
Review: The Problem of South Africa

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the latter consists of a set of fissures, along which the disturbance either originated simultaneously or spread with great rapidity, and from which the wave motion was propagated outwards. In this way he explains the very divergent estimates of the rate of propagation of earthquakes, for it is evident that if two places are both situated on one of the lines of origin, the difference in time between them gives the rate at which the disturbance has spread along the origin; if they are both on a straight line at right angles to this, the difference gives the rate at which the wave motion is propagated, and in every other case we have a combination of the two. The rate at which the disturbance spreads along the origin appears to be subject to great variation, and is usually high, but the rate of propagation of the wave motion seems to be much the same in every case, and is estimated at about five-twelfths of a kilometre, or about one-quarter of a mile, per second.

One of the greatest difficulties in the way of accepting this explanation has been the apparently conclusive results of the 'seismic triangulation' near Tokio, from which Prof. Imamura obtained, in 1902, a mean rate of propagation of 3.18 ± 0.05 km. per second. In his last published paper Major Harboe deals with this, noticing that only eight earthquakes in all are utilized, of which four gave usable seismograms at all four stations, three at only three stations, and one at but two. For two of these detailed records have been published of the times at which they reached the meteorological stations of Japan, and it is shown that these times cannot be made to fit in with the rate and direction of propagation deduced from the triangulation. Interpreted on Major Harboe's lines, it appears that in each case a branch of the origin passed through the triangle of stations near Tokio, so that the times at which the disturbance affected each of the stations do not refer to a single system of wave motion, travelling across the field of observation, but to two distinct sets of waves, spreading outwards from a common origin; on this interpretation the records from the meteorological observatories fall into line, and the discrepancies between the observed and calculated times are minimized.

We cannot say that Major Harboe has proved his thesis, but it must be confessed that he has impugned the title of the current explanation to general acceptance. The old theory must be put on its defence, and the decision between the two be left to future investigators of coming earthquakes, for the investigations of the past have been carried on so exclusively in the light of a single hypothesis that many facts must necessarily have been overlooked, which will stand out prominently in the light of the new interpretation.

R. D. O.

REVIEWS.

AFRICA.

THE PROBLEM OF SOUTH AFRICA.

'The Africander Land.' By Archibald R. Colquhoun. London: John Murray. 1906. Pp. xv., 438. *With Maps.*

It is hardly possible to review this interesting book as a geographical work. It is, in fact, a treatise on the unsolved political problem of South Africa, in which the author bases his statement of the manifold difficulties of the case, together with his suggested solutions of them, upon the personal observations for which he has had peculiar opportunities. He challenges geographical criticism at the outset, however, by his desire to apply the term "Africander" alike to the British and Dutch inhabitants, instead of to the latter only, and to coin the name "Africanderland" for the territory of a "South African nation." The book has a further

geographical claim in the presence of certain simple, but satisfactory, coloured maps, of a character met with too infrequently in works of this kind. They include even a physical map, the introduction of which, though it may have little direct connection with the actual words of the text, must always be laudable. The presence of this map especially, out of the series, points to the group of geographers to whom the book will be of chief interest, namely, those who have already an intimate knowledge of South Africa. For these the maps will serve to keep their previous knowledge clear in their minds while they graft upon it the peculiar economic and administrative difficulties which are so clearly set forth in the text. Mr. Colquhoun's historical facts, his remarks on the ethnographical distinction between South African races, both white and coloured, are adduced, one might almost say, incidentally, as things familiar to his reader. If they are so, then the reader will appreciate a statement of arguments which, while not seeking to be impartial, is studiously moderate.

AMERICA.

CENTRAL PLAINS OF THE UNITED STATES.

'Preliminary Report on the Geology and Underground Water Resources of the Central Great Plains.' (U.S. Geol. Survey, Professional Paper, No. 32.) By N. H. Darton. Washington: 1905.

The report covers an area of about half a million square miles, comprising the greater part of South Dakota, Nebraska, and Kansas, with the eastern portions of Colorado and Wyoming. It is a region in which the present water-supply is insufficient even for domestic purposes, and hence the great interest and importance of the question of the underground resources. The great central plain of North America, having been subject to no folding movements, presents a general tabular surface, traversed by broad shallow rivers flowing from the Rocky mountains, and cut up by the narrower, deeper valleys of the lateral drainage. The surface of the area under consideration is mainly covered by the late Tertiary deposits of Miocene and Pliocene age, laid down in thin but extensive beds of sands and clays on the relatively smooth foundation of the older rocks. These consist of an almost regular succession of the earlier sedimentary strata right down to Middle Cambrian, sandstone of that age, underlying nearly the whole area of the central plains. Various layers of porous rock alternate with sheets of impermeable shales or limestones, and are therefore in a favourable position to contain water. Tilted in the west by the great uplift which raised the Rockies, these older sandstones outcrop along the mountain slopes, and are covered with a thick mantle of younger deposits in the central plains, so that the water contained in them is here subject to great pressure, and a good artesian flow may be obtained. The Dakota (Cretaceous) sandstone, for instance, which is the most important of the water-bearing formations, has its intake zone at an altitude of from 4000 to 6000 feet, while the region of outflow is only 1000 feet above sea-level. The surface pressure of its waters in South Dakota is over 175 lbs. to the square inch.

The basal sandstone of Cambrian age certainly contains water, which has been reached by deep wells in the lower Missouri valley, but in the central region it lies too deep for investigation. The Ordovician rocks are chiefly limestone, and therefore not likely to contain water, and, dipping steeply, they are soon carried beyond reach from the surface, and the same is true of the Carboniferous formations. The Jurassic sandstone of Wyoming contains water of some importance, which is tapped by several wells, but the Dakota water-horizon is the most widely spread and most useful in the region of the Great Plains. The thickness of this stratum varies from 150 to 300 feet, resting on Red beds and Carboniferous limestones and shales, and overlain by a great mass of clays and shales. Its outcrop