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On the Further Observations of Deep-Sea Waves Now Required

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extending some 6 miles inland, rock was exceedingly scarce for most of the distance, and great labour was involved in transporting a sufficient supply for the construction of the thirty-four boundary pillars. A track varying from 20 to 25 feet in width was cleared through the bush or steppe-forest along the line of the frontier, and this will probably be kept open as a line of communication. No compact villages were met with, but many scattered groups of "Shambes," some of which were intersected by the frontier, involving some rearrangement as regards the collection of the hut tax. The Kionga district, between the frontier and the Rovuma, proved much better than its reputation, from the point of view of healthiness, tsetse-fly, mosquitoes, etc. The Swahili inhabitants were friendly, though the tribes along the boundary were shy, and further south the chief Machemba is a disturbing element.

GENERAL.

The Oxford School of Geography.—The Report of this School for 1908 has lately been issued. It states that the increasing work of the school has necessitated additions to the staff and equipment, which have been met by a grant of £200 from the Common University Fund for the current year. Mr. H. O. Beckit, M.A., has been appointed Assistant to the Reader, while Mr. M. M. Allorge has been appointed to a temporary Lectureship in Geomorphology. As regards the future, the fact that the growth of expenditure augments more rapidly than the increase in fees, and the probable withdrawal of the R.G.S. grant at the end of another five years, will soon render it necessary to consider the need of better accommodation and a permanent endowment for the school. Additions to the equipment have lately been made at a cost of about £40. It is proposed to make as complete a collection as possible of maps and official publications of geographical interest relating to all parts of the British Empire, and some generous contributions to this object have already been received. Although the total number of students did not differ much from that of the previous year (the numbers were 65, 59, and 54 for the three terms respectively), the number of those devoting most of their time to geography showed an increase from 17, in the Michaelmas term of 1907, to 30, in that of 1908. Seventeen courses of weekly lectures were delivered, and the usual field, practical, and seminar work was carried on. The fourth biennial vacation course was held in August, 1908, and was attended by 177 students, mostly teachers from schools. As a result of examinations in January and June, the Diploma of the school was awarded to eight candidates (with distinction in the case of two, Miss E. J. Rickard and Miss E. G. R. Taylor), and certificates in Regional Geography or Surveying to five candidates. During the year considerable additions have been made, both by purchase and gift, to the book and map collection.

CORRESPONDENCE.

On the Further Observations of Deep-sea Waves now required.

In view of a forthcoming discussion on observation of waves at sea to be held at the Meteorological Office, the time seems opportune for once more calling the attention of Fellows of our Society to the matter.

For ships engaged in commerce, the ordinary methods, such as have been employed by Lieut. Paris and others,* could be profitably included in the meteorological observations undertaken by officers, and the results would be of much

* *Paris Rev. Mar. et Colon.*, 31 (1871); W. H. White, 'Naval Architecture,' and Vaughan Cornish, *Geogr. Journ.*, May, 1904.

greater value than formerly if use be made of the wireless telegraphy. For this the ships plying on the North Atlantic have special opportunities. Whenever the condition of the sea is such as to make wave observation of particular interest, an effort should be made to get into wireless communication with the vessel immediately preceding and with that immediately following on the same track, and also with the vessel most nearly abreast on the parallel (outward or homeward) track, and the officers of such vessels should be requested to make a simultaneous observation of the state of the sea. The result would be to give much-needed data of the rate of growth (or decay), of height and length (1) in time and (2) in space.

By comparison of the records sent in by different ships following one another, it will be possible to obtain further insight into the relation between the dimensions and speed of the cyclone, or other atmospheric depression, and the height and length of the waves. This is particularly important in connection with the length of the waves, for the growth of that length of wave will be favoured which travels at such a speed as to be accompanied by the depression during its advance across the ocean.* It is thus essential to take account of *two* atmospheric velocities in connection with the growth of deep-sea waves, viz. (1) the velocity of the wind, and (2) the rate of advance of the *locus* of the wind. The part of the cyclone or other depression with which we are most concerned is that where the direction of the wind is identical with the direction of the advance of the depression.

There is one point in which the individual observer may readily improve upon the work of Paris and of most other predecessors, viz. in recording with particular care the effect of a squall during a gale to increase the height of the waves which it strikes. I have repeatedly observed in the Atlantic an increase of, apparently, 5 feet in wave-height during a squall of five minutes' duration, without any noticeable increase of wave-length. This increase in height and steepness is not only interesting in itself, but has a practical application to the designing of torpedo craft and other vessels to resist hogging and sagging strains. Some years ago a torpedo vessel was lost by breaking her back during a gale in the North sea. I doubt if the ratio usually adopted for $\frac{\text{height}}{\text{length}}$, or the steepness, of waves is sufficiently high to represent the groups of steep waves met with during storms, and I suggest that naval architects need fresh data for the ratio on which their calculation of these strains is based. In the case of vessels employed on scientific missions, the officers or members of the scientific staff can elaborate methods of observation which would greatly extend our knowledge of deep-sea waves, particularly by the use of instruments which would enable the total rise and fall of the sea to be measured, thus taking account both of the wind-wave, or "sea," and of the swell. At present, the observations made by eye from ships in motion only give the interval of height, length, and time between successive convexities of surface. The average numerical result for both height and length is thus just the same as if there were no swell running. The total rise and fall of the water is thus considerably underestimated.

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March 6, 1909.

* The largest swells generally get ahead of the storm, so that the sound of a heavy surf booming at regular and considerable intervals on the shore gives notice of the storm's approach.