The Wegener Hypothesis.

DISCUSSION AT THE BRITISH ASSOCIATION, HULL.

ON Monday, September 11, the meeting room of the Geological Section of the British Association was the theatre of a lively but inconclusive discussion on the Wegener hypothesis of the origin of the continents. This hypothesis, which is a development of the well-established theory of isostasy, regards the continental masses as cakes of light

mentation along the continental shelves localising the folding.

The union of the continental masses in former geological times explains many peculiarities in the distribution of life both past and present. It also affords an easy explanation of the hitherto unsolved problem of the Permo-Carboniferous glaciation, by supposing the pole to have been located in South Africa and the other glaciated parts of Gondwanaland to have been grouped around. When a reconstruction of this sort is made it is found that the main Carboniferous coalfields of the world lay, at the time of their formation, within the tropics.

The discussion brought forth a great diversity of opinion regarding the validity of the hypothesis, almost the only point on which there seemed to be any general agreement being an unwillingness to admit that the birth of the North Atlantic could have occurred at so late a date as the Quaternary. Proceedings were opened by the reading of a discourse by Dr. J. W. Evans, who was unfortunately unable to be present. Dr. Evans gave an outline of some of the leading features of the theory and emphasised the well-known similarity of the geological formations on opposite sides of the oceans. He, however, questioned Dr. Wegener's estimates of the thickness of the crust whether continental or oceanic, and considered that the latter, being probably as strong as the continental crust, would inhibit the continental drift. He dealt more particularly with the supposed recent variations of relative longitude and with the precautions which would have to be taken in the case of an attempt to repeat the observations.

Prof. H. H. Turner stated that the only piece of astronomical evidence supporting Wegener's hypothesis, and worthy of serious consideration, was the apparent westerly drift of Greenland. He was inclined to regard the longitude observations made up to the present as so much waste paper, but considered that the magnitude of the discrepancies between the Greenland observations of the years 1870 and 1907, which indicated a westerly drift relatively to Europe of 1200 metres, made a good case for repeating the observations to-day.

Mr. W. B. Wright pointed out that a critical comparison of the geological formations on the two sides of the North Atlantic shows on the whole a very remarkable correspondence, both stratigraphical and palæontological, from the Archæan to the Cretaceous, and in particular brings to light certain facts even more strikingly indicative of a former *rapprochement* between the two continents than any pointed out by Wegener.

The recurrence in America on opposite sides of the old Appalachia of the two facies of the European Cambrian and early Ordovician, which are here separated by the Caledonian chain, is perhaps the most striking, the lithological and faunal characters and the sequence of transgression and recession, different on either side of the chain, being reproduced with remarkable precision. Again, the continental and marine facies of the Devonian are separated in both countries by boundaries which become contemporaneous on the Wegener reconstruction.

Prof. Coleman, of Toronto, considered that the similarity in the Archæan formations on the two sides of the Atlantic, cited by Mr. Wright, meant very little, as the Archæan was a universal formation. He also raised the question of the meteorological

FIG. 1.—The world in the Carboniferous and Eocene periods and Old Quaternary era according to the displacement theory. White denotes land, dots shallow water, cross-hatching deep sea. From *Discovery*, May 1922, p. 116, by the courtesy of the publishers.

siliceous material floating on a heavier basaltic, fluid or viscid, substratum, which in its turn reaches the surface in a solidified form on the floors of the oceans. The continents, which are thus movable, are supposed in Carboniferous times to have formed a single mass, and to have split up by rift-valley formation and started floating apart in late Cretaceous or early Tertiary times. The mountain ranges fringing the Pacific are supposed to have been produced along those margins of the continents which are or have been, in virtue of their motion, impinging on the hard oceanic crust, the belts of thick sedi-

conditions of the supposed compacted continent of Gondwanaland, which he thought must necessarily have been a desert and therefore could not have nourished an ice sheet.

Prof. Sollas confessed himself attracted by the theory but doubtful as to proofs. He was not greatly impressed by arguments based on the similarity of the geological formations on the opposite sides of the oceans, the most remarkable of which was perhaps that cited by Mr. Wright. A certain uniformity is to be expected in rocks derived from the same Archæan base. The explanation on the whole was out of proportion to the points of correspondence cited.

Dr. Harold Jeffreys stated that the rotational force which could be invoked to explain the movements of the continents was very small and quite insufficient to produce the crumpling up of the Pacific ranges. The ocean floors also presented a difficulty, for, being composed of basaltic rock, they would be less radioactive and therefore stronger than the continental crust. The withdrawal of India northward and its gathering up into the Himalayan folds were moreover not easily accounted for.

Prof. Gilligan said that, as the great piles of Palæozoic sediments in Europe and America reached their maximum thickness on the borders of the Atlantic, it seemed necessary to assume the presence of a continent occupying the northern part of the ocean. The time-honoured conception that the earth shows a tendency towards a tetrahedral form was also in conflict with this new hypothesis.

Dr. G. C. Simpson thought the theory was a wonderful one from the meteorological point of view, as it explained the marked changes of climate given by the geological record and in particular the ex-centric position of the Quaternary ice-sheets with reference to the pole.

Prof. Marshall, of Wanganui, New Zealand, pointed

out that the movement of that country was to the east and not to the west. Speaking from personal knowledge of a number of the Pacific Islands and referring to the evidence they afforded as to the composition of the floor of the ocean, he said it was a mistake to suppose that the igneous rocks exposed in these islands were entirely basaltic. Alkaline rocks were also represented, but, so far as he was aware, siliceous rocks of continental type were unknown.

Dr. F. E. Wright spoke briefly, and Prof. Boswell referred to the forthcoming English edition of Dr. Wegener's book as affording an easy means of becoming acquainted with the leading features of the subject.

The president, Prof. Kendall, in closing the discussion said he had many years ago examined the question of a land connexion across the Atlantic, especially in its bearing upon the distribution of fishes and reptiles. The practical identity of the Old Red fish faunas of the Orkneys and N. America seemed to show a very close connexion, and the similarity extends to the Carboniferous. Divergence, especially in the reptiles, is marked in the Trias and probably complete throughout the Jurassic. Unfortunately the reptiles require two barriers, one of land to stop the migration of the marine forms, and one of sea to inhibit that of the land forms. The evidence adduced by Martin Duncan and marshalled by Gregory proved a connexion between Europe and America during the Oligocene. He had long ago found it necessary to abandon a belief in the absolute permanence of ocean-basins.

The discussion as a whole was interesting as bringing out the extreme divergences of opinion produced by viewing the hypothesis from different aspects, astronomical, physical, meteorological, and biological, but it becomes very apparent that the surest test of its validity lies in the domain of geology.

W. B. WRIGHT.

The National Research Council of America.

THE National Research Council of the United States corresponds to the Department of Scientific and Industrial Research in this country. It owes its being, as does our organisation, to the very urgent need, which the war made patent to governments, of an organised and systematic attempt to foster scientific research, to extend its industrial applications and, by co-operation and co-ordination, to do this on a national scale. The sixth annual report of the National Research Council, for the period ending June 30, 1921, shows clearly the extent to which this organisation has been carried in the United States. There are divisions based on political classification, *e.g.* Federal, foreign and States relations; on functional classification, *e.g.* educational relations, research extension and information service; and, finally, on a scientific and technological classification, *e.g.* physical sciences, engineering, chemistry and chemical technology, geology and geography, medical sciences, biology and agriculture, anthropology and psychology.

A popular chemical exhibit "to show the American people what the chemist has done and may do for them," prepared by the Chemical Warfare Service of the United States Army, was held in Washington, and arrangements have been made to install it as a permanent exhibit in the United States National Museum.

The division of educational relations has given special attention to the study of the detection and encouragement of students of superior ability, and

is co-operating in this investigation with the division of anthropology and psychology.

Among the projects of the division of research extension may be mentioned the following: An underwriting fund of 200,000 dollars is to be raised for the compilation of critical tables of physical and chemical constants. Measures are afoot for the establishment of a Crop Protection Institute; an Alloys Research Association; a school for tanning to be affiliated to an established university; a Textile Research Institute; and a Horological Institute of America, which will be concerned primarily with the scientific phases of time keeping with special reference to the mechanical devices necessary.

The research information service has for its purpose "to promote scientific and industrial research in this country through the operation of an active exchange for all kinds of scientific and technological knowledge." It prepared for publication Bulletin No. 9, Funds Available in 1920 in the United States of America for the Encouragement of Scientific Research, giving an account of medals, prizes, grants and research scholarships and fellowships amounting in value to approximately 36,000,000 dollars annually. In addition to research in personal records the service has a catalogue of 20,000 chemists and mining engineers, and a file of current investigations.

From the division of engineering a report embodying the results of the investigations on fatigue phenomena of metals will be published shortly. The results indicate that a rise of temperature test may