LETTERS TO THE EDITOR

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[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Hypothetical High Tides

WHATEVER conclusion may ultimately prevail with regard to the existence of very high tides in the earlier epochs of which geology has cognisance, I think that geologists will hardly accept the argument by Prof. Newberry, in your last issue (p. 357) as a settlement of the question. He appears to confound together three agents whose effects widely differ, viz. : (1) tidal waves of undulation, (2) tidal waves of translation, and (3) wind waves. In waves of undulation the particles of water move only in a vertical line, and can obviously neither denude nor transport. Waves of translation, acting as currents, are transporting agents, but are very subordinate to wind waves in their denuding power. In the present state of things waves of translation, *i.e.* the tides of our inland seas and estuaries, can hardly be said to denude at all ; they simply shift mud and sand from place to place. Even if their speed were enormously increased, their effect as denuding agents must still be very inferior to that of wind waves.

The picture which Prof. Newberry has drawn of an enormous current rushing round and round the globe, sweeping away continents, and destroying whole faunas, is not justified by fact. In the open ocean there would be no current at all due to tidal action, but simply, a vertical rise and fall. The Trilobites and Brachiopoda which swarmed in the Silurian seas would be conscious of no change in their surroundings save an alternate deepening and shallowing of the water over their heads. Where the tidal wave became inclosed between two lands its height would increase ; but it would acquire no transporting power till it was piled up in narrow estuaries. Marine denudations would be mainly effected, as at the present day, by wind waves.

I will present Prof. Newberry with a more energetic denuding agent than his tidal wave, viz. wind waves originating in the more powerful air currents of a globe rotating at (perhaps) thrice its present speed. But what could such waves do which our present waves cannot do? They would simply work more rapidly. They would produce deposits of conglomerate, sand, and mud, which would in no respect differ from modern strata. There would be nothing in the nature of the sediments from which we could either affirm or deny the existence of a more potent engine of denudation.

Prof. Newberry attempts to show that the hypothetical tidal wave of Devonian times would prevent the formation of coral-reefs. But this argument proceeds on the assumption that the habits of the Devonian corals were identical with those of recent reef-building polypes. Since, however, the Palæozoic corals belong to extinct families, any inference as to their habits must be purely conjectural. Besides, the tidal wave must have greatly diminished by the Silurian or Devonian epoch, and may not have exceeded the 150 or 200 feet which Mr. C. Darwin fixes for the limit below which the polypes cannot live.

Prof. Newberry makes a strong point of the evidences of quietude which we find in ancient littoral zones. The hypothetic tidal wave, he thinks, must have swept over the mollusks, corals, and sea-weeds which tenant the shore, so that they would be subject to the "greatest mechanical violence," and their zone would be rendered "uninhabitable." To this I reply (1) that shores bordering on the open sea would only be exposed to a wave of undulation, and (2) that even a rushing wave of translation would do less harm than our modern wind waves, which hammer against the shores where mollusks and sea-weeds manage to spend a tolerably peaceful life.

There are other details on which I should like to join issue with Prof. Newberry, but I fear to trespass upon your valuable space. C. CALLAWAY

Wellington, Salop, February 17

SURELY Mr. Newberry has too quickly come to the conclusion with which his paper of February 16 ("Hypothetical High Tides") terminates. I think if he reconsiders the matter he will still find that there is room for discussion. Has he fully taken into consideration the fact that at present, although in some places there are tides of thirty feet or more in height, notably where the waves roll in from the open ocean to some of the more or less confined bays or estuaries, on the contrary, in confined seas on the Mediterranean, Euxine, and Baltic, the tide is scarcely perceptible? This being the case, is it satisfactorily proved that the old Potsdam beach of which Mr. Newberry speaks was not deposited on the shore of such an inland sea, where, in despite of the fact that the oceanic tides might measure 200 feet or more, yet here I think the littoral zone might be comparatively quiet ; at any rate sufficiently so to support both animal and plant life? I merely make this suggestion in the hope that somebody more able to deal with the subject than I am will continue the discussion. A. HALE

Filston Hall, Shoreham, Kent, February 20

Rime Cloud observed in a Balloon

UNDER this heading (NATURE, vol. xxv. p. 337) M. de Fonvielle made an interesting communication on a cloud suspended over Paris, through which he and M. Brissonet passed in a balloon on January 25 last. Its thickness did not exceed 300 metres. "The nebulous matter," he says, "appeared perfectly homogeneous, and I could see no trace of any crystalline matter, but an unexpected observation proved that it was formed of minute solidified atoms of water in a real microscopic state of division."

While the balloon was floating over the cloud the sky was clear, and the temperature of the air from $-2°$ to $-3°$ C., and a rope hung from the balloon, the length of which was 60 metres, its end being immersed in the cloud. "We perceived that this part was quite loaded with hoar-frost, which had precipitated regularly in a series of hairs a few millimetres long,"

During the slow ascent no deposit of ice was visible ; "in our descent, which was rather quicker, but not to a great degree, the sweeping may have accumulated the frost rime on the bottom of the car, which could not have been easy to observe, and consequently I cannot state what occurred, but not a single crystal was deposited on our ropes during that period."

The mean temperature of the cloud is said to have been 5° C., but at the point at which the deposition of rime took place the temperature must have been 0° or lower. The upper layer of the cloud might have been colder than the layers below.

It is improbable that the upper part of the cloud consisted of solid water, as no trace of any crystalline matter was visible. The smallest crystals of snow are visible in the air in the thin mists formed over channels of water, for the snow crystals glisten and reflect light from their exceedingly small surfaces. M. de Fonvielle must have observed this phenomenon, as "the sun was shining in its full glory." It is more probable that the cloud was formed by small drops of liquid water cooled below zero. We know from Dufour's observations that water-drops, if they are not in contact with solid matter, and floating in a mixture of rock-oil and chloroform of equal density, may be cooled down to $-10°$ C., and even to $-20°$ C. if they are small enough, but become crystalline in contact with a solid body, especially a fragment of ice. The hoar-frost which we have frequently noticed this winter in Heidelberg, during hazy weather, and when the temperature was below 0°, may have been due to the solidification of such drops of mist. It covered the plants first with filigree-like ice, and then with a thick crust of the same. In consequence of this, sometimes so much ice is deposited on the stems of the trees that great damage is caused by it in the forests ; this was the case in the neighbouring "Rheinpfalz" in the winter 1858-59, and in other parts of Germany, especially in Bohemia.

It is, however, well known that a thick mist may consist of crystals of ice. Equally well known is Scoresby's description of the "frost-damp" or "frost-rime" of the Arctic regions, as it forms a layer in the cold air over the warmer sea-water, the masts of the ships projecting over it. Mohn describes the "Frostzög," which is formed in winter over the Norwegian fjords, which never freeze, when cold air, sometimes at a temperature of 20° C., and even lower, blows from the land over the water, which has a temperature above 0° C.

To these interesting occurrences of mist, generally termed ice-fog, one particularly singular instance has been added by Hildebrand-Hildebrandsson's meteorological observations made during the voyage of the *Vega* (*Zeitschr. der Oesterr. Gesellsch. f.*