by Mr. Baker and his colleagues in the Naval Tank. The most noteworthy is that with a series of ship models, each having the same principal dimensions, but with a different distribution of the displacement in a longitudinal direction. The experiments revealed the limits of speed to which various forms can be driven without excessive wave-making, and have also increased the general knowledge of eddy-making at the sterns of ships. An extensive series of experiments has also been carried out on hydro-aëroplane floats. Fig. 1 gives a general view of the tank with a model in place under the carriage by means of which the model is towed. Fig. 2 shows the wave profiles for a model of mercantile form with fairly bluff ends. It is satisfactory to note how very small the loss of water from the tank still continues—a tribute to its design and construction.

In the metallurgical department, Dr. Rosenhain and Mr. Archbutt have published the tenth report of the alloys research committee of the Institution of Mechanical Engineers. The report, which deals with the alloys of zinc and aluminium, contains features of great interest in view of the increasing importance of light alloys in aëronautical and instrument work. Dr. Rosenhain and Mr. Ewen have communicated an important paper on intercrystalline cohesion in metals, while Mr. Humfrey has been working on the effects of strain in iron at high temperatures.

The metrology division has been largely occupied with the arrangements for the reception of the Kew Observatory test work. The behaviour of the silica standard metre has been closely followed, and the value of its expansion-coefficient determined (Mr. Donaldson).

Dr. Stanton and his staff have carried out extremely valuable work in a number of directions, more particularly on wind-pressures (at the Tower Bridge), on the frictional high-speed flow of water and air in pipes, and on the pressure and flow round aëroplane surfaces. The experiments conducted in the 4-ft. wind channel have afforded valuable information to the Royal Aircraft Factory at Farnborough in designing biplanes and dirigible balloons. The Treasury has accordingly authorised the erection of a new 7-ft. channel at the laboratory; this is now approaching completion.

The new experimental road constructed for the Road Board is complete, and abrasion and endurance tests have been begun.

The optical division has been concerned with the testing of photographic shutters, the absorbability of glass for ultra-violet light, and the testing of telescope objectives and trial lenses. The staff took an active part in the organisation and proceedings of the Optical Convention which was held during the year at South Kensington.

This short summary may suffice to give a notion of some of the many fields of activity in which the National Physical Laboratory is working for progress. There are important problems waiting to be taken up; it is in many cases purely a question of "ways and means" which prevents a start being made.

THE ROYAL OBSERVATORY, GREENWICH.

AT the annual visitation of the Royal Observatory on June 7, the Astronomer Royal, Dr. F. W. Dyson, F.R.S., presented his annual report. The following extracts indicate the chief items of interest:—

The observatory has ceased to generate its own electric current for lighting and other purposes, and now obtains current from outside. Alternating instead of direct current is now used, and a small supply of direct current is obtained by means of a rotary converter.

In the new magnetic observatory, shortly to be erected, provision is made for the continuation of the long series of Greenwich observations of the variations of the magnetic elements. This series is unique as regards the length of time during which observations have been made on the same site. The care which has been taken to guard the observatory from all artificial electromagnetic disturbances which could affect the accuracy of the observations has preserved the suitability of the site for such work.

Observations of double stars have been made with the 28-in. refractor from a working catalogue containing all known double stars showing appreciable relative motion, and a number of pairs from the catalogues of Hussey and Aitken under 2″ separation. κ Pegasi was observed on five nights, δ Equulei on three nights, 70 Ophiuchi on thirteen nights, and ε Hydræ on one night.

The 26-in. refractor, the 30-in. reflector, and the 6-in. Cooke triplet have been in constant use during the year. The new cell for the crown lens was received and mounted in July. The adjustment of the crown and flint lenses for tilt and eccentricity relative to one another was made in August.

During the year 164 plates were taken for determination of stellar parallax, 124 of these being new plates and forty being re-exposures of plates taken six months previously. The programme for each star consists of six photographs. Three photographs taken in the evenings are re-exposed in the mornings about six months later, and are then developed. Three plates are exposed in the mornings, and, after re-exposure six months later, are also developed. For several stars the cycle has been completed and the plates have been measured for three stars. The results obtained are $+0.082'' \pm 0.017''$, $+0.043'' \pm 0.009''$, and $-0.014'' \pm 0.012''$. The star which gave a negative parallax is one with a small proper motion. It is considered that these probable errors are too large, and that one of $\pm 0.005''$ should be attainable. The increased constancy in the adjustment of the object glass secured by the new cell, and the use of the rotating sector by which the star observed is reduced to the magnitude 10·5m. to 11·0m. of the comparison stars, are expected to make a considerable improvement.

The 6-in. Cooke triplet which belonged to the late Mr. Franklin Adams has been employed in the determination of the photographic magnitudes of the stars brighter than 9·0m. in the Greenwich astrographic zone. During the year fifty-three photographs of fields compared with the standard polar area have been taken. Fifty-six plates have been measured, completing the eighty-eight necessary for the whole zone. The catalogue of the resulting magnitudes is nearly completed, and will contain 8000 stars.

Fifty-nine photographs of Neptune and satellite, taken in 1909–10, have been measured, and the results published.

At the date of the last report, 152 out of the 206 Franklin-Adams photographs had been counted in the manner then explained. During the year fifty of the remaining plates have been dealt with. The four plates still uncounted have not yet been received from Johannesburg.

The requisite photometric data for the reduction of these counts to statistics based on actual photographic magnitudes are now being obtained at a steady rate. The plan of taking long exposures on a field and a standard polar area has been abandoned, because of the rarity of nights on which the sky is uniform and constant for more than one hour. Instead of this, exposures of 5m. duration are being taken on the

central fields of the Franklin-Adams plates and on the standard polar area. The actual procedure consists in giving an exposure of 5m. on a field taken at the same altitude as the pole, two exposures on the pole, and then a second exposure on the field. These will serve to determine standard magnitudes down to the 13th or 14th magnitude on the Harvard photographic scale. With these short exposures it will be possible to make several determinations for each field required. For the fainter stars photographs will be taken with a wide grating and the magnitudes derived by comparison with the diffracted images of the brighter stars. These determinations have the advantage of being independent of the changing transparency of the sky. The star-images are compared with a scale formed by taking a number of different exposures on the same plate—the scale being calibrated by the Harvard standards.

With the astrographic equatorial 176 photographs have been taken on fifty-nine nights. Of these, 154 were for the determination of the photographic magnitudes of the stars in the Greenwich section of the Astrographic Catalogue by the method described in last year's report, and 107 of them were considered satisfactory for the purpose. There are now twenty-nine plates on the working list to be taken to complete the series.

Attention is directed to the determination of the position of the sun's axis which has been carried out by Mr. Maunder. The attempt has been made to utilise as fully as possible the long series of measures of the positions of sun-spots made at Greenwich. Although Carrington's determination proves to be only a few minutes in error, it is desirable that the position of the sun's axis should be obtained with all possible precision, and that the limits of accuracy should be known. A redetermination should be made at each sun-spot cycle.

An apparatus was set up on July 5 for the reception of the wireless time-signals from the Eiffel Tower and Norddeich. The signals have been constantly observed since that date, the morning signals being observed each day (except Sundays). The night signals from the Eiffel Tower have been observed on 128 and the rhythmic signals on eighty-two occasions. The night signals from Norddeich have been observed on 124 occasions. The morning signals from the Eiffel Tower were observed by both Mr. Lewis and Mr. Bowyer on 167 days; there is a mean difference L−WB = −0·066s. in their times of observation with an accidental discordance of ±0·06s. between the observers. Similarly in the receipt of the Norddeich signals the two observers showed a mean personal difference L−WB = −0·043s., and a similar accidental discordance. Thus the ordinary signals are observed by either observer with a mean error of less than ±0·05s. The rhythmic signals are apparently received with an error of less than ±0·01s., and the mean discordances between these and the ordinary signals are less than ±0·05s.

As regards the actual difference between the time sent out by the Eiffel Tower and that of the Greenwich 10h. and 1h. signals, from 184 observations Mr. Lewis makes the Eiffel Tower signal 0·256s. late on Greenwich, and Mr. Bowyer from 234 observations makes it 0·313s. late. It is supposed that the difference is mainly due to the difference of personal errors of the standard observers at Paris and Greenwich. The mean discordance after allowing for this constant difference is ±0·11s.

The Norddeich signals are, according to 160 observations of Mr. Lewis, 0·297s. late on the Greenwich time signals, and 0·340s. late according to 229 observations of Mr. Bowyer. Allowing for this there is an accidental discordance of ±0·23s.

The daily comparison of the Eiffel Tower signal affords a useful regular check on the time as determined at Greenwich. At the request of the director of the Paris Observatory, this comparison has, since the installation of the receiving apparatus, been forwarded daily to him as a check on the rate of the clock at Paris. These comparisons are specially serviceable in cloudy weather. In October the Astronomer Royal attended the "Conférence internationale de l'heure" as one of the British delegates, where the further development of the wireless time-service was discussed. The distribution of time in this way is of great value to navigators, and is likely to be of importance in the determination of longitude on land.

ORNITHOLOGICAL NOTES.

THE May number of the New York Zoological Society's Bulletin is devoted to the needs and results of wild-life protection in America, more especially as regards birds. A feature of this issue is a coloured plate representing five species of brilliantly coloured birds—the quezal, the great bird of paradise, the scarlet ibis, the cock-of-the-rock, and the white egret—which are in special danger of extermination in various parts of the world. Altogether, it is estimated that something like one hundred species are in danger owing to the feather trade or on account of their value as food. It is no answer to say that the present comparative abundance of some of these species renders protective measures unnecessary, for it is pointed out that the same argument was used in 1857 in the case of the passenger-pigeon and Wilson's snipe, the former of which is now extinct, save for one survivor in the zoological gardens at Cincinnati. The purchase of Marsh Island as a bird sanctuary by Mrs. Sage is recorded as an important step in the right direction.

In connection with the above may be noticed an article by Mr. B. H. Grove in the May number of *The American Naturalist* on the influence of agricultural development in Wyoming on the bird-fauna, in which it is pointed out that several species are on the increase, while others—notably the quail—have made their first appearance, as new-comers, into this State during the last few years.

The January number of *The Emu* contains the report of a committee of the Royal Australasian Ornithologists' Union appointed to consider the nomenclature of Australian birds and to publish a revised list of names. Although the list which accompanies the report is not based on absolute priority, the committee acknowledges its indebtedness, in its compilation, to the one recently published by Mr. G. M. Mathews, in which that principle is adopted throughout. Trinomialism is rejected.

In an article by Capt. H. Lynes on the drumming of snipe in the May issue of *British Birds*, it is pointed out that the performance is normally connected with the sexual function, but that it may occasionally take place at other seasons, although always within the limits of the breeding area. R. L.

THE AMERICAN PHILOSOPHICAL SOCIETY.

THE annual general meeting of the American Philosophical Society was held in Philadelphia on April 17–19 inclusive. A large number of papers was presented, their general character being of a high order of merit, and it is possible here to refer only to a few of them. The president, Dr. W. W. Keen, was in the chair at most of the meetings.

In a contribution on the flora of Bermuda, Mr.