The centre of mass describes an elliptic orbit in a period of 34·08 days, with a semi-amplitude of 33 km. per second. The spectral lines vary in width, and are broadest near periastron. Some of the peculiarities of the star may be due to its being actually involved in the nebulous matter by which it appears to be surrounded.

A REMARKABLE HELIUM STAR.—A notable exception to the rule that the helium stars are usually characterised by small parallax, small proper motion, and low radial velocity has been found by Mr. J. Voûte in the star Boss P.G.C. 1517 (*Astrophysical Journal,* vol. xlviii., p. 144). The investigation was undertaken at the suggestion of Prof. Kapteyn, who had suspected that this star might be found to have the unusually large parallax of about a tenth of a second. Mr. Voûte's result is $+0·069'' \pm 0·006''$, in good agreement with Prof. Kapteyn's supposition. For the proper motion Mr. Voûte has found $+0·235'' = 0·0185$s., but this is greatly in excess of the value $-0·0001$s. given in Boss's catalogue, and needs further confirmation. The radial velocity of the star is also exceptionally large, amounting to +83 km. per second. The position of the star for 1900 is R.A. 6h. 0m. 37s., decl. $-32° \ 10' \ 12''$, and the magnitude 5·6.

THE ORBIT OF SIRIUS.—The results of a new determination of the elements of the orbit of Sirius are given by Dr. R. Aitken in Lick Observatory Bulletin, No. 316. The elements with their probable errors are:—

| | |
|---|---|
| $P = 50·04$ years $\pm 0·09$ year | $i = +43° \ 31' \pm 0·25°$ |
| $T = 1894·133 \pm 0·011$ year | $\omega = 145·69 \pm 0·38$ |
| $e = 0·5945 \pm 0·0023$ | $\Omega = 42·71 \pm 0·33$ |
| $a = 7·570''$ | |

Dr. Aitken concludes that the available micrometric and spectrographic data give no evidence of departure from undisturbed elliptic motion. It will be observed that the period given above is in close agreement with that of 50·02 years recently deduced by Jonckheere.

## PRODUCTION IN THE SEA.[1]

A HIGHLY interesting report by Dr. C. G. J. Petersen describes the methods and results of recent work on the evaluation of the bottom fauna and flora of the sea in the Kattegat, Limfjord, and elsewhere. Abandoning the use of the dredge, as affording misleading ideas of the abundance of life on the bottom, the author invented his "bottom-samplers," which are apparatus that can lift up a sample of the sea-floor with its contained animals and plants. The area of bottom lifted varies between 0·1 and 1 square metre, the smaller apparatus being used at the greater depths. By a process of washing, the organisms are removed, counted, and weighed. The plates represent typical results, all the organisms found being drawn, in actual size, on paper ¼ square metre in area, which is then reduced to ⅗ in. linear.

Very often the bottom deposit consists of a "black, malodorous mass of sulphurous mud," and it was difficult to imagine that animals could utilise this as food. Sampling this by means of a glass tube thrust down into it, it was, however, seen that there was a thin surface layer of quite different composition, grey or brown in colour, and charged with vegetable remains. Oysters and other bivalves and demersal worms do not feed on the black mud or on the plankton in the water, but "literally stuff themselves with this upper layer of fine detritus." "The great bulk of the bottom animals are, and must necessarily be, herbivorous." They mostly burrow in the mud, but a large number are attached to solid objects, stones, and shells. These constitute the bottom epi-fauna.

The bottom fauna in general may be divided up into "communities," each characterised by one or more predominant forms; thus the author describes the bottom in the deeper parts of the Kattegat as inhabited by communities of *Amphilepis pecten, Brissopsis sarsii, B. chiajei,* and *Echinocordatum filiformis,* the typical forms present in each case being indicated by the systematic names.

The survey being a quantitative one, an attempt is made at an actual estimate of the mass of life in the whole Kattegat. There are about 24,000,000 tons of Zostera, 50,000 tons of plaice, 6000 tons of cod, 7000 tons of herrings, 25,000 tons of starfishes, 50,000 tons of predatory Crustacea and Gastropods, 10,000 tons of small fishes, with, of course, much else. These estimates are based, not only on the results of bottom-samples, but also on fishery statistics, the very probable assumption being made that the fish stock is practically constant, so that the fraction taken in commercial fishing represents the production.

No attempt is made to compare density of life on sea-bottom and land. "Strange as it may seem," says the author, "there does not exist any survey of the animal communities on land based upon quantitative investigations of the commoner species." J. J.

[1] Report of the Danish Biological Station to the Danish Board of Agriculture. "The Sea Bottom and its Production of Fish Food." By C. G. Joh. Petersen. Pp. 62+10 plates+chart. (Copenhagen, 1918.)

## MILITARY EXPLOSIVES OF TO-DAY.[1]

THERE have been no epoch-making discoveries in explosives such as, say, the discovery of nitroglycerine for many years. Nitroglycerine, discovered in 1846, still remains the most powerful explosive in practical use. Many useful advances have been and are being made, but new explosives are merely new mixtures of old materials, given fancy names. The nations at war use practically the same explosives, and no one can be said to be ahead of the others.

The following table gives a comparison of some of the most typical explosives in use:—

| Name of Explosive | Volume of gas per gram in c.c. = V | Calories per gram = Q | Coefficient = Q×V÷1000 | Coefficient G.P. = 1 | Calculated temperature $= \frac{Q}{C}$. Assuming C = 0·24 C = Specific Heat of Gases |
|---|---|---|---|---|---|
| | c.c. | | | | °C. |
| Gunpowder ... ... ... ... | 280 | 738 | 207 | 1 | 2240 |
| Nitroglycerine ... ... ... ... | 741 | 1652 | 1224 | 6 | 6880 |
| Nitrocellulose (13 per cent. Nitrogen) | 923 | 931 | 859 | 4·3 | 3876 |
| Cordite, Mk. I. (N.G. = 57, N.C. = 38, Vaseline = 5) ... ... ... ... | 871 | 1242 | 1082 | 5·2 | 5175 |
| Cordite M.D. (N.G. = 30, N.C. = 65, Vaseline = 5) ... ... ... ... | 888 | 1031 | 915 | 4·4 | 4225 |
| Ballistite (N.G. = 50, N.C. = 50, Stabiliser = 0·5) ... ... ... ... | 817 | 1349 | 1102 | 5·3 | 5621 |
| Picric Acid (Lyddite) ... ... ... | 877 | 810 | 710 | 3·4 | 3375 |

The coefficients correspond fairly well with the results obtained in practical use.

Detonating substances are called *high explosives,* and their immense shattering effect is due, not only to the volume of gas and quantity of heat, but also to the velocity of detonation and density of the explosive. Shattering power is proportional to

Volume of gas per gram × cals. per gram × velocity of detonation × density.

[1] From three Cantor Lectures delivered before the Royal Society of Arts in April last by J. Young, Chief Instructor in Science, Royal Military Academy, Woolwich.