Our Astronomical Column.

LIVERPOOL UNIVERSITY TIDAL INSTITUTE.—The first annual report of this institute, established in 1919 with funds provided by Sir Alfred and Mr. Charles Booth, gives a brief and interesting account of the work so far taken up under the auspices of Prof. J. Proudman, the honorary director, and Dr. A. T. Doodson, the secretary. Besides theoretical work on the seiches in Lake Geneva and on the dynamical equations of the tides, the study of tide-prediction has been vigorously prosecuted. The official British and American predictions of the tides in the Mersey, calculated by machines of Lord Kelvin's type on the basis of analyses made many years ago by a committee of the British Association, often differ by a foot in height between themselves, and from the actual observed heights by amounts up to 3 ft. Dr. Doodson finds that the predicting machines are susceptible to error, though further examination is necessary to determine whether to an extent which unfits them for use in research. Meanwhile, the institute has embarked on an intensive study of the tides at Newlyn, near Land's End, from the continuous record taken by the Ordnance Survey. This work has also been assisted financially and otherwise by a British Association committee. Analysis has been made by computations on a novel plan; the five most important constituents in the tides were first removed, using approximate values inferred from the results of analyses for neighbouring stations. This reduced the range from 18·5 ft. to 2·5 ft., and disclosed the presence of quarter-diurnal constituents, which also were removed by a method suggested by theoretical considerations. This revealed constituents of higher orders and the presence of some unremoved semi-diurnal constituents, as was to be anticipated. By this method the real constituents are discovered, and these alone removed.

LONGITUDE BY AEROPLANE.—The *Comptes rendus* of the Paris Academy of Sciences for August 2 contains a paper by M. Paul Ditisheim describing a new determination of the Paris-Greenwich longitude by the repeated transfer of a series of chronometer watches between the two observatories by an aeroplane. Twelve watches were used which had previously been tested at Teddington with most satisfactory results. They were packed in wooden cases surrounded by layers of wool, and remained in a horizontal position during transit. They were compared with the standard clocks at Greenwich and Paris by Mr. Bowyer and M. Lancelin respectively. The average time of transit was $2\frac{3}{4}$ hours; on one occasion the double journey was completed on the same day.

The resulting longitude difference is 9m. 20·947s., with a probable error of 0·027s. It is only 0·005s. less than the mean of the British and French results in the 1902 determination. It is needless to say that the new value does not claim anything like so much weight as that of 1902, in which the observers were exchanged and personal equation was eliminated. It is, however, an interesting confirmation of it, and it illustrates the fact, already known, that the use of the travelling wire in observing transits greatly diminishes personal differences. This fact gives ground for hope that the method of wireless signals, without interchange of observers, will give close approximations to the longitudes of all the participating observatories.

OBSERVATIONS WITH THE PHOTO-ELECTRIC CELL.—Prof. Joel Stebbins's valuable pioneer work with the selenium cell (with which he discovered the secondary minimum of Algol) is now being continued with still greater refinement with the photo-electric cell. The *Astrophysical Journal* for May contains two of his researches. The first is on the Algol-variable λ Tauri. The light-curve much resembles that of Algol, a secondary minimum being shown here also. Elements are deduced from Prof. Stebbins's results combined with the spectroscopic ones. The masses of the two stars are 2·5 and 1·0 times that of the sun; the radii are 4·8 and 3·6 times the sun's; and a third body is suspected with mass 0·4. The side of the secondary that is turned towards the primary is much brighter than the other, which is ascribed to the intense radiation of the primary.

The other star examined is π^5 Orionis. The variability was detected before Prof. Stebbins noted that it had already been classified by Lee as a spectroscopic binary (with only one visible spectrum). The total range of light is only 0·06 magnitude, yet the observations suffice to give a consistent curve. As this proves to be a sine-curve with two periods in the time of revolution, it is concluded that the light-variation does not arise from eclipse, but from the spheroidal figure of the bright component. The ratio of axes is 0·95, which is quite a reasonable figure.

Prof. Stebbins states that he has at last succeeded in obtaining a potassium cell, with walls of fused quartz, that gives complete satisfaction. It was only after ninety-eight trials that this result was reached.

The Scientific Investigation of the Ocean.

NEED FOR A NEW "CHALLENGER" EXPEDITION.

THE outstanding feature of the proceedings of Section D (Zoology) at the meeting of the British Association at Cardiff was the discussion on August 26 on the need for the scientific investigation of the ocean.

In opening the discussion, Prof. W. A. Herdman, president of the Association, pointed out that this need may be considered under two heads—the scientific need and the industrial. Simply as a matter of advancing knowledge, the need for much further investigation of the ocean is very great indeed, and biologists realise that the industries connected with those marine animals—fishes and others—which are of economic importance are all of them badly in need of scientific investigation. There is not a single marine animal in regard to which it can be said that we know anything like all there is to be known and fully understand its mode of life. Even our commonest fishes, such as the herring and the cod, are in some respects unknown and mysterious to us. Prof. Herdman then proceeded to give a few examples of the need for further investigation.

The first report of the Tidal Institute of the University of Liverpool, issued a few weeks ago, shows that the two independent published predictions of the Liverpool tides—one issued by the Admiralty and the other by the United States Coast and Geodetic Survey—"seldom agree; they often differ by a foot in height; also, both of them sometimes differ from the actual tide by as much as 3 ft. in height." It is evident from this report that the present state of affairs urgently calls for more scientific research both in regard to the theory of the tides and to the accuracy of observations.

The work of the bio-chemist and of the physical chemist in connection with hydrography seems likely to be of fundamental importance, *e.g.* the possibility of determining the point of entrance to known currents of water by means of indicators showing the hydrogen-ion concentration may be of practical utility to navigators. Then again, Otto Pettersson's submarine waves in the Gullmar Fjord and elsewhere,