extending perhaps beyond the orbits of the asteroids. In fact, the difference in the densities of the inner and outer planets and the sun, and the fact that practically all rotations and revolutions are in the same sense, suggest that our solar system once consisted of a sun and the outer planets, all having a very low density, and that on passing through a cloud of heavy meteoric matter, the density of the sun was slightly increased, and the inner heavy planets created; but it is impossible here to go into the details of these interesting questions.

As regards the nearer evidence of the earth's age to be sought for in the sedimentary rocks, no notice seems to have been taken either of the time required for the innumerable raisings and lowerings of level which certainly occurred during the coal periods or of the time which it must have taken to tilt horizontal strata through 90° and more. Thus Japan is being tilted at the rate of about 0·5″ per century, and if this tilting rate were steadily maintained in one locality, which is highly improbable, the Japanese strata would stand on end like our Cambrian strata in about forty million years' time. Yet a few such tiltings were completed before some of our oldest strata were formed and overthrusts suggest a still greater antiquity for the age of sedimentary rocks. C. E. STROMEYER.

"Lancefield," West Didsbury, April 26.

Man's True Thermal Environment.

IN connection with Prof. Leonard Hill's very interesting and instructive article on "Healthy Atmospheres" (NATURE, April 22), perhaps I may be allowed to direct attention to a paper which I contributed to the Journal of the Scottish Meteorological Society for 1912, entitled "On Atmospheric Cooling and its Measurement: An Experimental Investigation." In that paper will be found a description of an instrument termed a psuchrainometer ($\psi\nu\chi\rho\alpha\acute{\iota}\nu\omega$ = I become cold; and $\mu\acute{\epsilon}\tau\rho\sigma\nu$ = a measure) which traces on a moving paper strip, a continuous record of the amount of electrical heating needed to maintain at blood heat a body freely exposed to the atmosphere. This seems to serve much the same purpose as Prof. Hill's caleometer. In the same paper I also gave a table of preliminary numerical results obtained by its use in conjunction with an anemometer and self-recording thermometer, and from these data deduced an empirical formula giving the rate of cooling (ψ) as a function of temperature and wind velocity.

The question as to whether ψ could always be thus expressed as a function of already existing meteorological data can only be settled by a long continued series of observations with appropriate instruments, in the construction of which I have been engaged for some time. If ψ can be so expressed, then evidently there would be no need for a widespread installation of special apparatus for its measurements. If, however, this hope be disappointed, a new apparatus must be placed in the hands of meteorologists, and the simpler this is the better. I have now constructed a simple psuchrainometer, consisting essentially of a thermometer furnished with a small heater through which a constant current is always passing. This may be termed a "constant energy" psuchrainometer, and I propose to calibrate it against the necessarily more complicated form of "constant temperature" psuchrainometer, different patterns of which are described both in Prof. Hill's article and in my paper.

JAMES ROBERT MILNE.

Physical Laboratory Edinburgh University, April 30.

THE AUSTRALIAN ANTARCTIC EXPEDITION.[1]

THE most vexed question in antarctic geography has been the nature of the region west of South Victoria Land. D'Urville and Wilkes, who explored that region in 1838 and 1839, reported land in so many localities that it has been generally believed that their tracks skirted a continuous ice-covered and ice-barred land. Ross, however, sailed across the site of some of the land reported by Wilkes, and later explorers have had the same experience. The view has therefore often been held that this part of Antarctica consists of an archipelago. The first material step toward the solution of this problem was the sledge journey of David, Mawson, and Mackay during Shackleton's expedition. Their journey afforded strong evidence in favour of the continuity of the land; but this land might end far south of Wilkes's track and be separated from it by a fringe of islands. This question has been finally settled by the Australian expedition of 1911 to 1914 under Sir Douglas Mawson. The narrative of its experiences with some indications of its scientific results are given in two massive and superbly illustrated volumes.

The expedition sailed in the *Aurora* under the skilful command of Capt. Davis, whose soundings between Australia and the opposite coast of Antarctica are themselves of the highest geographical importance. Two bases were established in Antarctica, the main base in Adelie Land (about 142°40′ E.), and a western base under Wild in Queen Mary Land (95° E.); at each of these stations elaborate observations were taken, and the expedition established on Macquarrie Island a wireless station, which should be permanently maintained in the interests of Australian meteorology. From each of the bases extensive sledging expeditions were made to explore the surrounding areas. Wild sledged 4° eastward along the northern coast to Queen Mary Land in the hope of reaching Knox Land. A second party under Dr. S. E. Jones travelled westward to the Gaussberg, and thus reached the field of work of the German Antarctic Expedition under Drygalski. From the main base in Adelie Land one sledging party went eastward to Deakin Bay; a second under Bage nearly reached the Magnetic Pole; a western party sledged 4½° along the coast which had been seen by D'Urville. A sledge journey eastward over the ice-covered plateau led to one of the most tragic of Antarctic adventures, for Mertz and Ninnis perished on the journey, and only the lucky finding of a food depôt enabled Mawson to crawl back to his base.

The journey toward the South Magnetic Pole under Dr. Bage was one of the most arduous and successful of the sledging expeditions. The party reached lat. 70°36′5″ S. and 148°10′ E., where the magnet had a dip of 89°43½′ or only 16½

[1] "The Home of the Blizzard. Being the Story of the Australasian Antarctic Expedition, 1911–14." By Sir Douglas Mawson. Vol. i. Pp. xxx+349. Vol. ii. Pp. xiii+338. (London: W. Heinemann, 1915.) Price 36s. net two volumes.