## RAPID ELEVATIONS: A SELF-CRITICISM.

SIR,—In the GEOL. MAG. for 1892 (p. 405), I published a note on the possible effects from Rapid Elevation of submerged lands, in reference to Prof. Prestwich's paper on the Rubble Drift of southern England. In it I said: "Most violent Japanese earthquakes exhaust their potency in vibrations measured by inches or less." I am not aware that any measurement of vibrations have, even now, given any larger values. But after reading a paper by Prof. Koto on the great Japanese earthquake of October, 1891, it does not seem correct to say that their potency is exhausted in small vibrations. Prof. Koto gives both descriptions and photographs of effects from this prodigious convulsion, and these include the formation of a visible fault-line more than 70 miles long, with a relative horizontal displacement of its two sides along its direction, of from 3 to 6 or even as much as 12 feet in length, and with a relative vertical displacement producing a step along the fault, whose height sometimes reached 20 feet.

Prof. Koto gave attention to the question whether this step was due to a rise of the region on one side, or a fall of that on the other. We might expect that the effects on watercourses would have afforded a criterion; however, he judges that the evidence is insufficient for a decision. He regards fall as more probable, but mentions that, while in general the western side of the fault is lower, along one portion it is higher, and concludes that here at any rate must be an uplift, for which accordingly he conjectures an explanation. His conclusion is natural and probable. Still it is not quite impossible that the cause of the dislocation may here have changed sides of the fault. If water be drawn off from a frozen canal, the sinking ice breaks with a longitudinal crack; but we should not be surprised to find the two sides of the crack irregular in their relative levels. Prof. Prestwich's theory assumes rapid elevations. The throw of this fault is thus not proved to be an elevation. Also how rapid was it? This most interesting question does not seem to have occurred to the investigator. He describes a great shock, followed by less intense repetitions so numerous that 100 were counted during the remainder of the day, and 300 in the day following. Their frequency diminished, yet so gradually that after the lapse of a fortnight they still averaged more than one per hour. Surely these numerous disturbances had a share in the visible effect. What part was produced by them, what part by the great convulsion? How nearly was the change "instantaneous?" The slope of the fault-step is described as being the angle of repose of the material; but this would be the natural result of frequent shocks, and affords no argument as to the change being a single effect. Any evidence on this subject would be most interesting and valuable.

It appears, then, that this Japanese Earthquake does not afford an undoubted instance of such a Rapid Elevation as Prof. Prestwich's theory assumes. Nevertheless the argument in my note against the credibility of the theory is weakened, for one of my main data is now not unquestionable.

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