

### 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

Egypt. It is probable that the erection of a representation of the deceased over his grave belongs to the same complex.

The cumulative evidence of mummification, coffins, and anthropomorphic figures gives strong support to the belief that the resemblances between Ancient Egypt and Modern Africa are due to transmission of culture. Is this transmission of culture the result of direct influence from Egypt to Africa (or *vice versa*), or is it due to the common ancestry of Ancient Egyptians and Modern Hamites? This last possibility is untenable, since the history of mummification can be traced from its beginning in Egypt, whereas in Africa it appears to occur only in a fairly developed state. This further precludes the possibility of African influence on Egypt, leaving as the only solution that various Egyptian practices were transmitted to Africa, where they have survived, in a more or less degraded form, until the present day.

Why do these survivals occur in distant parts of the Continent rather than in the north and east? Two hypotheses are possible: (1) That elements of Egyptian culture were transmitted to various parts of Africa by land, but survive only in areas where pastoral peoples have not penetrated; (2) that seafarers established a centre of Egyptian civilisation on the Guinea Coast, whence their influence spread inland with ever-lessening intensity.

The presence in East Africa of a few isolated instances of the practices under consideration supports the first hypothesis. On the other hand, the evidence of Egyptian civilisation in West Africa raises the possibility of a settlement on the coast itself. It is probable that much of the culture of the Canary Islands was of Egyptian origin, and the islands may have served as a base for voyages further south.

In opening the discussion which followed the reading of the paper the president said that the question involved three distinct problems: (1) Was there any relation between burial customs in West Africa and those of Ancient Egypt? (2) Did the influence penetrate by land or sea, and why were these customs absent from the greater part of Africa? (3) What was the date of the movements by which they were introduced? Miss Murray said that regarding the evidence from the chronological, rather than from the geographical, point of view, she required further proof of connection. Similarity was no proof. For instance, the ceremonial of royal funerals in this country had been identical in many points with that of the royal funerals of Ancient Egypt; but it did not follow that they were connected. The types of mummification cited belonged to the earliest times.

Prof. Elliot Smith pointed out that the customs cited by the author, so far from being early in date, belonged to a small group of dynasties of the late Empire, ranging mainly from the nineteenth to the twenty-second dynasties. This gave the earliest date for the diffusion of these customs. They had spread by land across the Continent and down the Niger; but there was definite evidence of a later diffusion by sea in the sixth century B.C. The distribution should be compared with the occurrence of gold. Mr. Peake said that these customs must have been introduced at an early date, and clearly were not indigenous, as climatic conditions were not favourable to the independent development of mummification. The distribution was probably due, not to the occurrence of gold, but to the fact that an incoming people, arriving from the grasslands, would follow the line of least resistance along the open glades of the forest and the river valleys.

Mr. Torday suggested that the use of the coffin

might be due to European influence, while the distribution was due not to gold—there was no forest gold—but to the fact that these customs had been reported by travellers who had followed the beaten track. Further, was there not more reason to believe that these customs had been introduced into Egypt from Africa rather than *vice versa*? Dr. Stannus said that the custom of plugging the nostrils of a corpse, on which stress had been laid, was widespread in Africa, and was intended to arrest the rapid setting in of decomposition through the agency of flies.

### University and Educational Intelligence.

BRISTOL.—Prof. T. Loveday, principal of University College, Southampton, and formerly professor of philosophy at Armstrong College, Newcastle-upon-Tyne, has been appointed vice-chancellor of the University in succession to Sir Isambard Owen, recently retired.

CAMBRIDGE.—Mr. W. E. H. Berwick, University lecturer in mathematics at Leeds University, has been elected to a fellowship at Clare College.

The list of those who voted last month on the position of women at Cambridge has now been published. It shows a strong majority among the residents in favour of the compromise scheme. As had been generally surmised, this scheme was thrown out by the non-resident voter.

LEEDS.—Mr. E. C. Williams has been selected for the post of research chemist to the Joint Benzole Research Committee of the University and the National Benzole Association, and he was officially appointed by the council on November 16 last. Mr. Williams graduated in 1914 at the University of Manchester with first-class honours in the School of Chemistry. He was awarded the Mercer and Dalton research scholarships for research theses, and a special University prize for physical chemistry. His M.Sc. was gained by research, and later he was appointed research chemist to British Dyes, Ltd., where for the past four and a half years he has been engaged, not only upon laboratory research, but also on large-scale work and administration, as head of the department at the Dalton Works, Huddersfield, for the manufacture of intermediate products. Mr. Williams's work will centre at the University of Leeds in the Department of Coal-gas and Fuel Industries, where laboratory facilities are provided, but will also be carried out so far as may be found desirable on the plants engaged in benzole production and laboratories attached thereto.

LONDON.—The Senate has adopted a resolution that the recently erected inorganic and physical chemistry laboratories at University College should be named after the late Sir William Ramsay.

MR. E. R. WEIDLEIN has been appointed director of the Mellon Institute of Industrial Research, University of Pittsburgh.

THE Hampshire Field Club and Archæological Society has organised a course of six public lectures on topics of local archæological interest which are being delivered at Southampton. Two lectures have already been given, and it is gratifying to learn that the attendance has in each case been between 350 and 400, of whom nearly 300 were persons who had obtained serial tickets. We note that the lecturers are giving their services free, and all the profits made will be devoted to publishing original research.