

children than some that are indulged in. These I believe to be the views of nearly all teachers as well as those of myself, who am but a

SCHOOL TEACHER

December 8

The Tokio Earthquake of October 15, 1884

At 4h. 21m. 54s. a.m. the inhabitants of Tokio were awakened by a sudden and violent earthquake. In Yokohama, which lies about sixteen miles south-west by south from Tokio, the disturbance was noted at 4h. 21m. 38s., that is to say, sixteen seconds before it was felt in Tokio. The chief source of error in these time-records—if error exists—will probably be due to observers at different stations having noted time at different portions of the disturbance, the length of which, as determined by the sensations of those who made the records, was about one minute, but, as recorded by a seismograph, between five and six minutes. At the commencement of the disturbance four complete waves were described in three seconds, but at the end of the disturbance the motion became so slow that each wave occupied from two to three seconds. From a record taken by Mr. K. Sekiya, a gentleman whose especial duty it is to attend to the earthquake phenomena of this country, it would appear that the maximum range of motion may have reached 42 mm. The maximum acceleration per second per second was about 500 mm., that is to say, the intensity of the earthquake or its destructive power was similar to that which would be experienced by a building standing on a carriage which was suddenly caused to move with a velocity of about one foot and a half per second, or if, such a carriage having gradually acquired such a velocity, it had been suddenly arrested. The result of the earthquake was to overturn a few chimneys in Yokohama and to crack one or two in Tokio.

Our last severe earthquake was on February 22, 1880. On that occasion in Yokohama very many buildings lost their chimneys and were unroofed, whilst in Tokio the damage was chiefly confined to loosening tiles and shaking down plaster. Had our buildings in Japan been constructed like those in England, it is probable that this last shake would have caused about the same amount of damage as that which was so recently caused by the late disturbance in Essex. From the observations on direction, coupled with what has been said about time, it seems that the earthquake had its origin in Yedo Bay, at or about the same point as that which was determined for its severe predecessor.

It may here be remarked that nearly all the heavier earthquakes which are felt in Tokio and Yokohama practically have had a common centrum. They are not large earthquakes as measured by the area shaken, but they are severe because we are near to their origin.

The earthquake of 1880, according to a record furnished by one of Palmieri's instruments, had an intensity of 78°, whilst the recent earthquake, the actual intensity of which, as deduced by its destructive effect, was much less, is given as 95°.

These intensities measured in degrees really indicate the height to which a certain quantity of mercury in a bent tube was caused to wash—the height of the “wash” being measured by the turning of a pulley connected by a string to a small weight floating on the surface of the mercury. It would seem evident that the magnitude of the records obtained in this manner must among other things depend upon the duration of the earthquake, the period of its waves, and the depth of the mercury contained in the tube. For reasons such as these, records like those just given cannot be regarded as anything more than roughly approximative.

In connection with the remarks made on the amplitude it may be stated that the seismograph by which the record was taken was situated on soft soil in the flat portion of Tokio. This amplitude, had it been recorded on the hard ground of a hill, probably would not have exceeded 25 mm.

One of the most remarkable points connected with this disturbance were the changes in level as observed by the displacement of specially arranged pendulums, which took place before the shock, and again about six hours afterwards.

J. MILNE

Large Meteor

ONE of the largest meteors that I have seen for some years appeared at 7h. 15m. 15s. this evening. It began as a speck, north of Vega, at about 4° greater altitude than that star. The course was perpendicularly down, only disappearing by passing

below the horizon. It was 2° east of Vega on descending to the altitude of that star, and by that time had increased to fully a quarter the apparent size of the moon, and this size it maintained whilst above the horizon. The colour was an intense blue, and there was left a streak of orange-red elongated separate stars in its track, and this streak was about 1° in length, although the separate stars of which it consisted disappeared almost as rapidly as they were formed. The stars, like the meteor, increased in size and brilliancy from a mere point, and instantly vanished on attaining their maximum brightness. Each moved perpendicularly down for the length of about half a degree, and left a continuous momentary streak. None of these stars were seen within half a degree of the meteor, and their ignition was confined to the centre of the meteor's path. Their size was tolerably equal, being about that of a second-magnitude star. The speed of the meteor was unusually slow, it being visible for nearly six seconds. The shape was circular in front and cuneate behind (bluntly conical). Its brilliancy was great, considering the presence of a nearly full moon.

Shirenewton Hall, near Chepstow,
December 4

E. J. LOWE

The Cost of Anthropometric Measurements

ALLOW me to correct an absurd typographical blunder in the account of my anthropometric laboratory at the Healtheries, which appears in Mr. Ernest Hart's lecture at the Society of Arts. It originally occurred in the *Journal* of the Society of Arts, whence it was copied into your columns (p. 142) last week. The effect of the error to which I refer is to make the statement that the cost of measuring each person at the laboratory in seventeen different ways was 3*l.*, whereas it should have been 3*s.* The subsequent argument, based on the extreme cheapness of the process, becomes in consequence unintelligible. I write myself to make the correction, because the part of Mr. Ernest Hart's address which refers to the anthropometric laboratory was written for him, at his request, by myself. I regret I had not an opportunity of revising it in proof.

FRANCIS GALTON

The Northernmost Extremity of Europe

As “a Norwegian” now fully admits that the pretended discovery of Capt. Størensen is no discovery at all, but an elementary fact well known and long known to Norwegian geographers, I need not discuss that question any further, but I must protest against his reference to Sönsberg's “Norge,” which is the joint production of some of the most eminent men in Norway. Sönsberg is the *editor* and *publisher*.

Amongst the writers who have co-operated to produce the national “Handbook” are the following:—Lieut.-Col. Broch, Chief of the Geographical Survey of Norway (he is the largest contributor, and the writer of the words I quoted), Prof. H. Mohn, Prof. T. Kjerulf, Prof. Rasch, Prof. L. K. Daa, Sörenskriver, H. Thoresen, J. B. Halvorsen (the well-known writer), Beaureauechef Kjer, and Secretary Mohn, Th. Bøeck (Royal plenipotentiary), J. N. Prahm, Capt. Scharffenberg, E. Mohn, Lieut. Flood, Capt. Overgaard (the Inspector of Forests), Hörbye, Lieut. Langeberg, and Mr. Langeberg, K. Lassen, Dr. Kahrs, Lieut. Sölem, O. T. Olsen, Capt. Bang, Capt. Haffner, and Sörenskriver Nannestad.

All these names are given in the preface, and the contributors of each carefully specified. This was known to “A Norwegian” when he wrote his last letter, for he refers to that same preface, and yet asserts that Sönsberg “never claimed the least geographical authority for a faulty and crude guide to tourists” (his own italics). That preface is written for the express purpose of claiming such authority and thanking the authors. It makes special claim in a special paragraph of the geographical authority of the “head of the Geographical Survey,” Lieut.-Col. Broch, whose name, Sönsberg says, “offers a sufficient guarantee of correctness.”

The anonymous “Norwegian,” in further disparagement of the book, states that in this preface “the author himself says that for reasons explained it has many faults.” I will quote this very damaging confession. It is as follows:—“A few errors and misprints will be found here and there.” A list of them is given. After this the flippant misrepresentation of my pretensions in the last paragraph of the letter is not surprising, and demands no further notice.

I make this protest, knowing that NATURE is largely read by