

of reversed motion secured during a lengthy train journey.

If one admits the accuracy of these observations, they seem to me somewhat to modify the current theoretical explanations of the illusions of reversed motion. Such an assertion as that of Bowditch and Hall, for instance, that 'it is impossible to conceive how this persistent after-impression of motion can be a product of experience or association,' may, perhaps, be satisfactory so far as their observations go, but does not seem satisfactory when our observations after prolonged stimulation are also considered. Still, it may well be, and I think is, true that the illusion we are describing is independent of the illusion of reversed motion generally secured. On the other hand, an observation of Exner's, to the effect that an after-image of movement can be engendered by passing the eye over resting objects as well as by the usual method of moving objects past the resting eye, may possibly furnish the cue to the explanation of the matter under discussion, without the assumption of an illusion of judgment or of any other 'central' process. It may be that continued and intent scrutiny of the perforated drum-paper induced a habit of eye-movement in my experimenter, and that the sight of the drum was thereafter a stimulus which innervated unconscious eye-movements, even after the lapse of considerable time-intervals. This hypothesis, however, would appear to necessitate the acceptance of the rather debatable theory of unconscious eye-movement propounded by Helmholtz.

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A NOTE ON MID-CRETACEOUS GEOGRAPHY.

IN his Berne address, published in the October number of the *American Geologist*, Professor Osborn refers¹ to the apparent geographical unity between North and South America during the mid-Cretaceous and continuing possibly to the basal Tertiary. This connection is indicated by the fauna of the

Notostylops beds of Patagonia.² Hauthal, who has done more or less stratigraphical work in the region referred to, published a brief note on some of these formations several years ago,³ which is of some interest in this connection because the same observer discovered a plant-bearing layer at one horizon, which yielded a number of forms of great interest, particularly from the view-point of the phytogeographer. These plants were worked up by Kurtz.⁴ His paper, from the fact that it was not illustrated and because of its place of publication and language, being in Spanish, is not likely to attract the attention of paleontologists which it deserves, and is worth recalling at this time.⁵

The plants occur at Cerro Guido in the province of Santa Cruz, in a layer of fine gray sandstone which grades upward into a coarse greenish sandstone, the whole fifty to sixty meters in thickness and overlain by beds containing Tertiary fossils.

The Argentine geologists correlate the lower Notostylops beds containing a rich vertebrate fauna and this plant horizon with the Cenomanian. If the determinations are correct, which fact it is difficult to properly estimate, because they are not figured, the plants furnish striking confirmation of this view. There are thirty-one forms described, including a new species in *Abietites*, *Araucarites* and *Perseophyllum*. Eliminating these from our calculations, we have twenty-eight forms, of which twenty-one, or seventy-five per cent., are characteristic types of the Dakota group flora. It is a significant fact that the meager

² Ameghino, F., 'Sinóptico de las formaciones sedimentarias, terciarias y cretáceas de la Argentina. Anal. Museo Nacional Buenos Aires' (iii.), 8: 1-12, 1902.

³ Hauthal, R., 'Ueber patagonisches Tertiar, etc.,' *Zeitsch. Deutsch. geol. Gesell.*, 50: 436-440, 1898.

⁴ Kurtz, F., 'Contribuciones a la palaeophytologia Argentina-Sobre la existencia de una Dakota Flora en la Patagonia austro-occidental,' *Revista Museo La Plata*, 10: 43-60 (1899), 1902.

⁵ Wilckens, *Neues Jahrb. f. Min. Geol. u. Paläont.*, 21: 98-195, October, 1905, gives a quite full historical review and admirably summarizes our present knowledge of Patagonian geology.

¹ Osborn, H. F., *Amer. Geol.*, 36: 213, 1905.

flora from the heretofore most southern known Dakota outcrop containing plants, namely, the Woodbine formation of Texas, contains two species which are identical with Argentine forms. Four identical forms are found in the Magothy and three in the Raritan of the Atlantic coastal plain, two occur in the Atane beds of the west coast of Greenland, which are usually classed as Cenomanian, and one occurs in the Patoot beds (Senonian) of the same region. Two forms are common to the Cenomanian of Bohemia and one is found in the Senonian of Prussia and Bulgaria. The only possible lower Cretaceous form contained in this flora is one which Kurtz identifies as *Asplenium Dicksonianum*, which, as currently understood, ranges from the Kootanie and Kome beds into the upper Cretaceous. This view is probably erroneous, as I have a number of facts in support of the view that the lower Cretaceous forms which have been referred to this species are distinct from those which occur in the upper Cretaceous. Kurtz identifies one species with a basal Eocene form of North America and another with a basal Eocene species of Belgium.

The flora as a whole has an entirely Cenomanian facies and its remarkable similarity to that developed in the central west during the mid-Cretaceous certainly points very strongly to a community of origin. Were the evidence less convincing in its array of forms it would be an easy matter to infer that Kurtz's *Liriodendron Meekii* was a leguminous leaflet, and that his species of *Cinnamomum*, *Litsæa* and *Sassafras* were simply the Cretaceous precursors of the abundant Lauraceous forms which occur in the modern flora of South America, but such a view is entirely untenable in the light of the disclosed species of *Liquidambar*, *Cissites*, *Persea*, *Menispermities*, *Platanus*, *Populus*, *Betulites*, *Quercus*, etc.

These facts will suggest to some the possibilities of a southern origin of our upper Cretaceous floras quite the opposite of the usually accepted view that they had their origin in the far north. However this may be, the evidence, it seems to me, conclusively points to a geographical connection between North and

South America during the mid-Cretaceous, at which time the mid-Cretaceous North American flora extended southward, reaching Argentina and displaying a Cenomanian flora at a somewhat later time than that assigned to it by the Argentine geologists. In other words, that while these South American beds are homotaxial they are not synchronous with the North American Cenomanian, the time interval between them being that which was necessary for the northern flora to spread from about the latitude of Texas to that of Patagonia.

Further than this, such facts go a long way toward discrediting Von Ihering's theory, approvingly quoted by Ortmann in the Princeton Expedition Reports, that northern and southern South America are to be regarded as genetically different and separated, at least until well into Tertiary times, by a sea connecting the Atlantic and Pacific.

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AGE OF PETROLEUM DEPOSITS, SARATOGA, TEXAS.

WHILE careful watch has been kept on the drilling of a number of wells in this district, it is only within the present month that fossils have been found in such condition as permitted their accurate determination and the recognition of their geological horizon.

A bed of shells was noticed in one or two wells drilled by the Rio Bravo Oil Co. at a depth of approximately 1,100 feet, but the specimens were so fragmentary that nothing could be made of them. Mr. Robinson, who is drilling a well west of the proven field, found this same bed at 1,158 feet and was fortunate enough to get a number of fair specimens. He turned these over to the writer, who sent them to the United States National Museum for identification.

Dr. W. H. Dall, under date of January 18, makes the following report on them:

In regard to the small lot of fossils from 1,158 feet, Robinson well, Saratoga, Texas, referred to by Dr. Dumble in the letter of January 12, herewith returned, I have to report as follows: it contains—