766, 1797, 1802, 1812 (two), 1836, 1851 and 1902 (two).

We will now compare these with seismic disturbances of which more detailed accounts are to be found in Mallet's Catalogues of Earthquakes, published in the Reports of the British Association 1852-1854, and in Lyell's "Principles of Geology."

NO. 1702, VOL. 66]

1692.—June 7, between 11 a.m. and noon, Port Royal in Jamaica was destroyed. A piece of land of more than 1000 acres sank, carrying with it buildings and their inhabitants beneath the sea. There was great disturbance in the ocean, and houses throughout the island were shaken down. Mountains were shattered and a lake created. This was accompanied by the eruption of St. Kitts.

1718.—As already stated, this eruption in St. Vincent was accompanied by a "very violent" earthquake.

1766.—March 9, Island of Antigua, a violent shock. March 17, Island of Grenada, a violent shock. June 11 (midnight), Jamaica, especially at Port Royal, also at Cuba. In Jamaica a violent shock lasting one and a-half minutes. In Cuba it lasted seven minutes, and the shocks recurred up to August 1. July (middle of month, during the night), Ste. Marie, S. America, very violent shocks, followed by slighter ones every day up to July 21. August 13 (10 p.m.), Island of Martinique, an earthquake during a terrible hurricane. August (towards end of month), Island of Martinique, another and very violent shock. August 18, Guadeloupe. August (end of month), Cuba, an earthquake, City of St. Jago overturned. October 6, Island of St. Eustache, an earthquake accompanied by a hurricane. Very violent shocks. In the territory of Caraccas they recurred hourly (probably only at first) for fourteen months up to the end of 1767. According to tradition, the shocks were simple horizontal oscillations. At Surinam there were two other violent shocks felt besides the one here mentioned, viz. on the 24th at midnight and on the 27th at 7 a.m. October 21, 3 a.m., Cumana and Caraccas in New Granada, S. America; also Island of Trinidad; also Surinam and all N.E. portion of S. America. The whole of the city of Cumana was ruined. Eruptions of sulphurous water frequently occurred, especially about Casanay, two leagues east of Coriaco. The inhabitants lived in the streets for the two years 1766-67. The Indians celebrated by feasts the approaching destruction and subsequent regeneration of the world. During these shocks a little island in the Orinoco sank and disappeared beneath the waters, and in many places disturbances of the surface were produced. The first and third of the shocks at Surinam were attended with subterranean noise, as were the shocks at the mission station of Encaramado. December 12, Martinique, a slight shock.

1797.—February 4, 7.45 a.m. On this date there was a destructive earthquake in Quito, in which 40,000 lives were lost. A great extent of country was shaken, and the ground about Tanguragua opened into enormous clefts, from which water and stinking mud (moya) issued. The mountain itself remained quiet, but the smoke from Pacto, seventy-five leagues distant, disappeared suddenly.

About this time a series of shocks began in the Lesser Antilles, and these did not cease for eight months, until the eruption of the volcano in Guadeloupe on September 27 "put an end to them."

1802.—On February 2 there was a "severe shock" in Antigua, whilst in Guadeloupe there were vibratory shocks accompanied by an eruption. Shocks were felt in the west Indian islands during February and March.

1812.—On March 26 of this year Caraccas was utterly ruined, and 10,000 of its inhabitants perished. Shocks continued until April 5. The waters of Lake Maracaybo were lowered, and Mount Silla is said to have lost 300 to 360 feet of its height by subsidence. On April 24 St. Vincent erupted, the noise of which was heard as far as Caraccas. Preceding this eruption, in St. Vincent and in the West Indian islands there had been very many shocks. In St. Vincent more than 200 had been noted. Another tremendous earth disturbance, took place before this eruption commenced on November 16, 1811, in the valley of the Mississippi, Ohio and Kansas. The ground was raised or lowered, and about New Madrid shocks occurred almost hourly for months and continued until the date of the Caraccas earthquake.

The eruptions in St. Vincent and Guadeloupe appear to have been closely associated with two unusually large seismic disturbances on the neighbouring American Continent.

1835.—On February 20 an earthquake was felt for nearly 1000 miles along the coast of Chili. Many towns were destroyed and the coast was elevated from 1 to 10 feet. Up to March 4 300 shocks were counted. A submarine volcano broke out near Bacalao Head, and the Andes for a distance of 1300 miles were before and after the convulsion in an unusual state of activity. In November of this year Conception was severely

shaken, and on the same day Osorno, at a distance of 400 miles, renewed its activity. "These facts," says Lyell, "prove not only the connection of earthquakes with volcanic eruptions in this region, but also the vast extent of the subterranean areas over which the disturbing cause acts simultaneously." In 1836, on June 22 (or May 22-23) different places in Central America were shaken, and this was accompanied by the eruption of a volcano east of Omoa. In this year there was an eruption in Guadeloupe.

Without continuing these extracts further, it seems that the sequence of events which has recently taken place since the catastrophe in Guatemala on April 19 is but a repetition of very similar sequences which have taken place in the same quarter of the globe during the past two hundred years. The Antillean range is apparently one that is extremely susceptible to seismic disturbances originating at a distance, and that it may be so is suggested by its recent geological history. According to Dr. J. W. Gregory, when the Isthmus of Panama was submerged it is possible that "Antillia" existed connecting North and South America, and the Caribbean Sea was then a gulf of the Pacific. In Lower or Middle Miocene times this was submerged, and abyssal ooze was deposited which are now raised in the Barbados to a height of 1095 feet above sea level. The magnitude of these movements and their rapidity, which has often been referred to by the opponents to the theory of the permanence of continental masses and oceanic basins, indicate that we have in the Antillean ridge a line of weakness characterised by unusual instability, and it is in all probability this instability which renders the Windward Islands so responsive to hypogenic changes in the neighbouring continent.

Seismic Disturbances.

The earthquake recorded at Shide on May 8, commencing at 2h. 49'5m. a.m., was also recorded at Kew, Bidston, Edinburgh and Potsdam. The times of maximum motion at Shide, Kew and Bidston were 3h. 21'7m., 3h. 18'2m. and 3h. 23m.

The time taken for this movement to travel from the West Indies to Kew would be about 37 minutes. The local time of origin in the West Indies would therefore be May 7, 10.37 p.m. This time, calculated from other data, was given in NATURE, May 29, p. 111, as being about 10.33 p.m. Two other seismograms relating to this disturbance as recorded at Shide have not yet been examined. When this is done more certainty respecting this time is to be expected.

Assuming the clock in St. Pierre, which stopped at 11.50 (or 7.50 a.m. local time) to have been correct, this earthquake took place about twelve hours before that event occurred.

It is curious that although this earthquake was noted in Potsdam it does not appear to have reached Laibach and certain other European stations.

At Shide a slight earthquake was recorded on May 25 about 5.28 p.m., and a second shock at about 4.20 next morning. They are both small, and the relationship between the preliminary tremors and maximum motion is too ill defined to state definitely the distance at which they originated.

J. MILNE.

RECORDS AND RESULTS OF RECENT ERUPTIONS.

SEVERAL interesting observations and records connected with volcanic eruptions and earthquakes have come under our notice during the past week. As has already been remarked, the exact cause of the sudden destruction of the inhabitants of Martinique after the eruption of Mont Pelée is a little difficult to determine. Witnesses who were on the *Roddam* in the bay of St. Pierre at the time of the disaster on May 8, state that when the eruption occurred the vessel was struck with such force by the material

ejected that she was nearly capsized and seemed to be enveloped in "a whirlwind of fire." Apparently what burst from the volcano was highly heated gas carrying with it immense quantities of white-hot volcanic ash. The vessel eventually reached the harbour of Castries, St. Lucia, and a survivor gave a correspondent of the *Times* the following account of his terrible experience:—

No human being could stand against that terrific deluge of molten ashes. Even those who reached the cabin or hold did not escape, almost every nook and cranny of the ship being filled with the blazing dust. Captain Freeman sought shelter in the chart-room, but, the portholes being open, the fire streamed in and burnt him badly on face and hands.

The heat was awful, for the mass of ashes which poured into the ship all aglow still retained its heat, and it was only with great difficulty and caution that it was possible to move about at all.

When the ship reached Castries, every part was found to be covered thickly with volcanic ash. More than 120 tons of ash were taken from the ship, and as this was precipitated in a white-hot condition it is remarkable that anyone passed through the burning storm alive.

The eruption of the Soufrière of St. Vincent was accompanied by the same kind of "hot blast" as that of Mont Pelée. Many victims of the St. Pierre disaster bore no outward sign of injury or scorching, but after autopsy they were found to have been burnt internally. A *Daily Mail* correspondent at St. Vincent records, from the words of a survivor, how most people died:—

A dark cloud came from the Soufrière about 4 p.m., and a fine leaden powder penetrated doors and windows and filled the air. People breathed it in, and it was so hot it burnt the flesh. The people in the house began to cry out, and struggled, shouting for water, and placing their hands on their stomachs. They gasped, fainted, and died. All was over in three minutes. It is said that this hot blast killed most people, and wherever the powder touched people it burnt their flesh.

Prof. A. E. Verrill states in *Science* the opinion that the ejection of explosive gases was one of the causes of the sudden destruction of life in the Martinique eruption. His view is as follows:—

The heat was sufficient to cause the dissociation of hydrogen and oxygen from the water on coming suddenly into contact with highly heated lava, and in case of sea-water the chlorine would also be dissociated from the sodium. These gases suddenly ejected with great violence and exploding in the air, above the crater, would produce precisely the effects witnessed on an unusually large scale at Martinique. The people were mostly killed by the sudden explosion of a vast volume of hydrogen and oxygen, which will account for the sudden burning of flesh and clothes, as well as of the buildings and vessels. The chlorine, at the same time, combining with some of the hydrogen, would produce hydrochloric acid, a poisonous and suffocating gas, which would quickly kill most of those not instantly destroyed by the explosion.

As to the changes which have occurred at St. Vincent, it is reported that a party of American investigators who ascended the Soufrière found that the lake had disappeared, leaving a cavity 2000 feet deep. Vapour was still issuing from the new crater.

The Imperial Commissioner of Agriculture for the West Indies has informed Kew that the botanic station and agricultural school in St. Vincent are untouched beyond a fall of volcanic dust.

It is reported in the *Barbados Advocate* that the volcanic ash is adding to the difficulties of sugar-making. The dust is everywhere. It has worn some mill-rollers so smooth that they can hardly draw in the canes. In places the machinery is much injured, and everywhere the dust gets into the juice and has to be strained out, flannel bags having to be used to strain the liquor. On the evening of May 19 a fine dust of a light grey colour was observed to be falling on the Oxford plantation, and it was conjectured that it came from Mont Pelée, in Martinique.