

British Research on Tides.

OF recent years tidal research in this country has resumed the vigour which it showed during the fruitful years of Sir George Darwin's work and influence. Among official bodies, the Admiralty and Ordnance Survey have shown renewed activity in promoting tidal observation and research; but the revival is perhaps most closely linked with the interest shown in tidal problems by Mr. G. I. Taylor and by Prof. J. Proudman. The former has made several brilliant incursions into the field of tidal research, and has solved some important outstanding problems. His work on the tidal dissipation of energy in the Irish Sea has already inspired other workers to researches of a similar kind. Recently he has published a solution of the problem of tides on a rotating rectangular basin, a subject which had foiled the attempts of many former workers, including the late Lord Rayleigh; also, by an elegant investigation of the waves in a tapering channel with a sloping bed, he has lately explained the special tidal features in the Bristol Channel.

Free-lance work of this kind is essential to the progress of tidal theory, but not less necessary is systematic work on the immediate practical problems of tidal analysis and prediction. The establishment of a centre where such work is carried on is due primarily to the second-named mathematician, Prof. Proudman, backed by the University of Liverpool, the docks and shipping interests in that city, and later by the Department of Scientific and Industrial Research. The second annual report of the Tidal Institute of the University of Liverpool has just been issued, and describes the work completed or begun, under the direction of Prof. Proudman, during the past year. A fuller account of some of the work is contained in the report of the British Association Committee appointed "to assist work on the tides"; this report is drawn up by Dr. Doodson, who is the secretary both of this committee and of the Tidal Institute.

The main part of the year's work has consisted in the analysis of tidal observations, partly from a Liverpool tide-gauge, but chiefly from the Newlyn gauge. Newlyn is one of the four new tidal stations instituted by the Ordnance Survey. The analysis indicates that the errors remaining in the predictions made by former methods of harmonic analysis may amount to more than a foot, apart from the errors

arising from the use of predicting machines. About half of the error may be due to the inadequate treatment of shallow-water effects, while the rest is due to tidal constituents not included in Sir George Darwin's schedule. A re-examination of the astronomical and dynamical theory of the tides has also been made by Dr. Doodson, who has found a number of terms large enough to demand consideration which are absent from the Darwinian schedule.

The shallow-water effects have been isolated by successive elimination of known or determined astronomical constituents. They show themselves, as theory indicates, in the introduction of components having periods a half, a third, a quarter, and so on, of the primary astronomical components—mainly, of course, of the semidiurnal component. Partly on a basis of theory, and partly as a result of experience with the Newlyn records, Dr. Doodson has formulated a rule connecting the amplitude and phase of these secondary constituents with the resultant semidiurnal tide on any day. The rule is that the shallow-water constituent of frequency $2n$ ($n=2, 3, 4$) is proportional in amplitude to the corresponding component in the n th power of the resultant semidiurnal tide, while the phases of these two components differ by an amount characteristic (like the factor of proportionality in amplitude) of the station and of the value of n . This rule is valuable because its commercial application is easy; correction tables for the purpose are readily prepared, since the corrections are functions merely of the time and height of the semidiurnal tide on any given day.

Much attention has been paid to improved methods of tidal analysis and of prediction by the use of the results of such analysis. Computational methods are favoured as against mechanical methods; a test of the accuracy of the tide-predicting machines used by the Admiralty and the India Office has indicated some serious errors in their results, and it is concluded that the labour of reading the curves afforded by the machines, with any pretence to accuracy, is comparable with the labour of direct computation, while the value of the results is greater in the latter case.

The discussion has so far been confined to the tides of short period, and these still present many unsolved problems. The long-period tides and the meteorological effects also afford an important field for research, which has yet to engage the attention of the committee and institute.

The Influence of Egypt on African Death Ceremonies.

AT a meeting of the Royal Anthropological Institute held on October 25, Dr. W. H. R. Rivers, president, in the chair, Mr. T. F. McIlwraith read a paper on "The Influence of Egypt on African Death Ceremonies." He said that there was strong evidence of Egyptian influence in modern Africa, particularly in the region south and west of the Sahara. In West Africa and the Congo preservation of the dead had a wide distribution. The methods employed included desiccation and pressure, frequently assisted by preservatives, such as honey, palm-wine, salt, and spices. Not only were these methods strikingly similar to those practised in Egypt, but there were also resemblances in arbitrary details, such as the plugging of the nostrils, sewing up the opening in the body, placing plates over the mouth and eyes, and wrapping the corpse in bandages. Equally important

was the limitation of the preservation of the body to chiefs. Mummification had a slow growth in Egypt under favourable climatic conditions, but it was highly improbable that similar methods should have been evolved in the humid atmosphere of tropical Africa.

Coffins and anthropomorphic figures occur widely on the Guinea Coast and in the Congo, and are rare in East Africa. Coffins are usually the prerogatives of chiefs, and often occur in conjunction with some method of preservation of the body. Among the Baculé of the Ivory Coast a representation of the deceased is portrayed on the cover of the coffin, a feature highly suggestive of Egypt. Anthropomorphic figures are employed in a variety of ways in magical and religious ceremonies, and in a few cases are used to house the souls of the deceased, as was done in