tical utility of the vectorial method of ray tracing, and expressed the desirability of further information on this point. Dr. Silberstein writes:—". . . In order to help the spread and the easy handling of the vector method, in the spirit of Dr. Brodetsky's closing sentence, I shall be glad to do personally all in my power to remove doubts and apparent difficulties. In this respect half an hour's personal conversation is certain to be more efficient than many hours dedicated to the writing of notes or papers for publication. The former has, moreover, the obvious advantage of being adaptable to the individual needs of the questioner. In order to meet, in part at least, these needs, I gladly offer myself to give free information on the subject in question to everybody who will care to call personally (not by letter) at 4 Anson Road, Cricklewood, London, N.W.2, where I shall be available for that purpose *on every Friday from* 5.30 *until* 7.30 *p.m.*" We have much pleasure in making public Dr. Silberstein's offer, and feel that some of our readers will gladly avail themselves of this unique opportunity of being initiated into the practical application of vector methods by a master of the subject. At the same time we suggest that Dr. Silberstein would be doing a service to a wider circle of those interested in optical work if he were to publish one or two detailed computations based on his formulæ.

THE following works are in the press for publication by the Carnegie Institution of Washington:—"The Duration of the Several Mitotic Stages in the Root-tip Cells of the Onion," H. H. Laughlin; "Contributions to the Genetics of the *Drosophila melanogaster*," T. H. Morgan, C. B. Bridges, and A. H. Sturtevant; "The Genetic and Operative Evidence Relating to Secondary Sexual Characters," T. H. Morgan; and "Studies of Heredity in Rabbits, Rats, and Mice," W. E. Castle.

OUR ASTRONOMICAL COLUMN.

LUMINOSITIES AND DISTANCES OF CEPHEID VARIABLES.—In continuation of his important studies of stellar clusters, Dr. Harlow Shapley has investigated the luminosities, distances, and distribution of the Cepheid variables (*Astrophys. Journ.*, vol. xlviii., p. 279). Restricting the discussion to variables with definitely determined periods of less than forty days, there are forty-five stars which are of the "cluster" type and ninety-four ordinary Cepheids with periods greater than a day. The absolute magnitudes and parallaxes have been determined by means of the luminosity-period relation, with an average probable error estimated at 20 per cent. The cluster-type variables are found to have absolute luminosities a little more than one hundred times the brightness of the sun, while the ordinary Cepheids range from two hundred to ten thousand times that of the sun. Fewer than one-third of the stars have parallaxes greater than a thousandth of a second, and the most distant Cepheids now known are nearly 20,000 light-years from the sun. While the ordinary Cepheids are strongly concentrated towards the galactic plane, the cluster-type variables are indifferent to that plane. The wide dispersion of the latter may probably be accounted for by their relatively high velocities in space.

RADIAL VELOCITIES OF 119 STARS.—A preliminary account of the radial velocities of 119 stars, as determined at the Cape Observatory, has been given by Dr. J. Lunt (*Astrophys. Journ.*, vol. xlviii., p. 261). The number of these stars which probably have constant velocities is seventy-six, while the remaining forty-three are either known or suspected spectroscopic binaries. Eighteen of the stars in the first class were very frequently observed in connection with the spectroscopic determination of the solar parallax, the total number of plates obtained for them being 552. The following are among the results for some of the bright stars, as compared with the values obtained at the Lick Observatory:—

Star	Radial velocity Cape km.	Lick km.
α Arietis	−15·3	−14·0
α Tauri	+54·0	+55·1
α Can. Min.	−3·6	−3·5
β Geminorum	+3·2	+3·9
α Hydræ	−4·6	−3·5
ε Virginis	−14·3	−13·2
α Boötis	−5·3	−3·9
α Serpentis	+2·9	+3·4
λ Sagittarii	−43·4	−43·1
α Aquarii	+6·8	+7·5

Approach to the sun is indicated by a *minus* and recession by a *plus* sign.

"ANUARIO DEL OBSERVATORIO DE MADRID."—This useful annual for 1919 contains all the customary astronomical data, including the times of rising and setting of the moon (which might with great advantage be inserted in our own Nautical Almanac). There are also several essays; one, by A. Vela, gives a *résumé* of researches on the temperature of the sun's photosphere, concluding in favour of 7000°. C. Puente shows how to find time and latitude from the observed altitudes of two stars; this can be solved graphically by the well-known Sumner method. Dr. F. Iñiguez, the director of the observatory, gives an interesting monograph on Nova Aquilæ, with photographs of the spectrum from June 9 to September 4, and a light-curve, which appears to show that the period of variation was about twelve days in July, but more than a month in August and September.

Very full details are given of the sun-spots and prominences observed at Madrid in 1917; also the results of observations of solar radiation between 1917 September 1 and 1918 August 31.

The remainder of the volume is occupied by the meteorological observations of 1917.

THE CHEMISTRY OF SEAWEEDS.

THE scarcity of potash compounds, of iodine, and of foodstuffs caused by the great war has directed increased attention to seaweeds during the past four years, and to the possible extension of the use of these as a source of such materials. For some years before the war the giant seaweeds of the Pacific Coast were the subject of systematic investigation in the United States, especially with a view to their utilisation as a source of potash. After the outbreak of war, when many countries, including the United States and the countries allied against Germany, were cut off from their usual supplies of potash compounds from the German mines, examination began to be made of all sources from which potash might be obtained independently of Germany, and seaweeds came in for an increased amount of attention.

If we consider the great supplies of seaweed which are available, especially in the case of an insular country like our own, with a long and deeply indented coast-line, it is remarkable how little has been done, either from the purely scientific or from the industrial point of view, for the thorough and systematic exploration of the chemistry of seaweeds. A criticism by Prof. C. Sauvageau,[1] of Bordeaux, of

[1] "Réflexions sur les Analyses Chimiques d'Algues Marines." *Revue Générale des Sciences*, 29e Année, No. 19, October, 1918.

the analytical work which has been carried out to determine the chemical composition of marine algæ brings out clearly how incomplete and scrappy is our knowledge of the chemical composition of these plants, and how untrustworthy and unscientific is much of the work which has already been done.

Prof. Sauvageau reviews what has been done in France, Britain, and the United States during recent times, and especially during the past thirty years, in the analysis of seaweeds, and he is specially severe on some of his own countrymen for their ignorance of botanical nomenclature and for the contempt with which they treat natural science, as shown by their failure to learn the rudiments of the language of botany before undertaking to deal with a botanical subject. Much of this criticism is just, and some of the examples given of the use of out-of-date and inexact nomenclature are sufficiently serious to show that it was necessary. While thus dealing faithfully with his own countrymen, Prof. Sauvageau recognises that some chemists have taken the trouble to identify with sufficient care the species which they have analysed. Thus he says that "the accuracy with which Stanford names the plants studied inspires more confidence in the reader than the uncouth appellations of Allary." He also recognises that American workers like Wheeler and Hartwell have taken care to obtain competent assistance in identifying the species they have examined.

At the same time Prof. Sauvageau appears to underestimate the difficulty in which the careful chemist who wishes to identify and name his species correctly sometimes finds himself. He himself offers a good illustration of this difficulty in his reference to the present writer's recent work on the composition of five of our commonest seaweeds collected on the coast of Scotland. Two of these belonged to the genus Laminaria, and are similar both in their appearance and structure and in their habitat. There is no difficulty to one who takes the trouble to make himself familiar with them either in distinguishing these species, or in recognising from Prof. Sauvageau's own description that what is called in my papers *L. digitata* is what he calls *L. cloustonii*, and that what I analysed under the name *L. stenophylla* he calls *L. flexicaulis*. But standard works of reference which were consulted were not agreed as to these names, which I used only after reference to a distinguished botanical colleague; and to make as certain as possible that there should be no mistake as to what species were intended, a standard work on seaweeds in accordance with which these names were used was referred to in one of my papers. Nevertheless, Prof. Sauvageau writes:—"His *L. stenophylla* is probably a mixture of that which English botanists call *L. digitata* (*L. flexicaulis*) and *L. stenophylla*, that being a close ally, if not a variety, of *L. flexicaulis*." He himself does not appear to be clear either as to the nomenclature of English botanists or as to the species which were identified with so much care. He can scarcely expect the chemist to do more than accept the best botanical guidance to be obtained on a point of this kind where, he admits, the practice of botanists is not uniform.

Another criticism which Prof. Sauvageau offers of the work of chemists is also valuable, and requires careful attention from the chemist, but again one cannot help thinking he would have been more effective if he had not attempted to press his criticism too far. He points out that if the analyses are to have a scientific, and not merely an industrial, value, not only should species be properly identified, but also samples collected for analysis should be clean and biologically pure, and obtained, if possible, from the actual habitat, with a careful record of the season, the condition of growth, and the state of the plants, whether fertile or sterile. All these are important points which have too often been neglected. The large common seaweeds are frequently garnished with a great variety of other organisms, both animal and vegetable, making it difficult to procure even a reasonably pure sample. In some cases these foreign organisms can be removed, but it is generally difficult to remove them entirely. It also introduces errors, as great in many cases as those which are being avoided, if attempts are made to wash the samples, as compounds which properly belong to them are also removed in the wash-water. All that one can do is to collect reasonably pure samples and to pick off all the foreign organisms which can be distinguished. In many cases, however, the chemist was not attempting to analyse a pure botanical species, but to determine the composition of the impure substance used for some industrial purpose, such as the drift-weed which is washed up on the beach, and used as manure or for kelp-burning. The value of such analyses is limited by the object in view.

Prof. Sauvageau has performed an important service in directing the attention of chemists to the precautions which they require to take when they enter on the systematic study of the composition of seaweeds or of any other species of plant. Our knowledge of the composition of seaweeds is still quite rudimentary, and very valuable work might be done in this field by chemists with a competent knowledge of the botany of seaweeds, or working in collaboration with botanists who would collect and identify the samples for analysis. The recorded analyses show wide variations in the composition of seaweeds of the same species, and Prof. Sauvageau is inclined, on account of this, to cast doubt on the samples or on the conditions under which they were collected. In the present state of our knowledge this is scarcely justified. Numerous well-authenticated cases of similar wide variations in composition are found in the case of other plants, even when they appear to be grown under similar conditions in the same locality and are collected at the same stage of growth.

JAMES HENDRICK.

ITALIAN CLIMATOLOGY.

TWO more contributions by Prof. F. Eredia to our knowledge of the climate of Italy have recently appeared, one dealing with the normal mean values of annual rainfall in Italy, and the other with diurnal temperature variation in Sicily. In the first paper, "Le Medie normali della quantita' di Pioggia in Italia" (*Giornale del Genio Civile*, anno lvi., 1918), the mean values for each calendar month are shown for nine well-distributed cities on the basis of the fifty-year period 1866–1915; and it is calculated that the values are correct to within 5 mm. for the rainier winter months and 9 mm. to 12 mm. for the summer months of smaller rainfall and more irregular distribution. In northern or continental Italy, as exemplified by Milan and Turin, the seasonal variation of rainfall is not prominent, but the wettest periods are early summer and autumn, the highest figures being for May and October. In peninsular Italy the typical Mediterranean feature of wet winters and dry summers is conspicuous, especially in the extreme south. Thus at Palermo the figure for December, the wettest month, is 108 mm. (4·3 in.), and for July, the driest, only 7 mm. (0·28 in.). The wettest city quoted is Genoa, on the Ligurian coast, where the wettest month, October, has 190 mm. (7·6 in.), and the driest,