The Chines along the coast of Bournemouth Bay did not originate at the cliff-edge and grow inland, as generally stated, but are the over-deepened bottoms of older and longer valleys. A similar double structure is seen in the Chines of the south-western corner of the Isle of Wight, where it is due to the destruction of part of the valley of the Yar by the sea since the deposition of the valley gravel; and it is suggested that the Bournemouth Chines are due to the breach of the Solent River by the sea at the same late period. The 140 ft. bluff, running all across Hampshire to the sea-cliff at Goodwood, is comparable with the 100 ft. terrace of the Thames, and was probably formed in an estuary in pre-Chellean times.

The rate of recession of the cliff in the western part of Bournemouth Bay is estimated at about 1 foot per annum. It may be more in the eastern part, but the estimate of 3 yards per annum near Christchurch, made in the *Natural History of Bournemouth*, is probably much too high; and the reasons given in that volume for local variations in rate cannot be accepted.

The angle of the cliffs is said to have become steeper of late years; but this is not true of the western part of the bay, and it is desirable that the observations on which the belief rests should be published.

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4. *February* 2, 1916.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

A lecture was delivered by Richard Dixon Oldham, F.R.S., on the Support of the Himalaya.

He said that it was known that the major prominences of the Earth's surface are in some way compensated by a defect of density underlying them, with the result that they do not exert the attractive force, either in a vertical or in a horizontal direction, which should result from their mass. A study of the distribution of this compensation shows that there is a general balance between it and the topography, such that the weight of any vertical column through the crust of the earth is, on the average, constant, whatever may be the elevation of the surface. To this condition the term isostasy has been applied, which does not merely denote a static condition, but implies a power of adjustment of the compensation to the variation in load produced by surface denudation and transport.

The explanations that have been proposed of the existence of compensation fall into two classes. One supposes the relief of the surface to be due to an alteration in the volume of the underlying rock, and may be regarded as hypotheses of tumefaction. They involve no addition of matter to the crust under a mountain range, and do not provide, either for any departure from a balance between topography and compensation, or for a restoration of the balance when disturbed by denudation. The other group of hypotheses attributes the origin of the range to a compression of the crust, the injection of molten matter, or the 'undertow' of the lower part of the crust. To provide for compensation any hypothesis of this class will require a downward protuberance of the nether surface of the crust, causing a displacement of denser by lighter material, as also an

effect of buoyancy owing to this difference of density: this group of hypotheses, therefore, may be regarded as one of support by flotation. They involve a migration of matter from outside to beneath the range, they allow of a considerable local departure from exact balance between load and support (or topography and compensation), so long as the defect in one tract is balanced by an excess in an adjoining one, and they provide for an adjustment of any disturbance of this balance.

The geodetic observations in the Himalayas show that there is a defect of compensation in the outer hills, which increases in amount until at about 50 miles from the edge of the hills it reaches an equivalent to an overload of about 2,000 feet of rock. In the interior of the Himalayas the only observation yet published shows that at about 140 miles from the edge of the hills this overload has disappeared, and compensation is in excess. The variation in the balance between topography and compensation points to one of the second group of hypotheses, to a support of the range by flotation, and to the conclusion that the growth of the support has been more rapid than that of the range. The primary problem then becomes, not as to how the Himalayas are supported at their actual height, but why they are not even loftier; in other words, the problem is carried one stage farther back, from the origin of the range to the origin of its 'root'.

This result of the examination of the geodetic data simplifies the explanation of some difficult geological questions. It affords an easy explanation of the indications which are found in the interior of the Himalayas, and of other similar ranges, of simple vertical uplift without disturbance, and also of the manner in which the contorted and faulted strata, the disturbance of which must have taken place under the pressure of some thousands of feet of rock, have been brought up to a level where they are exposed to denudation and their structure revealed; but it brings us very little nearer to an explanation of the ultimate origin of the range. It is a distinct step forward in illustration of the mechanism of the production of mountain ranges of the type of the Himalayas and the Alps, but we are as far as ever from an understanding of the power by which this mechanism is driven.

ANNIVERSARY MEETING.

5. *February* 18, 1916.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

The following Awards of Medals and Funds have been made:—

The Wollaston Medal is awarded to Dr. Alexander Petrovich Karpinsky, in recognition of his researches concerning the Mineral Structure of the Earth, especially in connexion with the Geology and Palæontology of Russia.

The Murchison Medal, together with a sum of ten guineas from the Murchison Geological Fund, is awarded to Dr. Robert Kidston, in recognition of his valuable contributions to Geological Science,