one of those figured by the writer in 1865 (see Quart. Journ. Geol. Soc. vol. xxi. pl. xiv. fig. 1i); but the Wenlock specimen is broader in proportion to its length, and the keel of the valve is straighter, and the general outline more angular than is the case with the Ottawa specimen.

I propose for this new form the trivial name of *Canadensis*, and trust that before long, through the researches of Mr. Ami, we may become acquainted with many more examples of the valves of this very interesting and widely-distributed fossil.

IX.—REMARKS ON MR. DAVISON'S PAPER ON SECULAR STRAINING OF THE EARTH.

By REV. O. FISHER, M.A., F.G.S.

A VERY important discovery was made independently by Mr. Davison, and somewhat earlier by Mr. T. Mellard Reade, when they demonstrated that, on the hypothesis of the earth having cooled as a solid body, there is within it a certain level, which is called by Mr. Davison the "surface of zero-strain," and for which Mr. Reade has adopted the term "level of no strain." At this level compression ceases, and for a certain distance beneath it extension, or stretching of the layers of the globe, takes the place of compression.

There are one or two points in Mr. Davison's paper which invite remark, because they have an important bearing upon the geological aspect of the subject. He states that he has come to the conclusion that, after an interval of 174,240,000 years since the earth solidified, the depth of the surface, or level, of no strain "was or more probably will be" five miles. But for geological purposes what we want to know is, what the depth of this level may be at the present time. Now, on the assumption that the earth has cooled as a solid, this is easily calculated, without the need of any knowledge either of the length of time since solidification, or of the conductivity of the materials of which the crust of the earth is composed.

The formula which gives the depth of the level of no strain within a few hundred feet is simple. It is:

$$\text{Depth of level of no strain} = \frac{6}{3 \cdot 1416} \left(\frac{\text{temperature of solidification}}{\text{temperature gradient}} \right)^2 \div \text{radius.}$$

The temperature gradient at present is known to be $\frac{1}{31}$ of a degree Fahr. per foot. The only quantity to be guessed at is the temperature of solidification, which Mr. Davison, following Sir Wm. Thomson, puts at 7000° Fahr. The radius of the earth in feet is 20,900,800.

Working out the sum we then find that the depth of the level of no strain, on this hypothesis respecting the temperature, is at the present time 11,645 feet, or 2·2 miles.

But 7000° Fahr. seems to be an excessive temperature for solidification; and if we put it at 4000°, which seems more probable, the depth of this level at the present time would only be a little over half a mile. It must be remembered that the depth of this level

increases as time goes on, so that it is deeper down now than ever it has been before.

It is obvious that the amount of compression which can be got out of a superficial shell certainly not more than two miles thick, and probably much less, the compression gradually diminishing and coming to an end at that depth, can have produced scarcely any appreciable folding. We must therefore look in some other direction for the cause of rock folding, thrust planes, and other phenomena of that nature. The probability is that the theory of the earth being solid throughout is incorrect.

NOTICES OF MEMOIRS.

- I.—RECORDS OF THE GEOLOGICAL SURVEY OF NEW SOUTH WALES.
Vol. I. Part I. Department of Mines, Sydney, 1889. 8vo.
31 pp. and Plates i.—iv.

AS a significant indication of the increasing interest in geological science in New South Wales, it gives us pleasure to call attention to the first part of a new periodical, issued under the auspices of the Geological Survey of that colony, in which it is intended to record the discoveries and observations in the geology, palæontology and the mineral deposits of the country. The part just issued contains seven papers on a great variety of subjects, amongst which may be noticed 'Notes on the Geology of the Barrier Ranges District and Mount Browne and Tibooburra Goldfields, by C. S. Wilkinson, F.G.S., Geological Surveyor in charge'; 'Report on the Discovery of Human Remains in the Sand and Pumice Bed at Long Bay, near Botany,' by T. E. David, F.G.S., and Robt. Etheridge, jun., and 'On a Coral intermediate in structure between the Genera *Lonsdaleia* and *Spongophyllum*, etc.,' by R. Etheridge, jun.

G. J. H.

- II.—FAUNE DU CALCAIRE D'ERBRAY (LOIRE INFÉRIEURE). Par CHARLES BARROIS. Contribution à l'étude du Terrain Dévonien de l'Ouest de la France. Extrait des Mémoires de la Société géologique du Nord, tome iii. Avril, 1889. pp. 384, pls. i.—xvii.

FROM the beds of limestone quarried near the small town of Erbray (Loire inférieure) a comparatively rich fauna was obtained by M. Cailliaud in 1861, who compared it with that of the Bohemian étage F., the so-called third Silurian Fauna of Barrande, and it has since been regarded as the sole representative of this particular division in France. This conclusion is now called in question by Dr. C. Barrois, who has made an exhaustive study of the fossils from these rocks, and described and illustrated them very fully in the present memoir. The limestones yielding the fossils occur as discontinuous lenticular masses in a series of fine argillaceous schists, which are unfossiliferous and estimated to be from 800 to 1000 mètres in thickness. Dr. Barrois recognizes three distinct levels in the limestones, each marked by particular litho-