Possibly some of your readers may have considered this problem, and may be able to suggest some other method of packing the spheres. I do not remember to have met with any discussion of it. W. STEADMAN ALDIS.

University College, Auckland, New Zealand, February 4

Temperatures in Lake Huron.

SOME very interesting results observed by Commander Boulton, R.N., on the temperature of the waters of the Georgian Bay, the eastern basin of Lake Huron, have been placed by him in my hands. They appear to establish that the waters of the bottom of the bay are colder than the even deeper waters of the rest of the lake.

Lake Huron in its profound depths forms three great basins—the Georgian Bay, defined along its western outline by the bold cliffs of the Niagara limestones, and the central and southern basins, separated by the subaqueous corniferous escarpment which diagonally crosses the lake in a south-eastern direction from the outline of Lake Michigan. Whilst the southern basin has generally a sandy bottom, and is in many parts comparatively shallow, the central basin has a floor chiefly of clay, and includes the deepest portions of the lake.

The surface temperature necessarily varies with the seasons, and with the continuous or fitful nature of the weather for days preceding the observations. Thus on May 11, 1888, when the ice had but recently broken up, the surface water of the Georgian Bay near Owen Sound registered 34° F., whilst at 15½ fathoms the minimum was 34½° F.

Observations will during the coming summer be continued in this and other lakes, but in the meantime the records given hereunder may be taken as preliminary illustrations of the temperature of the waters of the bay. For comparison, some published observations taken in 1860 by the United States engineers in the central and southern basins are also given.

GEORGIAN BAY.

Lat. 45° 6′, *long.* 81° 7′.
July 27, 1888, 8.30 *a.m.*

	° F.
Surface	60¼
10 fathoms	45¾
20 ,, ...	41½
35 ,, ...	41
66 ,, (bottom)	39½

Lat. 45° 35′, *long.* 80° 49′.
August 20, 1886, 8 *a.m.*

	° F.
Surface	59¾
31 fathoms (bottom)	39½

Lat. 45°, *long.* 80° 52′.
August 20, 1886, 12.38 *p.m.*

	° F.
Surface	65
42 fathoms (bottom)	37¾

CENTRAL BASIN.

Lat. 45° 18′, *long.* 82° 23′.
July 30, 8 *a.m.*

	° F.
Surface	52
65 fathoms (bottom)	42

SOUTHERN BASIN.

Lat. 44° 33′, *long.* 82° 54′.
August 5, 10 *a.m.*

	° F.
Surface	58
38 fathoms (bottom)	52

Lat. 43° 46′, *long.* 82° 1′.
June 20, 9 *a.m.*

	° F.
Surface	55
45 fathoms (bottom)	52

On August 20, 1886, the temperature of the surface rose from 59¾° F. at 8 a.m., to 62° at 9 a.m.; 63¾° at 11.34 a.m., and 65° at 12.38 p.m.

The suggestive explanation of the lower temperature of the Georgian Bay depths is that whilst the more southern and warmer waters of Lake Michigan in their course from the inlet to the outlet do not reach the bay, a considerable portion of the colder waters of Lake Superior find their way into it by the channel north of the Manitonlin Islands. Further, the subaqueous cliffs which block the western side of the bay preclude a free circulation between the deeper waters of the bay and the profound depths of the lake beyond. A. T. DRUMMOND.

Will Fluctuations in the Volume of the Sea account for Horizontal Marine Beds at High Levels?

IN the interesting article "On the Gradual Rise of the Land in Sweden" (NATURE, March 21, pp. 488-92), Nordenskiöld arrives at the conclusion that the small alterations of the relative level of sea and land which observation proves have taken place in Sweden, are due to movements of the land, not to fluctuations of the sea-level. On the other hand, he contends that the extensive horizontal stretches of marine strata found in many places on the earth's surface at heights measured by thousands of feet above the sea-level indicate fluctuations of level in the sea itself. This is certainly reversing the order of things as believed in by most geologists. It is also suggested that the fluctuations of sea-level are due to alternate increase and decrease of the volume of the sea, arising from gaseous and fluid additions from outer space or loss thereto, the alternate gains and losses balancing one another over long periods.

It is not my object in this communication to discuss the physical possibility of such alterations of the volume of the sea having taken place in this way, but to point out that, even if granted, such rising and falling of the sea-level fails to explain the geological phenomena for which it is invoked. Formations horizontal in one place are disturbed in another. They cannot be divided into two hard and fast stratigraphically dissimilar kinds of marine deposits, the *horizontal* and the *folded*, as is attempted by Nordenskiöld. Even the example quoted by him of the Tertiary strata of Spitzbergen shows this, as it is stated, "Near the west coast they are much disturbed, but further inland they form horizontal strata of sand and clay, &c."

The plains of Russia are, as was shown long ago by Murchison, largely occupied by nearly horizontal strata of undisturbed Silurians, while in the Ural Mountains the same formation is thrown up on end. I venture to pronounce this continuity of horizontal with disturbed deposits an almost universal phenomenon, for where plateaus are capped by horizontal strata, as often happens, these cappings are only the remnants left by denudation.

It is a well-known geological fact that as strata recede from a mountain range they become less and less disturbed and more horizontal. Again, there are no horizontal strata of any extent or thickness that are not riven with faults showing that they have been subjected to upthrow or downthrow as the case may be, and these have to be accounted for as well as the level at which the strata occur. Except in the very newest deposits, strata bear very little relation to the levels at which they are now found. Because strata are often horizontal at high levels it is no indication that they have not been upheaved. The Colorado plateaus may be cited as an instance, and such instances may be multiplied to any extent.

There is, however, another difficulty appertaining to the explanation offered by Nordenskiöld. It is this, the general rise of the sea-level over the whole globe to the extent even of 1000 feet would obliterate an enormous area of land. Where, then, would the sediment come from to form the beds appealed to in proof of the rise of the sea-level? Formations are not arranged concentrically at varying levels or, in other words, stratigraphically contoured, as would be the case were they due to this cause. But there is a final and still greater difficulty to be met. Denudation is year by year reducing the height of the land, and if no compensatory elevation excepting over disturbed areas took place, continents instead of growing as they are supposed by some to do, would long ago have been obliterated, and the earth planed down to a uniform level, so that when periods of "high water" recurred all terrestrial life would be destroyed. This contingency no doubt to some minds will be plain demonstration of the truth of Nordenskiöld's theory.

T. MELLARD READE.

Park Corner, Blundellsands, near Liverpool, March 25.

The Meteorological Conditions of the Aruwhimi Forest Tract.

I CANNOT but think that the true explanation of the rank exuberance of the Aruwhimi forests, so graphically described by Mr. Stanley, or rather of the humid climate that fosters them, is different from that suggested either by the great traveller himself or the writer of the notice in last week's NATURE. The source of the winds that feed the rainfall of this region seems to me a question of secondary importance, but since in equatorial regions, as a rule, easterly winds predominate, I am inclined to think, with the writer of the article, that this source is most probably the Indian Ocean.

If, however, this be so, since in the interval between the coast and the Aruwhimi basin they have to pass over some of the highest mountains in the continent, and reach the latter on a descending slope, they would be comparatively dry winds, more or less analogous to the Alpine *föhn*, were there not other conditions present which more than counterbalance the desiccating influence of the eastern mountains. The first and most

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