LETTERS TO THE EDITOR.

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Intensity and Quantity of Sunheat at Different Zones.

THE following figures may interest readers of NATURE. They give the relative summer and winter intensities of sunheat for every five degrees of latitude, *i.e.* the sunheat per square foot—and also the relative total quantities of heat received at the zones extending from 0°–5°, 5°–15°, &c.

Latitude	0°	5°	10°	15°	20°	25°	30°	35°	40°	45°
Summer Intensity	943	971	997	1016	1026	1030	1026	1016	997	973
Winter Intensity	961	915	866	808	752	694	634	569	498	423

Latitude	50°	55°	60°	65°	70°	75°	80°	85°	90°
Summer Intensity	947	909	868	840	821	806	793	780	766
Winter Intensity	345	269	197	135	79	40	18	5	0

Zone	0°–5°	5°–15°	15°–25°	25°–35°	35°–45°	45°–55°	55°–65°	65°–75°	75°–85°
Summer Heat	478	987	964	886	764	612	434	286	84
Winter Heat	469	857	707	550	331	269	100	27	9

The figures are not guaranteed as accurate to the last place, but that place is included so that the totals may be fairly correct when we take the total sunheat over several zones. Thus we get the summer and winter sunheat up to latitude 30° in the ratio of 30 to 23, while from the cap from 30° to the pole the quantities are 25 to 10, on the same scale. Again the summer and winter proportions from 0°–45° and 45°–90° are 43 to 29 and 12 to 4 respectively.

The proportion of the summer and winter sunheats received by the entire hemisphere is obtained as 55 to 33, the unit being the same as before. That these two are almost exactly in the ratio of Ball's and Weiner's numbers, 63 to 37, may be regarded as a sufficient check on the accuracy of the figures, which were calculated separately.

E. P. CULVERWELL.

Trinity College, Dublin, November 25.

The Discovery of the Anti-Toxin of Snake-Poison.

IN reference to the statements contained in Prof. Ray Lankester's letter in your issue of December 12, I have to point out that no claim of priority has ever been advanced by me.

Hitherto my communications have been of the nature of preliminary statements, and in such communications it is neither possible to enter into details of the work done by others on the same subject, nor usual to attempt to do so.

On each occasion in which I have described the results of my experiments, I have briefly referred to all previous workers on the subject, in so far as they were known to me; and, in particular, I have definitely mentioned, or otherwise drawn attention to the circumstance that, before I had been able to do so, M. Calmette had published evidence showing that animals could be immunised against snake-venom, and that the blood-serum of those animals possesses antidotal properties.

At the same time, the work done by me was absolutely independent in its conception. It was originated several years ago, and has been carried out on a plan and with aims which were formed independently of the work of any other experimenter. That part of it which has as yet been described in the published abstracts had for the most part been completed before M. Calmette's paper announcing successful immunisation had come to my knowledge. I have rarely had occasion to consult Pasteur's *Annales*, and thus it happened that M. Calmette's paper was noticed only when the literature of a different and purely bacteriological subject was being collected for me. As to the articles in the *Contemporary Review*, I have not seen them, nor did I know of their existence until they were mentioned by Prof. Lankester.

THOMAS R. FRASER.

Edinburgh, December 16.

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"Pithecanthropus erectus" and the Evolution of the Human Race.

THE remarkable advance made by biology during the last twenty years in the study of the Tertiary mammalia, must strike even the most casual onlooker. It is not merely that an exact knowledge has been gained of a vast number of extinct forms, but that amongst these has been discovered a profusion of missing links, rendering possible the construction of ancestral trees, or diagrammatic illustrations of the successive stages through which existing animals may have been evolved from a common stock. Some of these "trees" may prove to be mere intellectual weeds, which to-day are, and to-morrow are cast into the oven; but others are of robust growth, finding a firm support in geology, which has been able in many cases to certainly fix the order in which successive branches of the tree have budded forth. It is to be regretted that geology has not been able to do more than this; could it but succeed in the construction of a scale of past time, what fascinating prospects in the study of evolution would be opened out! The construction of such a scale is beset, however, by grave—possibly insurmountable—difficulties, as will readily appear from the following attempt.

For the present there appears little hope of connecting geological events with such astronomical processes as changes of eccentricity and the precession of the equinoxes, and the only method left for our adoption is that of estimating the maximum thickness of the successive systems of stratified rocks. This, however, is to a great extent vitiated at the outset by the heterogeneous character of these systems; some are wholly or in part marine, some fluvial; some consist largely of organic, others of mechanical sediment; and it is impossible to reduce their various members to any common term.

As there is no alternative, we proceed to do the best we can with existing materials, and shall now endeavour to obtain some approximate notion of the relative duration of the last three periods in the earth's history, viz. the Pleistocene, Pliocene, and Miocene. The first and most recent of these was probably of longer duration than we are accustomed to suppose. Borings sunk in the deltas of existing rivers have seldom penetrated to the bottom, yet they have indicated a very considerable thickness of deposits; thus, in the case of the Po, a boring near the Casa di Dio, Venice, passed through 572 feet of sediment. Near New Orleans, the delta of the Mississippi was penetrated for 630 feet; while the fluvial deposits of the Ganges were shown, by a boring near Lucknow, to exceed 1336 feet in thickness. In Alaska, however, as the observations of Russell prove, the Pleistocene attains a far greater thickness than this ("Second Expedition to Mount St. Elias in 1891." U.S. Geol. Survey, Thirteenth Report, part ii. p. 24, 1891-2).

The following extracts from his report may prove generally interesting:—"The Chaix hills are geologically unique. They are formed of a monoclinical block of conformable strata eight or ten miles long, trending north-east and south-west, and tilted northward at an angle of 10° or 15°. . . . But what makes the hills especially interesting to the geologist is the fact that they are composed of stratified morainal material. . . . From many eye estimates it is evident that the minimum thickness of the deposit cannot be less than 4000 or 5000 feet. The rocks are essentially homogeneous from base to summit, and are composed of sandy clay containing large quantities of both angular and rounded boulders of all sizes up to six or eight feet in diameter. In the finer portions of the deposit . . . sea-shells are numerous. A small collection was made. . . . All [the species] are still living in the adjacent ocean. Besides the shells of molluscs, there are the shell-cases of annelids [*Serpula*?] attached to glaciated boulders, showing that the stones on which they grew must have remained exposed at the bottom of the sea for some time before being wholly buried."

It may be objected that these deposits differ so completely from those of the alluvial plain of the Ganges, in their nature and origin, that they might fairly be left out of account; but to this it may be replied that we have no reason for supposing that glacial denudation proceeds at a greater rate than fluvial, indeed the reverse is probably nearer the truth, and though it is deposition and not denudation which is directly in question, yet the observation of Mr. Russell, that annelid tubes are found adhering to the embedded boulders of the deposit, certainly does not suggest an excessively rapid rate of accumulation. We shall take then 4000 feet as representing the maximum thickness of the Pleistocene system.