gyroscope then exerts a powerful restoring couple on the frame of the ship. The arrangement appears to have been very successful, and rolls of 25° on each side of the vertical have been quenched to 3°, the quenching being accompanied by much steadier steering. By no means the least interesting part of the paper is the collection of accompanying photographs and drawings of the arrangement; some of the latter are from working drawings, and enable the construction of the gyroscope to be understood perfectly.

DR. J. E. STEAD has collected the results of analyses of a large number of German shells and has given them recently in a paper read before the Cleveland Institute of Engineers, and reported in the *Engineer* for January 14. Dr. Stead discusses our own specifications for shell steels. The actual tests applied to such steels are confidential, but it is of interest to note that Dr. Stead, speaking as an analytical chemist, is of the opinion that no shell steel should be rejected on the results of chemical analysis provided the mechanical tests are satisfactory. Our enemies are not particular in having shell steel of uniform quality; the steel used is generally of relatively high tenacity, and is much more liable to break up by shock than what we produce and prescribe. It is most probable that some of the German shells are made by the basic Bessemer process, judging from the relatively large amount of nitrogen present in one of the toughest and best fragments, which also contained 0·07 per cent. of sulphur and phosphorus. The analysis of armour-piercing shells agrees with that of similar material made in other countries. German shells with between 0·07 and 0·1 per cent. of phosphorus did not burst in the gun, hence it seems probable that great freedom from that element has been found to be unnecessary.

OUR ASTRONOMICAL COLUMN.

COMET 1915*e* (TAYLOR).—There continues to be a dearth of information regarding this comet. Its actual position now differs very considerably from the only ephemeris available. Thus on January 13, 11.0 p.m., an observation made at the Hill Observatory showed that the ephemeris required corrections of +4·0 min. in R.A., and −1° 15′ in declination. The comet was easily seen in spite of strong moonlight, and was bright enough to show the cross wires in the eyepiece.

Employing observations made at Rome, December 5, Bergedorf, December 18, and on January 3, 1916, at Bamberg, M. J. Braae and Mlle. J. Vinter-Hansen have calculated the following elliptical orbit and ephemeris :—

Epoch 1916, *January* 0·5 *G.M.T.*

Mo = 355° 15′ 49″·3	ϕ = 32 54 206″		
ω = 354 39 37·6	μ = 564 209″		
Ω = 113 57 46·5	Log a = 0 532378		
i = 15 28 9·1	T = 1916 Jan. 30·7205 G.M.T.		
	U = 2297 02d	(6·29 years).	

12*h*. *G.M.T.*

	R.A. h. m. s.	Dec. ° ′
Jan. 20 ...	5 8 39 ...	+15 47·2
22 ...	9 38 ...	16 38·3
24 ...	10 49 ...	17 28·9
26 ...	12 12 ...	18 18·9
28 ...	13 48 ...	19 8·1

The comet's distance from the earth has been slowly increasing. The comet is stated to be about eleventh magnitude.

COMET 1915*d* (MELLISH).—We are informed by Prof. Edwin B. Frost, director of Yerkes Observatory, that Mr. John E. Mellish has taken up residence there as volunteer research assistant. Comet 1915*d* was found with the 6-in. comet seeker, and Prof. Georges Van Biesbroeck, who is spending the year at Yerkes as visiting professor of practical astronomy, subsequently obtained the accurate positions of the comet using the 12-in. telescope and filar micrometer (see NATURE, December 2, 1915).

MIRA CETI.—American observations of this variable star during the 1914–15 cycle show that from a minimum of 9·0 mag. on October 15, 1914, the brightness increased to a maximum of 3·6 on February 11, 1915. By August it had again fallen to nearly 9·0 mag. (*L'Astronomie*, December, 1915). With regard to the present maximum, unless undue weight be given to an observation made on December 27 through a momentary rift in clouds, this star did not quite attain to the magnitude of α Ceti (2·7). Although it is still the next brightest star in the region, it now appears distinctly weaker than at the beginning of the year.

SECOND TYPE STARS OF LOW DENSITY.—At the present time the crucial evidence on the question of stellar evolution is stellar density. Numerical data accumulates which more and more insistently proclaims the existence of stars extremely different in mean density, yet capable of giving rise to almost identical spectra. As these data result from complicated calculations of orbital elements, Dr. H. Shapley has successfully sought for a method of deriving limiting mean densities merely from length of period and the duration of eclipse. The results obtained by this direct method are in close agreement with those already published in his "Orbits of Eclipsing Binaries" (Proc. Nat. Acad. Sci., vol. i., p. 459).

THE DISTRIBUTION OF SPECTROSCOPIC BINARIES OF CLASS M.—To the already long list of objects showing a preference for low galactic latitudes must now be added the spectroscopic binaries of class M (Antarian). C. D. Perrine (*Astrophys. Journ.*, xlii., p. 370), dealing with ten such binaries, finds the average galactic latitude is 9°, whilst omitting one (β Andromedæ), the average sinks to 7°. Orbits are available for only α Orionis and α Scorpii. Comparison with the Cepheid variables discloses some significant resemblances and differences, *e.g.*, light variations, small proper motions, and for the two known orbits the masses of the secondary bodies are similar, whilst some of the differences pointed out are the large value of $a \sin i$, and consequently periods measured in years instead of days.

REPORT OF THE NIZAMIAH OBSERVATORY.—The annual report (1914–15) of the Nizamiah Observatory (director, Mr. R. J. Pocock) shows that work on the astrographic chart has been actively advanced both as regards number of plates secured with the recently installed astrographic equatorial, and their measurement, although, through illness, the director had unfortunately to spend some weeks in hospital.

THE VARIABLE NEBULA, N.G.C. 6729.—There is very little definite information of the light variations of nebulæ, notwithstanding the great importance of the matter. Perhaps this apparent neglect is merely a measure of the atmospheric humidity where most observational work has hitherto been carried on. At Helwân, however, Mr. Knox Shaw has been able to make a good beginning with a photographic study of the well-known nebula N.G.C. 6729—the fan-shaped

appendage of the variable star R Coronæ Australis. Some results obtained since 1911 are described in a preliminary note (Bulletin No. 16). It is found that the nebula is bright when R Coronæ Australis is bright, and selectively variable areas have also been noted.

BRITISH RAINFALL IN 1915.

A DIGEST of the rainfall returns over the British Isles for the year 1915 is given in the *Times* of January 18 by Dr. H. R. Mill, director of the British Rainfall Organisation. For the purpose of the discussion 130 stations, scattered over the British Isles, have been selected from a total of 3000.

A table shows for each of the 130 stations the rainfall for 1915 with the average fall for thirty-five years, and the difference of 1915 from the average, also the percentage of 1915 fall on the average. The heaviest rainfall at the 130 stations was 103·52 in. at Seathwaite, and the least 24·56 in. at Bury St. Edmunds. Other records as yet to hand give 138·99 in. at Llyn Llydaw, in Snowdonia, and 138·97 in. on the Stye, overlooking Borrowdale, in Cumberland, whilst at Huntingdon the fall was only 23·99 in., and at Cambridge 23·00 in.

The percentage of the average rainfall for the year over the British Isles is given on a map which shows at a glance that the most excessive rainfall occurred in the south-east of England, south of the Thames, where the fall was 130 per cent. of the average. From the Bristol Channel to Mid-Norfolk there is a belt with practically normal rainfall, whilst to the north of this in the Midlands the rainfall was relatively higher. The east coast, as far north as the Moray Firth, had a rainfall in excess of the average. The whole of the west of Scotland and the north-west of England had a rainfall below the average; the deficiency was greatest in the West Highlands. The lack of rainfall in the north-west of Great Britain is said to have been a feature of the year's weather as striking as the excess in the south. In Ireland the distribution of rainfall during 1915 was not very different from the normal. For the British Isles as a whole there was practically an average rainfall with a tendency to excess rather than deficiency.

A table is given showing the general rainfall for the several months. The winter months—January, February, and December—had the greatest excess of rain in England and Wales, whilst the heavy summer rains in July were slightly the heaviest in Ireland.

The rainfall in London for 1915 was 28 per cent. above the average, the year being the wettest in fifty-nine years, with five exceptions—in 1903, 1879, 1878, 1872, and 1860; whilst the number of days with rain was 7 per cent. below the average. Rain fell for 568·9 hours, which is 136·1 hours above the average, and the highest in thirty-four years, except in 1903 and 1909.

SCIENCE AT EDUCATIONAL CONFERENCES.

II.

A PREVIOUS article (January 13) summarised the papers and discussions at conferences of teachers with reference to the national aspect of early training in science. The number and variety of the meetings was so great that many other points of general scientific interest deserve notice. First may be placed the exhibition of scientific apparatus at the meeting of the Public School Science Masters' Association, as it marks a new era. Formerly a large proportion of the laboratory ware and appliances were of German or Austrian origin; this year, with the exception of a few balances from Rotterdam, all the exhibits were British. Naturally, the size of the display was reduced, but there was no falling off in quality. So far as visual and handling tests can be trusted, the goods shown were of a high grade of material and workmanship. There was a large selection of electrical apparatus, mostly measuring instruments, suitable to all grades of teaching, from the most elementary forms of magnetometers or electroscopes to the elaborate potentiometer sets. Messrs. Philip Harris, F. E. Becker and Co., Gallenkamp and Co., and Gambrell Bros. all contributed to this section. Messrs. Baird and Tatlock (London) made a special feature of laboratory glassware, and a number of science masters paid a visit to their works at Walthamstow. Messrs. Philip Harris exhibited lamp-blown glass apparatus suitable for volumetric and research work, also moderately-priced strong instruments suitable for field-work in physical geography and meteorology. Balances were also a strong feature in the exhibits of the above-mentioned firms, and of Messrs. Townson and Mercer, the last-mentioned providing a good variety of glass apparatus. It was satisfactory to observe that those essentials, best quality porcelain and filter papers, have not been neglected. There is evidence that the efforts of the British Science Guild have stimulated the manufacturers; without doubt the guild, by bringing before the Government the fundamental importance of the supply of scientific apparatus, has done a great service to science teaching. It is inevitable that prices should be advanced, and doubtless there will be some shortage in the supplies here and there; but it is a matter for congratulation that the main requirements are being so well met by British firms under conditions of exceptional difficulty.

Exhibitions of books were held at the University of London, and also at the Science Masters' and the Assistant-Masters' meetings. New scientific books are being steadily issued, and the general state of the book-trade, so far as leading publishers of educational works are concerned, appears to be far more normal than could have been anticipated. This implies that instruction is proceeding with but little disturbance.

The inventiveness of the Science Masters shows no diminution. The Rev. W. R. Burton (Sandwich) showed several of those simple and cheap devices which combine the merits of economy with pedagogic effectiveness. An instance was an electroscope costing one shilling, the main insulator being a piece of candle deprived of its wick. Mr. D. R. Pye (Winchester) showed a most effective wave-motion model; even more educative was his model illustrating diffraction at a straight edge, of light from a point source. From Rugby came an admirable exhibit of chemical preparations made during the summer holidays, under the direction of Mr. E. R. Thomas. The Rugby exhibit included useful devices in the fitting of apparatus, and stereochemical models made almost instantaneously by the use of plasticine—a useful lecture "tip." To the present writer it seems a pity that these exhibitions should not be accessible to a larger number; if they could be transferred to South Kensington as soon as the P.S.S.M.A. meeting was concluded, their sphere of stimulating usefulness would be widened.

Mr. M. D. Hill (Eton) opened a discussion on "School Museums," the general outcome of which was the importance of frequent change in the objects shown, and the relatively great value of living objects, aquaria, etc. The curator must regard the function of the museum as dynamic rather than static. It was so much easier to follow the arguments of the speakers whenever the hearer knew the buildings in which the work was done, that it is here suggested that the British Association committee which is dealing with the subject should obtain a collection of photographs and lantern-slides of school museums.