in Greek Lands," F. H. Marshall; and "Life and Labour in the 19th Century," C. R. Fay. *Messrs. Constable and Co., Ltd.*, announce "Montessori Experiments," Miss Blackburn. Prof. Patrick Geddes has written a volume, which *Messrs. Longmans and Co.* will issue shortly, on the life and work of Sir Jagadis Chandra Bose, the founder of the Bose Research Institute in Calcutta.

OUR ASTRONOMICAL COLUMN.

FIREBALL ON DECEMBER 25.—A brilliant fireball was visible on Christmas night at 10h. 21m. at Bristol. It must have very much exceeded Venus in lustre, for it gave a flash which illumined the whole sky, and in that section of its flight where the greatest outburst occurred it left a streak about 3° long for 40 seconds. The apparent path was from 115°+34° to 105½°+1°. The motion was rather swift, the course of about 35° being traversed in 2 seconds. The radiant point is doubtful; it may have been at 165°+73°, 219°+75°, 245°+72°, or 261°+62°. If the second is the correct position, the meteor may quite possibly be considered to have been a fragment of Mechain-Tuttle's comet, which has a period of about 13½ years. Further observations of the object would be valuable, and should be sent to Mr. W. F. Denning, 44 Egerton Road, Bristol.

COMETS.—The following continuation of the ephemeris of Finlay's comet is for Greenwich midnight, from the elements in Lick Bull. 325 :—

		R.A.	N. Decl.	Log r	Log Δ
		h. m. s.	° ′		
Jan.	2 ...	3 3 35	21 47	0·1703	9·8160
	6 ...	3 12 57	22 24	0·1806	9·8510
	10 ...	3 22 24	22 58	0·1911	9·8849
	14 ...	3 31 21	23 27	0·2013	9·9173
	18 ...	3 40 9	23 55	0·2114	9·9485

The comet will traverse the Pleiades on January 18.

It is calculated that Holmes's comet passed perihelion about November 30, and a search ephemeris was published. The comet is probably too faint to give much hope of its recovery. It has not been seen for two revolutions.

RADIATION PRESSURE.—The *Astrophysical Journal* for October last contains an article by Mr. Megh Nad Saha in which the opinion is expressed that the quantum theory of light will explain the repulsion of particles much more minute than those the dimensions of which are of the order of a wave-length. In the undulatory theory the repulsion is a maximum for particles of that order of magnitude, and becomes practically zero for those of the dimensions of molecules. Mr. Saha quotes the results of spectrum analysis of comets' tails, and some laboratory experiments by Lebedew (*Ann. der Physik*, 1910), for the fact that gaseous molecules actually do suffer repulsion by radiation pressure, which he considers an argument in favour of the quantum theory.

Assuming that a pulse of light gives all its momentum to a hydrogen atom, the velocity imparted to the latter by each "kick" would be 60 cm./sec. Some calculations are given, from which the author deduces that by repeated "kicks" the atom might acquire a velocity of 6×10^7 cm./sec., which has sometimes been observed in the solar prominences.

THE ORION NEBULA.—We lately noted Dr. Bergstrand's estimate of the parallax of this object, 0·0078″. Prof. W. H. Pickering (Pubns. Ast. Soc. Pac., April, 1919) contends for the value 0·0020″. This is deduced from assumptions of the absolute magnitudes of a number of faint stars which appear to be associated with the nebula. By comparing their photographic with their visual magnitudes, he concludes that their spectral type is A or B, whence their absolute magnitude is unlikely to be very low. But this involves the conclusion that the brighter stars in Orion are supergiants. Rigel in particular would have 87,000 times the luminosity of the sun. But perhaps it is nearly as easy to accept this as the value 5000 times the sun, which results from Dr. Bergstrand's parallax. Prof. Pickering estimates for the masses of the faint B7 stars in the nebula only four times that of Jupiter, using his parallax. With Kapteyn's parallax 0·0054″, the mass would be one-twentieth of this. Either value seems far too small for a body to attain the temperature necessary to shine as a B star.

SPHERICAL SHELL CRYSTALS IN ALLOYS.

AT the autumn meeting of the Institute of Metals recently held in Sheffield, Dr. J. E. Stead presented an account of his investigations on some ternary alloys of tin, antimony, and arsenic, one of which was noticed by him to crystallise in a most unusual and remarkable way.

Having found that the alloys of antimony and tin crystallise in what appear to be cubic crystals, and those of in and arsenic in rhombohedral flat plates, he made trials with the object of finding how the metals would arrange themselves when the three elements were fused together and the melt allowed to cool. The results obtained were astonishing, for the crystals found in the matrix had the form of incomplete spherical shells, the radii of which were small or great, according to the time allowed for development. With rapid freezing the radii were less than half a millimetre; when it was protracted for one hour they were 5 mm. or more. The most perfect structural arrangement of the crystals was obtained in an alloy containing from 70–85 per cent. of tin, 25–15 per cent. of antimony, and 4–5 per cent. of arsenic. Whether cooled slowly or quickly, the polished surface of the alloys, after dissolving away the matrix, is very suitable for printing blocks, since the hard crystals stand out in bold relief (see Fig. 1). The alloys are very brittle, and the fracture was found to travel midway along the shell walls. An alloy containing tin 70 per cent., antimony 25 per cent., and arsenic 5 per cent. gave the following arrests on cooling :—

(1) First separation of crystals ... 440° C.
(2) Retardation in cooling between 325° and 320° C.
(3) Solidification of the eutectic ... 244·9° C.

The last-named temperature agrees closely with that of the eutectic of the tin-antimony alloys. The conclusion is, therefore, warranted that the eutectic cannot contain more than a trace of arsenic, an inference confirmed by experiment. It was afterwards shown by analysis that the primary crystals contain a maximum amount of arsenic, and that, as crystallisation proceeds, the deposits contain less and less of this metal.

A large number of ternary alloys were prepared. It was found that, while it required 2·5 per cent. of arsenic in the presence of 25 per cent. of antimony to produce slightly curved crystals, 0·5 per cent. of arsenic in the presence of 3·75 per cent. of antimony yielded curved segments in the upper layers. In an alloy containing 1·65 per cent. of arsenic, 14·35 per cent. of antimony, and 85 per cent. of tin, spherical crystals were found in the top layers, below these smaller seg-