fully dealt with by a special society (the Optical Society), and overlapping is most undesirable in matters of publication.

The original papers attain a very creditable standard for so young a society and so new a subject. Prof. Boswell's work on British glass sands is already widely known and appreciated, since it has already been more or less completely published elsewhere. Mr. C. J. Peddle describes trials of British sands as substitutes for some of foreign origin, and his results are extremely hopeful, provided that careful treatment in regard to grading and washing is applied to the British materials. Mr. F. Twyman deals with the annealing of glass, and describes a method of testing the glass for strain and for its disappearance by means of a special form of polarimeter; the modification ascribed to Mr. F. E. Lamplough, however, is not novel, as the writer saw it in use more than fourteen years ago. Nor does Mr. Twyman make it quite clear that his reasoning is not applicable to any but thin glass vessels, such as the beakers he refers to. In such thin glassware all that is required is uniform cooling from the "annealing temperature" of Mr. Twyman; in thicker glass, however, such uniformity as between exterior and interior portions can be obtained only by very slow cooling.

Apart from detailed criticism of particular points, the whole volume clearly shows the vitality of the new society and the need for the co-ordinated study of glass and glass manufacture from the scientific point of view. It is to be hoped that all branches of the British glass industry, which has received a rejuvenating impulse from the war, will support the new society and thus facilitate the co-operation of science in an industry that should be essentially scientific.

PLANKTON RESEARCH AT PLYMOUTH.

THE May number of the Journal of the Marine Biological Association is devoted to an interesting account of the investigations of the plankton of the sea outside Plymouth Breakwater, made during the year September, 1915, to September, 1916. The main systematic research has been conducted by Miss Lebour, while Dr. Allen describes post-larval stages of fishes, and Mr. Matthews gives an account of the variation in the quantity of phosphoric acid present in the sea-water. Miss Lebour used Lohmann's method of centrifuging small volumes of sea-water (50 c.c.), and then actually counting the organisms so obtained. Her results are in general agreement with those of Lohmann (at Kiel) and Herdman and Scott (at Port Erin). There are well-marked seasons of abundance of microplanktonic organisms, diatoms occurring in greatest quantity some time in the spring or early summer, and then again in the autumn, while Peridiniales attain their maximum of seasonal abundance a little later than the diatoms. The Peridiniales have been very thoroughly investigated, and Miss Lebour describes eight species which are new to science and twenty-one species which have not hitherto been recorded from British seas. She also gives some records of the occurrence of larval Trematodes, free-swimming in the sea, and descriptions of the Helminth parasites of Sagitta. These worms have been noticed many times, and some of them are very familiar to planktologists, but no sound identifications have been made prior to the research now under notice. Sagitta is a host for larval forms of *Derogenes varicus* and *Pharyngora bacillaris*, both well-known fish Trematodes. A larval Ascaris also occurs, and two larval Cestodes, the species of which are not identifiable.

Mr. Matthews gives detailed accounts of his methods of determining the exceedingly small quantities of phosphoric acid which occur in sea-water, at the most about 0·06 mg. of P_2O_5 per litre. There is a well-marked maximum at nearly the end of the year (in the darkest days). The variations are dependent upon the metabolism of marine plants, and the minimum quantity of phosphoric acid occurs in April and May—that is, at about the time when holophytic plants are taking most food substance from the sea-water. The larger algæ seem to be the principal factors for the curve of variation in quantity of phosphoric acid not being the reverse of that for variation in abundance of diatoms, as was at first expected. J. J.

CORRECTION FOR ATMOSPHERIC REFRACTION IN GEODETIC OPERATIONS.[1]

THE memoir before us is concerned with the correction for refraction in geodetic operations between distant stations, especially those differing considerably in altitude. The author quotes Helmert's elaborate formula, which gives the correction as a function of gravity, atmospheric pressure, coefficient of expansion of air, tension of aqueous vapour, temperature, and vertical temperature gradient. The values deduced from the formula are compared with those obtained by observation over several bases in Italy and the Alps. The results are grouped both by months and by hours of the day; they show in a clear manner that there are both diurnal and annual variations in the refraction coefficient, which appear to be mainly due to the changes in the vertical temperature gradient. The following table shows the results of two series, the coefficients in the first column being deduced from the formula, and in the second by experiment. The third column gives the observed vertical temperature gradient.

Months	Coefficient of refraction at noon		Diminution of temperature for 100 m. altitude in degrees Centigrade
	From formula	From experiment	
Jan., Dec. ...	0·175	—	0·44
Feb., Nov. ...	0·170	0·181	0·55
Mar., Oct. ...	0·158	0·168	0·68
Apr., Sept. ...	0·154	0·159	0·74
May, Aug. ...	0·145	0·154	0·79
June, July ...	0·144	0·153	0·79

The results of several measures of altitudes over long bases in Italy (length 23 km., difference of altitude 900 m.) show a range of somewhat over a metre, and indicate that better results are obtained by using the meteorological data of the lower station only than by combining those of both stations. The memoir closes with a table arranged to facilitate the application of the correction for temperature to measured altitudes in surveying. A. C. D. CROMMELIN.

THE COMPLEXITY OF THE CHEMICAL ELEMENTS.[2]

II.

The Periodic Law and Radio-active Change.

THE second line of advance interprets the periodic law. It began in 1911 with the observation that the product of an α-ray change always occupied a place in the periodic table two places removed from the parent in the direction of diminishing mass, and that in subsequent changes where α rays are not expelled, the product frequently reverts in chemical character to

1 "Sulla Determinazione del Coefficiente di Rifrazione Terrestre in Base ad Elementi Meteorologici." By Vincenzo Reina. (Roma: R. Accademia dei Lincei, ser. v., vol. xii., Fasc. ii, 1916.)

2 Discourse delivered at the Royal Institution on Friday, May 18, by Prof. Frederick Soddy, F.R.S. Continued from p. 418.