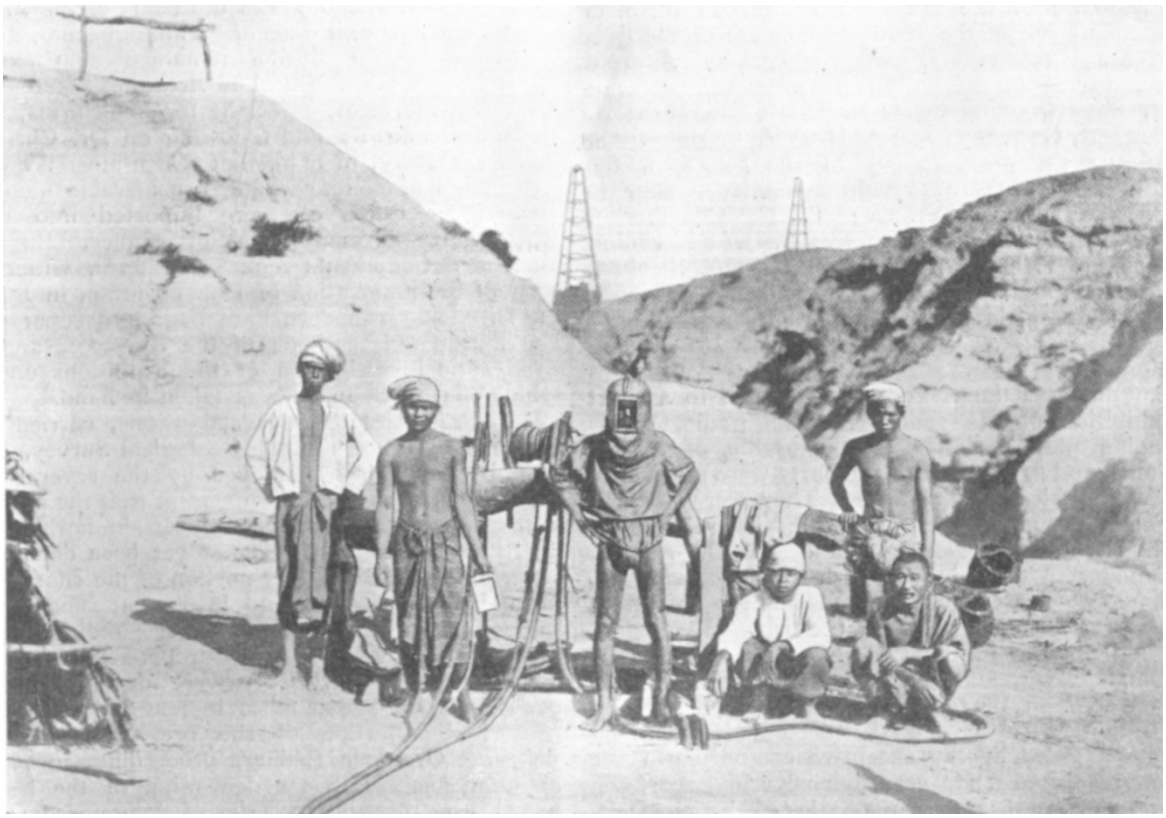
Burma, though many an anticline, apparently as well fitted for the storage of petroleum, has been examined and tested. Meanwhile no fewer than nine companies are engaged in a race for the deeper and richer oil-sands in the Yenangyaung field, and it would appear that the end cannot be far off. One may, perhaps, be allowed to express regret that steps were not taken by Government to regulate this competition until it had seriously affected the resources of the field; especially in view of the fact that Burma is the only country directly under Imperial control which is known to possess large stores of petroleum, and that an adequate supply of fuel oil may become, in the near future, of vital importance to the national existence.



Yenangyaung—Native well-digger in diving dress. (The man on his right is holding the mirror used to illuminate the bottom of the well.) From Memoirs of the Geological Survey of India, vol. xl., part i., "The Oil-fields of Burma."

In the final chapters of the work will be found an able discussion of the origin of petroleum, and of its relations to geotectonic structure. The difficulty of accounting for the presence of oil-sands above a water-bearing stratum (a by no means uncommon occurrence at Yenangyaung) on any theory of inorganic origin, which would entail an upward migration of the oil from a deep-seated source, seems to be insuperable; while, on the other hand, the arguments brought forward in favour of an organic origin, at least in Burma, Assam, and other similar areas, seem no less convincing. Though any direct genetic relation between coal and oil is expressly disclaimed, their close juxtaposition in those countries is highly suggestive, as well as the affinity shown to exist between petroleum gas and such admittedly organic products as marsh-gas and firedamp, in respect of the proportion of methane that they contain. The solution of the problem is one of great practical importance, for upon it depends the question whether an oil-sand, once drained of its petroleum, might ever recover its productiveness.

T. H. D. L.

OCEANOGRAPHY OF THE MEDITERRANEAN.[1]

THE Mediterranean Sea has always been an attractive field for oceanographical investigation, since it presents many features which contrast strongly with those of the other enclosed seas. Italy, Sicily, and a submarine ridge over which the greatest depth of water is about 400 metres, separate the whole area into two sea-basins. The western one, comprising the Balearic and Tyrrhenian Seas, is, for the most part, about 2000–3000 metres in depth; while the eastern basin, which includes all the seas to the east of Italy and Sicily, is rather deeper on the average, and soundings of more than 4000 metres have been made. Large coastal areas, like the North Sea, with depths of less than 200 metres do not

[1] Report on the Danish Oceanographical Expeditions of 1908–10 to the Mediterranean and Adjacent Seas. Edited by Joh. Schmidt. Vol. i., Introduction, Hydrography, and Sea-bottom Deposits. (Copenhagen, 1912.) Pp. 270+xx plates.

exist, and because of this absence of extensive tracts of sea-bottom of moderate depth, fisheries on the scale of those of the North Atlantic enclosed seas are non-existent. Because of this relative unimportance of the sea-fisheries, the fauna of the Mediterranean is not nearly so well known as, for instance, that of the North Sea and Baltic; and the remainder of the reports of the Danish expeditions, dealing with the biological investigations, promise to be of exceptional interest on this account.

The sea-bottom deposits are of relatively little interest. Over by far the greater part of the Mediterranean the bottom is covered by terrigenous materials. These contain far less volcanic débris than might have been suspected. Siliceous materials are also relatively rare, and the chief calcareous deposits are to be found over relatively small areas, and contain Pteropod shells.

The hydrographic conditions in the Mediterranean depend mainly on the fact that this water area is one of high concentration. The amount of water received from the rainfall over the land area which it drains is far less (less than a quarter, it is said) than the amount of water removed by evaporation. The temperature of the superficial strata of water is relatively high: even at a depth of 1000 metres it is uniformly 13° C., while the salinity is also relatively high, being everywhere about 38 per mille in the bottom and intermediate strata. This excess of evaporation over precipitation would lead, of course, to a reduction of water-level, were it not compensated by the strong inflow from the Atlantic through the Straits of Gibraltar. But this inflow tends, of course, to raise the hydrostatic pressure of the water in the sea, and therefore a counter-current sets out from the Mediterranean into the open Atlantic Ocean. The inflowing current is superficial, has a velocity of from one to three knots, a temperature which is that of the Atlantic water in the Spanish Bay, and a salinity of about 36 per mille. The outflowing current is a deep one, its velocity varies from one-half to about five knots, its temperature is uniformly about 13° C., and its salinity is about 38 per mille. The variations in velocity are due to the tidal streams in the straits.

The volume of relatively warm and dense water flowing out from the Mediterranean is very considerable. This water is so highly saline that it flows on as a bottom or intermediate current in spite of its high temperature. Although its direction is nearly east to west as it emerges from the straits, it soon becomes deflected to the north and east as the result of the earth's rotation, and it approaches the coasts of the British Islands. Normally it flows to the west of Ireland, and Dickson has shown that it may be present even so far north as the channel between Rockall and Scotland, but as a rule the current must flow along deep depressions of the sea-bottom. If, however, it is unusually strong it may enter the shallower sea-basins, and Bassett has recently suggested that unusually high salinities in such enclosed sea areas as the English Channel or Irish Sea may be due, not to an unusually strong Gulf Stream drift, but more probably to the presence of this highly saline Mediterranean water. This indeed, appears to have been the case in the summer of 1912 in the Irish Sea and adjacent waters.

Precisely the opposite conditions exist in relation to the Black Sea and the Sea of Marmora. The latter basin has a depth of 1000 to 2000 metres, and the Black Sea has a maximum depth of about 2200 metres. The Black Sea is an area of excess of precipitation over evaporation, so that the superficial strata of water are of low salinity. From the surface down to about 20 metres the salinity is about 17·5 per mille, and it is nearly constant at this limiting depth, increasing towards the bottom. The temperature appears to be nearly constant at about 80 metres depth, and also increases slightly towards the bottom. Because of the excess of precipitation over evaporation the water-level of the Black Sea tends to rise, but this is prevented, of course, by an outflow of relatively light water through the Bosporus into the Sea of Marmora, and from the latter basin through the Dardanelles into the Mediterranean. But since this outflow reduces the hydrostatic pressure of the communicating water masses, a counter-current of relatively dense Mediterranean water enters the Sea of Marmora, and then the Black Sea through the Bosporus. The water flowing out from the Black Sea is a surface current, that flowing in a deep one. The depth of water at the entrance to the Black Sea is, however, very small, and the existence of this "sill" prevents the complete renewal or ventilation of the deeper strata of water, a condition which also exists, on a much smaller scale, in some of the Norwegian fjords. The absence of renewal of water leads to the stagnation of most of the water of the Black Sea: not only is oxygen absent in the deeper layers, but its place is actually taken by sulphuretted hydrogen, and except for some forms of bacteria this water-mass is lifeless.

The horizontal water circulation in the Mediterranean depends on the Atlantic inflow. This is at first west to east in direction, but, becoming deflected to the right in consequence of the rotation of the earth, it flows along the coast of Africa. The direction of flow of surface-water then follows the general scheme of that in the northern hemisphere. Two cyclonic circulations are set up in the western basin—one in the Balearic Sea to the west of Sardinia and Corsica, and another in the Tyrrhenian Sea. The main stream enters the eastern basin through the channel between Sicily and Tunis, and then becomes deflected, forming another cyclonic circulation. There is also an intermediate level water circulation which depends for its direction on a complex resultant of superficial horizontal circulation and vertical circulations due to concentration and cooling of superficial waters. This intermediate circulation is difficult to explain, and, indeed, is still imperfectly known. It is, of course, the origin of the westerly flowing deep current in the straits, and seems to

result from the junction of two main streams flowing to the south of Sardinia and the north of Corsica respectively.

Many disputed questions are discussed by the authors of the papers in this report, and we await with interest the results of the biological investigations. There is no doubt that the fishes and other groups of animals inhabiting the Mediterranean area are still imperfectly known; while the investigation of the pelagic microscopic life of these seas is one which is full of interest. A good deal of such work has, of course, already been done, but the results of investigators thoroughly familiar with deep-sea work of this kind in the northern seas are sure to be interesting, and the comparisons which we may expect they will attempt ought to throw new light on many questions of general biological interest. J. J.

THE GUM TREES OF AUSTRALIA.[1]

MR. T. H. MAIDEN, the director of the Botanic Gardens, Sydney, N.S.W., published the first part of his great work on the characteristic Australian genus Eucalyptus in 1903, and it has now reached the seventeenth part. There is no other country of the same extent as Australia in which one genus of trees largely predominates throughout and, at the same time, has few extensions beyond. It has been estimated that three-fourths of the forest vegetation of Australia consists of gum trees and bushes, yet the genus is not represented in the native flora of New Zealand, New Caledonia, Lord Howe Island, and other contiguous countries, including, I believe, New Guinea, though *E. alba* is a native of Timor.

But, like Baeckia and Melaleuca, other myrtaceous genera, Eucalyptus has a considerable northward extension in eastern Asia, limited, however, to one species the present distribution of which is peculiar. Mr. Maiden has succeeded in showing that this species, *E. naudiniana,* abundant in Neu Pommern (New Britain), is the same as that discovered in Mindanao, Philippines, by the United States Exploring Expedition (1838–42), and described under the name multiflora—a name previously occupied. These two localities are separated by about 13° of latitude and 25° of longitude, or, approximately, 1500 miles, and hitherto *E. naudiniana* has not been recorded from any intermediate locality. Its presence in the Philippines is an interesting fact in phytogeography, and the question arises, Is it a straggler of a southern migration, or is it, and similar outliers, a northward extension of a type of southern origin? But this is not the place to discuss the point.

So far Mr. Maiden has described and figured ninety-four species of Eucalyptus, and given all details available of their distribution, based on practically all the important herbarium material in existence, and a very wide personal experience in the forests of all parts of the country. Upwards of one-third of these ninety-four species are of later date than Bentham's "Flora Australiensis," or were not given specific rank by Bentham. From a rough calculation the number of valid species of Eucalyptus will not be fewer than 150; some generally dispersed, though the western species are mostly different from the eastern, and many of them bear more conspicuous flowers than the eastern. Others are very rare and near extinction, notably the very large-flowered, shrubby *E. macrocarpa.* It is to be hoped that Mr. Maiden's health and official duties will permit him to bring this valuable monograph to a relatively early conclusion, as it is only in the complete form that it can be fully useful.

W. BOTTING HEMSLEY.

[1] "A Critical Revision of the Genus Eucalyptus." By J. H. Maiden, Government Botanist of New South Wales. Parts xii–xvii. Plates 50–76, with descriptive letterpress. (Published by Authority of the Government of the State of New South Wales, 1910–13.) Price 2s. 6d. each part.

NOTES.

WE are informed by Dr. H. Mohn that he has resigned the professorship of meteorology in the University of Christiania and the directorship of the Meteorological Institute of Norway. Mr. Aksel S. Steen has been appointed to succeed him in these positions.

AT the time of going to press with our issue of last week, the race by Mr. H. G. Hawker in an all-British waterplane for the 5000*l.* prize offered by *The Daily Mail* was in progress. The distance to be covered was 1540 miles, and of this 1043 had been accomplished on Wednesday when, according to the aviator, his foot slipping off the rudder bar, he lost control of the machine, which fell into the water of Lough Shinny, Ireland, and was wrecked. Mr. Hawker and his companion, Mr. Kauper, were rescued, the first-named uninjured, but the latter with a broken arm and other injuries. Although the task set him to accomplish was not fulfilled, the aviator must be congratulated upon having made a very satisfactory series of flights. The machine, fitted with a Green engine, was built by the Sopwith Aviation Company, and was a biplane with a span between the wing tips of 50 ft., and a length of 31 ft. 6 in. It had two main floats, with single hydroplane step, each weighing 170 lb., and also a small torpedo float under the tail. The total weight of the machine and passengers was estimated at 2400 lb.

THE next International Conference on Cancer (the fourth) is to be held at Copenhagen in 1916.

ACCORDING to the *New York Medical Journal,* an International Exposition of Safety and Sanitation will take place in New York in December next. It will include exhibits devoted to safety, health, sanitation, the prevention of accidents, the welfare of the public and the individual, and the advancement of the science of industry. Exhibits from foreign countries will, by a special Act of Congress, be admitted free of duty.

A REPORT from Vienna states that a ship has been purchased for an Austrian expedition to the South Polar regions, and that funds are being collected in