

is usual with enzymes; but hydrocyanic acid, which is fatal to nearly all enzymes, completely prevented coagulation. Even the "acid" process of coagulation is considered to be enzymic, the added acid functioning as an enzyme activator.

At the present time there is only one calcium carbide factory in Great Britain; it is situated in Manchester, and is just now being enlarged to meet war requirements. There are also two small factories in Ireland, the electric current for which is supplied by water-power; but the supply of water is small and erratic, and the output of calcium carbide is only about 1 per cent. of our normal consumption. Mr. C. Bingham (Journal of the Society of Chemical Industry, March 15) gives reasons for the conclusion that in peace times we shall be quite unable to compete with water-power countries like Norway in the production of calcium carbide, unless very much more economical methods than the present ones can be found for producing electricity. From an experimental study of the question he believes this can be done by utilising waste gases from blast-furnaces and coke-ovens as the source of power for generating the current required.

In the Journal of the Society of Chemical Industry for January 31 Dr. T. Rettie gives an account of work done on antiseptics for the Medical Research Committee at the Pathological Department, Edinburgh University. An urgent requirement of the medical service at the war front was a trustworthy antiseptic for the treatment of heavily infected wounds, with special reference to spore-bearing organisms. The object, therefore, was to find an antiseptic agent thoroughly efficient as a killer of bacteria and spores, and at the same time harmless in its effect on the wound-tissues. Of the various substances tested the hypochlorites were found to be the most efficient germicides. Pure solution of bleaching powder, however, and also sodium hypochlorite solution, are drastic remedies, and on account of their strong alkalinity and high chlorine content they are unsuitable for continued application to wounds. On the other hand, aqueous solutions of hypochlorous acid itself are also unsuited for wound treatment, by reason of the fact that free chloric and hydrochloric acids develop in them through spontaneous reaction. These defects were largely overcome by using a mixture of equal weights of boric acid and bleaching powder ("Eupad"—a name derived from the initial letters of Edinburgh University Pathological Department). An aqueous solution of this ("Eusol") is prepared, of strength 25 grm. per litre; it contains about 0.26 per cent. of hypochlorous acid, together with calcium bichlorate. In this way the alkalinity of the bleaching powder is reduced, the full effect of the hypochlorous acid secured, and the solution cannot become unduly acid, as the dissociation constant for boric acid has a very low value. Hence the solution can be applied freely to the body tissues, and a large quantity can even be injected into the circulatory system without harmful effect. This solution has been used successfully both for the treatment of wounds and, by intravenous injection, in certain types of gas-gangrene toxæmia.

THE announcements of Messrs. Longmans and Co. include "Elements of the Electromagnetic Theory of Light," by Dr. L. Silberstein, and (in the series of Text-books of Physical Chemistry) a new edition of Prof. S. Young's "Stoichiometry," containing rewritten chapters dealing with the more recent determinations of the atomic weights of silver, nitrogen, chlorine, and lead. Messrs. G. Routledge and Sons, Ltd., are to publish "Wealth from Waste: Elimina-

tion of Waste a World Problem," by Prof. H. J. Spooner, with a foreword by Lord Leverhulme. Messrs. Routledge also announce "Incidents in the Life of a Mining Engineer," by E. T. McCarthy. Messrs. Constable and Co., Ltd., will shortly publish "The Future Citizen and his Mother," by Dr. C. Porter, with a foreword by Sir J. Crichton Browne. Messrs. Henry Frowde and Hodder and Stoughton have in the press "Vaccines and Sera," by Capt. A. G. Shera, and "The Hearts of Man," by R. McNair Wilson.

OUR ASTRONOMICAL COLUMN.

MINOR PLANETS.—The following ephemerides of Pallas and Ceres are from the Rechen-Institut's List:—

Pallas: Magnitude 8.8.

Date	R.A. h. m.	N. Decl.	Log r	Log Δ
May 26	17 9.4	25 19	0.489	
June 3	17 2.6	25 46		0.368
11	16 55.7	25 53		0.372
19	16 49.2	25 39		0.379
27	16 43.4	25 6		0.388
July 5	16 38.6	24 17	0.500	

Ceres: Magnitude 7.6.

Date	R.A. h. m.	S. Decl.	Log r	Log Δ
June 11	18 23.9	25 57	0.457	
19	18 16.4	26 29		0.269
27	18 8.6	26 58		0.270
July 5	18 0.9	27 23		0.274
13	17 54.0	27 44		0.283
21	17 48.2	28 1	0.461	

Planet 31 Euphrosyne was observed on April 13 and 14; the ephemeris needs the large corrections $-12.4m. + 3^{\circ} 12'$. The interesting planet DB, discovered by Wolf on January 3, has been named Alinda.

CURRENTS IN THE UPPER AIR.—The behaviour of the streaks or trains left by large meteors supplies abundant evidence as to the rapid motion of the atmosphere at its outer limits. The diversity of direction, as well as the rate of velocity, of these upper winds is remarkable; in fact, hurricane speed would appear to be quite a common feature amongst them. It is true that the data are not of sufficiently accurate character to allow very exact deductions to be drawn, but there is no doubt as to the general correctness of the results. In some instances the observations have been as complete as they have been precise, and these corroborate in a very satisfactory manner the average values obtained from more uncertain or incomplete records.

The long-enduring streaks of swift fireballs, like the Perseids and Leonids, are usually about fifty-five or sixty miles in height, but they may extend from heights of fifty to seventy miles. The mean velocity of their drift is 121 miles per hour, and the predominating direction to the eastward, but there is no quarter to which these lofty cosmic clouds may not be carried. Of seventy-eight enduring meteoric streaks motion was found to be directed to points at or between north-east and south-east in thirty-seven cases, while to the points north-west to south-west there were only twenty-four. The individual velocities varied from nil to 360 miles per second. In some cases a moderate speed of twenty-seven or thirty miles per hour was indicated. Certain streaks gave evidence of a series of differing currents underlying each other, the upper sections drifting in different directions to the lower.

DISTANCE OF THE ORION NEBULA.—An interesting estimate of the distance of the Orion nebula has been made by Prof. W. H. Pickering (Harvard Circular No. 205). From a consideration of the brightnesses and distribution of the stars in the nebula and in the surrounding region, it is concluded that practically all the stars within the nebula are of type B, and that there are no stars in the nebula fainter than fifteenth magnitude. Since we are looking very nearly along the axis of the great spiral nebula which stretches over nearly the whole length of Orion, and is connected with the great nebula, all the stars associated with it must be at approximately the same distance from us. Russell has shown that only very massive stars can attain the colour of type B; and assuming 10.5 as the mean magnitude of the stars within the nebula, while the average absolute magnitude of such stars may be taken as -1.0 , it follows that the distance of the nebula is 6520 light-years, or that the parallax is $0.0005''$. Among the interesting results which follow, the mean diameter of the brilliant Huygenian region is found to be 6.3 light-years, and the distance between the extreme stars of the trapezium 0.68 light-year. It is also calculated that Rigel is 2,100,000 times as bright as the sun, thus far exceeding Canopus, for which Walkey estimated a brightness of 50,000 times that of the sun.

TERRESTRIAL MAGNETIC OSCILLATIONS.

THE paper referred to below¹ is an important contribution to our knowledge of oscillations in the magnetic elements, especially those of shorter period termed "pulsations" by van Bemmelen. The records were obtained in an underground chamber near the Marine Biological Laboratory at Misaki, between 1910 and April, 1914, with a special set of very sensitive magnetographs, designed by Prof. Tanakadate. The magnetographs, which recorded the north (N), west (W), and vertical (V) components, show several original features. The V instrument, which worked very satisfactorily, had the magnet carried by horizontal quartz fibres. The sensitiveness of the instruments was about 0.15γ per 1 mm., and the time-scale about $3\frac{1}{2}$ mm. to the minute.

The original object was to ascertain whether seismic movements were accompanied by magnetic waves. No certain connection was established, but many interesting records of pulsations were obtained. The distribution of pulsations throughout the twenty-four hours varied markedly with the period, waves with periods less than seventy seconds having their maximum frequency during the day, and those with periods longer than ninety seconds having their maximum during the night. Periods shorter than thirty seconds were rare. Pulsations in V were almost facsimiles of those in N, except that they were of smaller amplitude and had a retardation of phase. As the period became longer, the ratio borne by the amplitude of the V to that of the N pulsation increased, while the difference in phase diminished. The hour of the day seemed without direct influence on the value of the ratio. The relation between the pulsations in N and W, on the other hand, depended largely on the hour of the day. Regarding north and west as the positive directions in the two cases, it was found that agreement in phase between N and W pulsations was most frequent in the early morning, whilst direct opposition in phase was most frequent in the evening. Cases in which the N pulsation was largely dominant were most frequent near noon and near midnight.

Generally there was a marked tendency in the vector

¹ "On Rapid Periodic Variations of Terrestrial Magnetism." By Torabiko Terada. Journal of the College of Science, Imperial University of Tokyo, vol. xxxviii., 1917, Art. 9. Pp. 85+5 plates.

in the horizontal plane to rotate, after the fashion first described by R. B. Sangster for longer-period movements. According to the author, in pulsations at Misaki, clock-wise rotation is most frequent between sunrise and noon, and again between sunset and midnight, anti-clock-wise rotation predominating in the intermediate hours. One interesting feature, which the author thinks may possess considerable significance, is a tendency when pulsations start abruptly for N to show a rapid rise. He is disposed to attribute pulsations to fluctuations in the electrical currents in the upper atmosphere, to which the regular diurnal magnetic variation is now generally ascribed. If, as he thinks most likely, pulsations arise simultaneously and not successively at different stations, the currents in the upper atmosphere probably fluctuate in intensity as well as in position. This might, he thinks, arise from vertical oscillations in limited portions of the upper atmosphere. A variety of mathematical problems relating to oscillating linear electric currents are worked out. The plates at the end contain numerous interesting examples of pulsations.

C. CHREE.

GLOBULAR STAR CLUSTERS.

MR. HARLOW SHAPLEY'S preliminary work on the distances of the globular clusters attracted much attention two years ago. He has since then diligently pursued the subject, and gives an interesting summary of the progress of his researches in *Pubns. Astr. Soc. Pac.*, February, 1918.

His methods are:—(1) To determine the photographic and photo-visual magnitudes of the cluster stars by photographs on ordinary and panchromatic plates. The colour-indices of the stars are thus determined and their spectral types inferred. The fact that stars are found in the clusters quite as blue as the B stars in our neighbourhood leads to the assumption that light absorption is negligible. The distances can then be inferred, making assumptions on the absolute magnitudes of stars of different spectral types.

(2) The work of Miss Leavitt, Hertzsprung, and Shapley shows that the absolute magnitude of Cepheid variables is a function of the period of light variation. A curve is given in the article, from which the following values have been measured:—

Period (days)	Abs. mag.	Period (days)	Abs. mag.
63	-6	4.9	-2
33	-5	1.7	-1
17	-4	0.85	-0.5
9.2	-3	0.7 (and under)	-0.3

Since the cluster variables conform mainly to the Cepheid type, this affords a very accurate means of obtaining the distances of clusters. Mr. Shapley notes that the long-period Cepheids are the most luminous of all stars. The longest observed period is about 130 days, absolute magnitude -6.8 (indicating about 50,000 times the luminosity of the sun). Cepheid variables are also notable for their rapid motion, which appears to average more than 100 km./sec.

(3) By the above methods the average absolute magnitude (photographic) of the brighter stars of the different clusters (twenty-five stars selected from each cluster, rejecting the five brightest) is found to be -1.5 . Making this assumption for other clusters, we can estimate their distance without waiting for more detailed researches.

(4) There is found to be a fairly close correlation between distance and apparent diameter, indicating that the linear diameter of a cluster is a function of its distance. With diameter 1.4' corresponds distance