## OUR ASTRONOMICAL COLUMN.

THE PULSATION THEORY OF CEPHEID VARIABILITY.—The Monthly Notices for November last contain a paper on this subject by Prof. Eddington, who selects fourteen Cepheids, the light-curves of which are well known, to test the theory. The absolute magnitudes are deduced from the periods, using a diagram given by Mr. Shapley, and the effective temperatures and densities from a former paper of his own. Prof. Eddington finds that all the stars are in a gaseous state throughout their volume except the two of lowest absolute magnitude; he connects this with the fact that Mr. Shapley's diagram shows a linear relation between period and magnitude for the brighter stars, but a curve for the fainter ones. The radius of Y Ophiuchi, the brightest star on the list (abs. mag. $-4$), is given as 42,000,000 km., the mass being thirteen times the sun's; on the average, the semi-amplitude of the pulsation is 1/13 of the radius. Assuming an effective temperature proportional to the fourth root of the luminosity, the semi-amplitude of the temperature fluctuation is 1/12 of the whole. Prof. Eddington also deduces that with period 4·5 days should correspond spectral type F8½, and with period 30·8 days type G3½. These deductions are in fair accordance with Mr. Shapley's latest observational results.

Prof. Eddington directs attention to an erratum in his former paper on the radiative equilibrium of the stars, the radiation pressure being taken at four times its true value. The error may be corrected by multiplying the adopted molecular weight by 2·8. It will, however, make the calculated duration of the Giant stage even shorter than before.

CALCIUM CLOUDS IN THE MILKY WAY.—The February *Observatory* contains a letter on this subject by Mr. J. Evershed. The suggestion was first made in the case of δ Orionis that it was surrounded by such clouds, since the H and K lines did not share in the orbital motion. Mr. Evershed now shows that the same is the case in Nova Aquilæ, Nova Persei, and Nova Geminorum (2), and quotes five other stars in Aquila, Scorpio, Perseus, and Orion showing the same phenomenon. In all cases the radial motion indicated by the H, K lines agrees within some 4 km./sec. with that due to the sun's motion (assumed 20 km./sec., towards 18h., +30°). Hence the calcium clouds would appear to be practically at rest with respect to the star system, the attraction of the stars upon them being, perhaps, nearly balanced by radiation pressure. It will be remembered that the Orion nebula also appears to have no line-of-sight velocity other than that due to the solar motion.

Mr. Evershed notes that the phenomenon is rendered easier of detection in novæ owing to the large displacement of the H line in the star's own spectrum, which separates it from that due to the cosmic cloud. The latter is seen as a fine absorption line on the broad bright hydrogen band $H_\epsilon$ of the nova's spectrum.

A "NEW NAVIGATION" METHOD.—In "Notes on the Working of the 'New Navigation'" (Cairo: Government Press, 1918), Dr. John Ball gives a convenient method of calculating altitude from hour-angle ($h$), latitude ($l$), and declination ($d$). First find an auxiliary angle M from the equation

$$\cos^2 M = \cos^2 \frac{h}{2} \cos l \cos d.$$

Then

$$\sin^2 \frac{Z.D.}{2} = \sin\left(M + \frac{l \pm d}{2}\right) \sin\left(M - \frac{l \pm d}{2}\right).$$

Use upper sign for $l$, $d$ *same* name, lower for *contrary* name. Dr. Ball points out the advantages of the method both for navigation and land-surveying. He might, however, have alluded to the very useful "Altitude Tables" of his namesake, the Rev. F. Ball, R.N. (London: J. D. Potter), which give the altitude, without calculation, for every degree of $l$, $d$, $h$ to an accuracy of 0·1′ (nearly).

## THE WORK OF THE GOVERNMENT LABORATORY.

FROM the recently issued annual report of the Government Chemist on the work of the Government Laboratory (Cd. 9205), it appears that the total number of samples examined during the year 1917–18 was 200,453.

Work for several new departments, including the Air Board, the Ministry of Food, and the Coal Controller's establishment, was undertaken during the year. The aggregate number of samples analysed, however, was some 58,000 less than in the preceding twelve months. This decrease is attributed chiefly to a falling-off in the work required for the Customs and Excise Department. Following upon diminished imports, fewer samples of imported goods were taken for analysis; and war-time restrictions affecting the home consumption of wines and spirits similarly caused a reduction in the amount of analytical work required.

On the other hand, much of the laboratory activity has been devoted to matters arising directly out of war conditions. Among points of special interest may be noted the analytical control over the quality of foodstuffs and medical supplies for the fighting forces, and over the composition of metals employed in naval and aerial constructional work.

More than 20,000 samples of foodstuffs were examined in connection with the feeding of the Expeditionary Forces. This work was carried out partly at the chief laboratory, and partly by officers of the laboratory stationed at the various supply bases. The quality of the supplies was controlled by first examining samples tendered by contractors, in order to ascertain whether the conditions of the specifications were complied with. Specimens of the foods actually delivered were afterwards analysed, to ensure that the deliveries compared satisfactorily with the selected "tender" samples. Most of the analyses were made on specimens taken from contractors' deliveries in course of transit to the Forces, the goods being detained until the report upon their quality had been received by the Army authorities. A salutary check was thus in operation against any tendency to unfair dealing.

The scientific public, and also the general public, would no doubt be interested in knowing whether any adulterations or other attempted impositions were discovered, but on this point the report of the Government Chemist is silent. Still, it may safely be assumed that the systematic examination of supplies would in any case be a strong deterrent against attempts to substitute inferior articles. It may be taken for granted, therefore, that the laboratory control has both conduced to the efficiency of the fighting forces and effected economy of public money.

For the Army Medical Department 960 samples of medicinal articles were examined. As might be expected, these consisted largely of anæsthetics. It is scarcely necessary to point out that the comfort, and often the life, of wounded soldiers under anæsthesia