boy, in demonstrating geometrical propositions, was not the least put about with the reversal of the diagram. He afterwards turned out a clever pattern-designer. JAMES SHAW.

The Age of the Wealden.

IN a letter in NATURE for March 12, Prof. Marsh calls attention to the evidence of the vertebrate fauna of the Wealden rocks as being in favour of including that series in the Jurassic system.

It may be of interest to add that a recent examination of an exceedingly rich collection of fossil plants obtained by Mr. Rufford from the Wealden rocks near Hastings, and now in the British Museum, leads very decidedly to the same conclusion. Between the Wealden flora of the South of England, in which no traces of undoubted Angiosperms have so far been found, and the typical Jurassic plants from the Yorkshire coast, there is a very close resemblance. A. C. SEWARD.

Cambridge, March 16.

The Stress in Magnetised Iron.

DR. CHREE will meet, I think, with general support in his opposition to the view that there is of necessity, or even usually, an actual stress in a magnetised rod tending to shorten it; but in maintaining, as I understand him to do, the opposite view that the magnetic tension along the lines of force is necessarily accompanied by a mechanical stress of pull and the associated extension, he appears to me to be on more disputable ground. Dr. Chree's conception of the Maxwell distribution of stress seems, if I may venture to say so, to be too materialistic. What Maxwell really showed, of course, was that such a distribution would produce on every element of matter in the field the mechanical force which it was known actually to experience. It was not suggested, however, that these stresses were to be considered as transmitted by the matter by virtue of its mechanical properties, indeed this could clearly not be the case where the matter was liquid or gaseous; and so there are no grounds for supposing that the matter would exhibit strains directly associated with these stresses. The stresses, in fact, must be considered as transmitted by the ether which pervades the field, and it is in the ether that the associated strains are to be looked for.

If, however, we turn our attention from the ether to the matter in the field, and remember that certain portions of this matter will in general be experiencing mechanical forces, we see that if its equilibrium is to be maintained a suitable system of mechanical stresses and the associated strains must be set up in it.

In the case considered by Dr. Chree in his letter to NATURE, published on January 23, it is plain that if AA′ and BB′ are air-gaps, and are not filled up with a material capable of offering resistance to longitudinal compression, the portions A′ and B′ of the bar must be held or fixed in some way if there is to be equilibrium. This was pointed out by Prof. Ewing, but Dr. Chree does not seem to have appreciated its significance, and his disregard of the external forces required for this purpose is responsible for the apparent discontinuity to which he refers in his second letter. If A′ and B′, with these forces applied to them, are allowed to move up to A and B so as to close up the air-gaps, we pass without discontinuity to the case of a magnetised rod under external pull, and thus in a state of mechanical tensile stress and elongation. If now we consider these external forces to be gradually diminished to zero, and suppose that the question is not complicated by end effects at the outer ends of A′ and B′ (as it will be in the case of a straight rod unless external forces are kept applied at these ends), the mechanical tensile stress and elongation will diminish to zero also, and we have passed without discontinuity from Dr. Chree's result to Prof. Ewing's.

That Dr. Chree has obtained the correct result for the special case which he investigates, appears from the following considerations. Assuming that AA′ and BB′ are equal air-gaps, and that A′ and B′ are fixed, AB will be in equilibrium. The Maxwell distribution of stress gives equal mechanical forces on the surfaces A and B directed outwards, and consequently there will be tensile mechanical stress in AB with its associated extension. In this case, therefore, there is actual elongation of the metal in the direction of the lines of force. In the case of an endless ring, however, the Maxwell distribution of stress gives no mechanical force, and no mechanical stresses with associated strains will be set up. This is the case considered by Prof. Ewing, who obtained the same result. I must confess that I do not follow Dr. Chree's objections to Prof. Ewing's reasoning on this point. The mechanical stresses must be such that every portion of the ring is in equilibrium. Prof. Ewing does not complain that tensile stress in a ring is unimaginable, but that it does not comply with this condition. If Dr. Chree will reconsider his reference to the case of a rotating anchor ring, he will admit, I think, that as every element of such a body is not in equilibrium, but in accelerated motion, the fact that tensile stress can and does exist in it is not relevant.

As a further illustration of the variety of the mechanical actions which may accompany the Maxwell distribution of stress, we may consider the case of two sheets of tinfoil placed against opposite faces of a plate of glass and maintained at different potentials. It is readily seen that in this case the glass undergoes a mechanical stress of compression and the associated strain of shortening in the direction of the lines of electrostatic force, though the Maxwell stress in this direction is a tension. L. R. WILBERFORCE.

Cavendish Laboratory, Cambridge, February 26.

RECENT WORK OF THE GEOLOGICAL SURVEY OF THE UNITED STATES.[1]

II.

SINCE Gilbert (in 1887) published his classical monograph on the geology of the Henry Mountains, in which he gave to the world for the first time a clear and connected account of the nature and occurrence of Laccolites, we have waited many years for further original work on this type of physical structure in America. A study of the writings of Peale, and of the exquisite panoramic drawings of Holmes, made it abundantly clear that laccolitic masses must be frequent in the United States. Mr. Whitman Cross has now collected a number of instances from Colorado, Arizona, and Utah.[2] He has remarked on their structure so far as it has been made out by these observers, by Emmons, and by himself, given a description of the characters of the rock of which the laccolites consist, and offered some remarks on the general theory of laccolitic structure.

The theory has not been quite so fertile in results as might have been expected from the clear-cut nature of Gilbert's brilliant piece of work; nevertheless the author is able to show that, although Reyer refuses to accept the facts on which the theory is based, Suess, on the other hand, reproduced the illustrations, summarised the results of Gilbert, Peale, and Holmes, and applied them to European and other examples, while Neumayr added further arguments in favour of the intrusive nature of the Henry Mountain rocks themselves. It may be pointed out here that the existence of laccolites has been taken almost for granted by many British authors (not referred to by Cross), such as Kinahan, Geikie, Harker, Marr, and others, and that in one case at least a numerous group of laccolites has been described, and proof given that the igneous masses are conformably underlain and overlain by sediments.[3] The abstract of this paper, all that was published for many years, also anticipates some of the conclusions independently reached by Mr. Cross.

The familiar Henry Mountains are first described, then the West Elk Mountains to which attention was drawn by Peale, and in succession the San Miguel, La Plata, Carriso, El Late, Abago, and La Sal Mountains. All these are either on the verge of the great plateau, being thus geographically outliers of the Colorado Mountains, or they are isolated groups on the plateau itself. They are groups of laccolites intruded into nearly horizontal strata probably at about the same period—in Tertiary

[1] Continued from page 441.
[2] "Fourteenth Annual Report of the Geological Survey of the United States," 1892-93. (1894.)
[3] "Report of the British Association," 1886.