annually. But the annual precipitation amounts to one foot. If we suppose this to be formed during the winter, then the heat given off in winter by radiation is as much as would evaporate one foot.

Radiation goes on in summer as well as in winter, indeed more actively, as then temperatures are higher. This has to be compensated out of the heat then being received. Thus, out of the heat received during summer, as much as will evaporate more than one foot of ice is spent simply in replacing the heat being radiated away. The heat ultimately left will scarcely be sufficient to evaporate the one foot of ice which we had to account for. Thus even neglecting the effects of the fall of temperature far below freezing-point in winter, the interception of solar heat by fogs in spring, and other possible causes, it is still conceivable for the calculated heat to fall on Greenland, and yet not dissipate so much as the observed amount of ice.

The above calculation gives some idea of the diverse results which may be obtained when we reason on uncertain assumptions. The heat given off in forming a foot of snow or ice out of vapour, if applied to changing snow or ice back merely into water, would liquefy nearly eight times as much. Whether solar heat would melt or evaporate the ice into which it entered probably depends on the dryness or dampness of the air. This suggests, what I have often thought probable, that to know better the laws of winds might be very helpful in the study of Glacial Periods.

The suggestion of Dr. Roberts's lucid letter, that the heat disengaged in the formation of snow, being disengaged in the upper regions of the air, produces little effect at the ground, is well worthy of consideration. The same is probably true of rain, and over not merely Arctic regions but the whole surface of the globe. But to make this action available in support of the theory under discussion, we must show that its effect can be increased by increase of eccentricity. It is not sufficient to prove that it is intensified by rising temperatures, unless it also be shown not to be correspondingly enfeebled when they fall. This remark applies to many suggested actions. Eccentricity when it seems to throw a sword into one scale, often places in the other scale a shield.

E. Hill.

THE KURILE ISLANDS.

Sir,—The following notes upon the Kurile Islands were obtained from Mr. J. Snow, a gentleman who has spent several summers cruising amongst this interesting group of volcanos, whilst engaged in otter hunting. I offer them to you as supplementary to what I wrote upon these islands myself in 1878 (see Geological Magazine, Decade II. Vol. VI. pp. 337—348).

Chirnoi Islands.—On May 29th, 1879, smoke or steam was seen to be issuing from the northern of these two islands. It is possible that the eruption may have commenced before this date. On the 30th, at intervals of from ¼ to ½ an hour, loud explosions were heard. During the night the mountain was seen to be covered with fire. The eruption seems to have formed a new point of land. On the island there are four cones, all of which give off steam. Of these four, the most northern

one is the highest. It was the two smaller ones which erupted this year.

Iturup.—At the south-west end of this island there is a mountain which was seen to give off steam for the first time in 1879.

Simusir.—At the south end of this island there is a mountain which gives off steam.

Ushishir.—From this island a little steam is given off.

Rashua.—This island also gives off a little steam.

Shaiskotan.—Not only does steam issue from the north-east end of this island, but it also issues at the south end. The state of activity appears to be greater than on Simusir, but less than it is on Chirnoi.

Kharim Kotan.—This island gives off a little steam.

Onekotan.—A little steam is given off from the mountains at both ends of this island.

When I wrote about the Kurile Islands, I only mentioned nine mountains, which were seen to be giving off steam. The numbers of such mountains will now be increased to 17. Of well-defined volcanic peaks I saw fifty-two. Forty-three of these were at that time (1878) apparently extinct. From Mr. Snow's observations we now see that several of these shortly afterwards, that is, in 1879, became active. The number is in fact variable, and, for aught we know, the number of active cones in the Kurile Islands may at the present moment be different from what it was when I was there, or when Mr. Snow was there. We have in fact in the case of the Kurile Islands a remarkable example of the futility in attempting to enumerate the number of active cones in any given area. The number is ever changing, but on the whole it is probably growing less. It may roughly, perhaps, follow some law analogous to a rate of cooling. For any one short period we may perhaps determine the number approximately, and it is only in this way that we can regard enumerations like the oft-repeated lists, as, for instance, those by Humboldt, which tell us that there are only 225 active volcanos in the world.

As to what is a volcano, whether it is active, dormant, or extinct, and how volcanos are to be enumerated, are questions which require discussion, and upon which I hope to offer a few remarks in a contribution which I am preparing upon the volcanos of Japan.

In conclusion, I may remark, that through the kindness of Mr. Snow, I have obtained a few more specimens of rocks from the Kuriles. These are like those which I obtained before, namely, Andesites,—a class of rock which seems to be as characteristic of the Pacific area as Basalts are of the Atlantic.

J. MILNE.

YEDO, JAPAN, *Jan.* 11, 1880.

MISCELLANEOUS.

GEOLOGICAL SURVEY OF JAPAN.—Reports of Progress for 1878 and 1879. By B. S. Lyman. Tokei, 1879. These reports give a short statement of the work carried on in the field during 1878 and part of 1879. Besides descriptions of the metalliferous deposits of gold, silver, and lead, attention was paid to the extent and yield of the coal-fields of Yesso; it appears that the productive coal-fields as at present ascertained occupy about 350 square miles. The chief aim, however, was to finish the survey of the oil lands of Japan, to complete the reconnaissance of the whole country that had already been begun, and to ascertain what places most needed detailed surveys. The reports are accompanied by a small map of the eastern part of Asia, to show the position of the productive coal-fields of Yesso, Japan, and geological and topographical maps of the Kayanoma, Nuppaomanai and Bibai coal-fields. Tables are also given of the principal facts in regard to the oil wells of Akita Ken, and of all Japan.—J. M.