Tidal Predictions by Mariners.[1]

THE publication of the fourth edition of Part 2 of the Admiralty Tide Tables may well be regarded as a memorable event in the history of practical aids to navigation. The first edition was published in 1858, reprinted annually with amendments and additions until 1909, and subsequent editions were published in 1910 and 1920. Though each edition was and improvement on that which preceded it, the type of information and the method of using it remained in all essentials unchanged. The tidal data were presented in the form associated with the names of Whewell and Lubbock, who were mainly familiar with the comparatively simple types of tide experienced in British waters.

Up to a point, it was sufficiently accurate to state that the high water follows the moon's transit by an interval which is approximately a constant at a given place. Such constants have hitherto been the chief aid to navigation in ports for which no daily tidal predictions are available. In many instances it was possible to supplement this method by the use of 'tidal differences'; thus if daily predictions were available at a 'standard port,' then small corrections on time and height could be applied to give fairly good approximations to tidal movements at a neighbouring subsidiary port. If the tidal height at a given hour of the day was required, then tables and diagrams were used, the arguments being (1) the time interval between that hour and the time of high water, (2) the range of tide.

The latest edition supplements this information by the harmonic constants of the principal tidal constituents for about a thousand ports, and very strong reasons are given for the use of these constants. It is even indicated that the non-harmonic constants will ultimately be omitted, and mariners are therefore advised to become familiar with the new methods. It remains to be seen whether the process of conversion will be easy, as mariners do not take kindly to new ways of doing things.

The reasons given for the change are of course entirely connected with the degree of accuracy required. The tidal oscillation is composed of a very large number of constituents which may be broadly divided into two main groups, semidiurnal constituents and diurnal constituents. The non-harmonic tidal constants and the tidal differences can only be functions of either the semidiurnal constituents or of the diurnal constituents. It is not possible to include both diurnal and semidiurnal constituents in the same constant or difference, and the constants hitherto given have practically been functions of the semidiurnal constituents only. More strictly, they are functions only of the constants of particular constituents, inasmuch as the effects of changing phase and distance of the moon are not included, though corrections can be made for these conditions. The tidal differences are more general than the constants, as the variations due to phase and distance are included in the predictions for the standard port. In any case where the diurnal tide is not wholly negligible, large errors are possible, and the error increases with the relative magnitude of diurnal and semidiurnal tides. In general, the non-harmonic constants and differences are of little value outside the Atlantic Ocean.

For heights of tide at times other than high water, the tables and diagrams assume that the tidal oscillation is simply harmonic. This is never the case where there is diurnal inequality and is very rarely the case for ports situated in relatively shallow water.

The harmonic method, however, is uniformly applicable, and its results in general are of very much greater value than those of the non-harmonic methods. The computations required are not excessive, and are facilitated by explicit instructions and tables. Carefully worked examples are given, and it is difficult to see how misunderstanding can occur. The tables to assist predicting are well set out, and the whole work is straightforward and within the powers of any intelligent man. No knowledge of tidal theory is required. The harmonic constants have been given in such a form that the predictions are automatically rendered in the standard time kept at the place, a feature which is unique to the present publication. Since the values of mean sea-level with respect to chart datum are given, the mariner can readily obtain the actual depth of water available; other recent publications of harmonic constants have omitted this important quantity.

Approximate methods of harmonic tidal prediction have been published by Van de Stok for use by seamen, and a recent publication by the International Hydrographic Bureau is based on his work. In Great Britain the movement for reform has been initiated by Commander H. D. Warburg, and it has been backed by scientific opinion. The results of his labours are extremely creditable. In the opinion of the writer the list of constants, the mode of presentation, and the instructions exceed anything yet published in this line. This serious attempt to reform the methods of prediction, and the progressive policy of the Hydrographic Department of the Admiralty, are very commendable. It is to be hoped that the methods advocated receive a favourable reception by seamen.

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[1] "The Admiralty Tide Tables." Part 2. Fourth edition, 1927, containing Non-Harmonic Tidal Constants, Tidal Differences and Harmonic Tidal Constants for the Principal Ports, etc., of the World. Published by Order of the Lords Commissioners of the Admiralty. Pp. 508. (London: J. D. Potter, 1927.) 3s. net.

Studies of Ovarian Dynamics.

PROF. LIPSCHÜTZ in an illuminating review of current work on this subject in *Biological Reviews*, vol. 2, No. 4, pp. 263-280, gives concrete expression to some of the main results which have emerged from the study of ovarian dynamics. In the first place, the author shows that the number of primary follicles which enters into follicular development, the degree of follicular ripening which is attained, and the further fate of the follicle, depend not upon the total number of primary follicles present, but upon general internal factors outside the ovary. This he terms the law of follicular constancy, and there is a constancy for each species.

Secondly, Prof. Lipschütz shows that the time at which endocrine activity of the ovary sets in is dependent upon the age of the internal environment and independent of the age of the ovary. Young ovary engrafted into an adult animal will begin its endocrine activity sooner than corresponds to the age of the ovary, and conversely, adult ovary engrafted into a young animal will cease endocrine activity. The ovary is only the means by which sexual puberty is realised when certain environmental factors allow follicular development and endocrine activity (the law of puberty). The influence of body growth on the ovary is next discussed, and it is shown that certain growth substances, not sex specific, which are necessary for both body growth and follicular