summary of much that has been published in the reports of the survey.

Primary, secondary, and tertiary triangulations are included, the permissible triangular error in the first of these being put at 3″ and that of tertiary triangulations at 15″. The measurement of base lines is fully described, and examples are given to show how various sources of error are eliminated. Invar tapes of 50-metres length are used exclusively for base measurement in all grades of work, and a precision of 1 in 2 million is found to be attainable. The cost of such measurements is given as 20*l.* per kilometre on the average, rising to 30*l.* in some cases. The tape is usually supported in the centre and at each end, but in windy weather two additional intermediate supports are advantageously employed. The observation of horizontal angles is fully dealt with, and the reduction of the results is explained and illustrated by well-selected examples. A short chapter deals with the subject of map projections, and as this branch of the subject had to be so superficially dealt with, references to works which treat of it more completely might with advantage have been added.

Two appendices are devoted to the determination of time, longitude, latitude, and azimuth, and to the method of least squares as required by the surveyor. The whole forms a very useful and convenient manual of advanced surveying based on American requirements, but it will be welcomed also by surveyors in British colonies, where much work of this character has still to be done, as it will suggest methods which may suit the cases there occurring. H. G. L.

The Birds of Britain: Their Distribution and Habits. By A. H. Evans Pp. xii+275. (Cambridge: At the University Press, 1916.) Price 4*s.* net.

MR. EVANS'S name is a sufficient guarantee of accuracy, and this little volume, intended primarily for schools, calls for no adverse criticism. The considerable advances in our knowledge of British birds which have been won and "consolidated" during the last twenty years or so have all been taken account of, with due caution as to the present tendency to discover innumerable local forms and to recognise plenty of sub-species. In point of method Mr. Evans adopts a new plan; he deals with the birds according to their families, giving a separate section to each family, but not to each species. In this way the learner gets a better idea of the British bird-world as a whole, and of the several departments of it, than he could have done from the older books, where the interest was concentrated on the individual species. No doubt those older books, with their pleasant talks about the ways of a species, will always be both welcome and necessary; but this one has a value of its own, and is at the present moment the only cheap handbook which is fully up to date. The illustrations are the least attractive part of it, and much space might have been saved for the letterpress by the omission of some photographs by which nothing seems to be gained.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

On Fizeau's Experiment.

IN two papers published in the Proceedings of the Amsterdam Academy (vol. xvii., 445, 1914; vol. xviii., 398, 1915) an experimental investigation concerning Fresnel's convection-coefficient for light of various colours was described. The main object of my repetition of Fizeau's experiment, in the improved form introduced by Michelson, was to decide between the expressions for the convection-coefficient given by Fresnel and by Lorentz. As a review of the papers mentioned has appeared in NATURE (vol. xcvi., 430, 1915), I may be permitted to give here a short account of further progress. It may suffice to recall that my results were largely in favour of the Lorentz expression with the dispersion term. For the wavelength 4500 Å.U. the difference between the two expressions under consideration amounted for water to quite 5 per cent. The probable error of the experimental result was estimated at somewhat less than 1 per cent.

The weak point of my investigation is the determination of the velocity of the running water at the axis of the tubes. This velocity was deduced from the mean velocity combined with the ratio of the mean velocity to the velocity at the axis. The most trustworthy measurements available at the time gave for this ratio 0·84, and this number was adopted. A direct measurement of the velocity at the axis would have been preferable, but only lately have I succeeded in devising an (optical) method for this purpose. Small gas bubbles introduced into the running water are illuminated by a very intense, narrow beam along the axis of the tube. A small window in the wall of the tube permits the inspection of the brilliant bubbles in a rotating mirror. From the inclination of the paths of the bubbles, as seen in the mirror, and the constants of the apparatus, the velocity is deduced at once. Direct tests proved the trustworthiness of the optical method.

Applying this method (Amsterdam Proc., vol. xviii., 1240, 1916) to my original apparatus, the window being at the prism end of the arrangement, unexpected results were obtained. The velocity actually observed by the optical method not only differed from the formerly accepted value of the velocity at the axis by several per cent., but by reversing the flow of water its value (at the same window) appeared to change by quite 10 per cent. Nothing short of a measurement of the velocity at a number of points of the tubes and for both directions of the water current became necessary. For this purpose a Pitot tube, *verified by the optical method*, was made use of. The results were further confirmed by the determination of the velocity distribution over the cross-section of the tubes at a few places. Evidently one cannot speak of *the* velocity at the axis, as its value changes in a rather complicated manner along the tube. A detailed description will be published shortly in the Proceedings of the Amsterdam Academy. The average mean value of the velocity at the axis comes out 550·8 cm./sec. This is only $\frac{1}{2}$ per cent. smaller than the value accepted in my principal paper. The conclusions there given remain unchanged, but they are now arrived at very directly, all verifications of water-meters and the determination of the ratio