Earth's volume—The volume of a sphere is

$= \frac{1}{6} \pi \times (\text{diameter})^3 = \cdot 5236 \times (7920)^3$

$= 259{,}800.000{,}000$ cubic miles

$= 38{,}242{,}027{,}930$ billion cubic feet

or $= \frac{4}{3} \pi \times (\text{radius})^3$

$= \frac{4}{3} \times 3\frac{1}{7} \times (3960)^3 =$ &c.

or (by the method of solid rectangular conical sectors)

$= \frac{1}{3} r \times$ area of surface $= (\frac{1}{3} \times 3960 \times 197{,}000{,}000)$ cubic miles = &c.

(*To be continued.*)

Extracts from Publications.

Jupiter visible before Sunrise.—The planet Jupiter can now be well seen in the mornings, and it is important that telescopic observers examine his disc carefully and note the chief features. Last year the equatorial current had increased its rate of movement, its rotation being 9h. 50m. 11s. from a number of spots on the south edge of the northern equatorial belt. Are these markings still visible, and what is their velocity as compared with that determined during the previous opposition ?

The great red spot also exhibit a quickening of speed in 1914, the rotation period being 9h. 55m. 35s. It is probable that at the present time the red spot precedes the zero meridian of System II (see Ephemeris for physical observations of Jupiter in Nautical Almanac) about 3h. 40m. It is impossible to tell exactly, however, because the planet has been too near the Sun during the past winter for corrective observations to be made. Transits of the red spot and hollow in the southern belt may, however, be looked for at the following times :—

		H.	M.			H.	M.
April	14	14	27	May	3	15	6
,,	16	16	5	,,	8	14	14
,,	21	15	12	,,	15	14	59
,,	26	14	20				
,,	28	15	58				

Some estimated transits would be valuable in order to determine what the rate of rotation has been during the last six months.

The great south temperate spot now precedes the red spot. The former was no less than about 135° in length during last opposition, and it may ultimately extend all round Jupiter and darken the previously brilliant south tropical zone.

[*Nature.*]

A Faint Companion to Capella.—An interesting discovery has been made by Dr. R. Furuhjelm (Astronomische Nachrichten, No. 4715), who has found that Capella, a spectroscopic double star, is accompanied by a faint companion (phot. mag. 10·6) at a very great distance. The absolute positions of the stars, according to the Helsingfors' catalogue plates are as follows :—

	a 1900·0		1900·0 epoch	
	h. m. s.			
Capella	5 9 18·09	...	+ 45° 53′ 49″·11	895·42
The faint star	5 10 1·26	...	+ 45° 44′ 23″·9	

The companion is distant from Capella by 12 3 3, and the position angle is 141·20°. The discovery was made by comparing the proper motions of the stars in the neighbourhood of Capella determined from photographs of the region taken at two different epochs at Helsingfors. Dr. Furuhjelm's proper motion for the faint star gave the values 0·422 in the direction 170·9°, while the values for Capella as determined by Boss were ·0438 in the direction 168·7°. Other stars in the vicinity have no such physical relationship.

The Solar System.—The following neat empirical formula connecting certain elements of the known planetary satellites is given by M. F. Ollive in a modest little note communicated to the French Academy of Sciences (Comptes Rendus, Vol. CLVII, No. 26, p. 1501). Let R represent the mean distance of the satellite from the planet around which it gravitates, V its orbital velocity, R the mean distance of the planet from the Sun, and r its mean radius, then, M. Ollive states $r^3 = KRRV^2$. In c. g. s. units the constant $k = 4·313 \times 10^{-8}$.

The data for the twenty-six known satellites in the solar system necessary for calculating the planetary radii are tabulated, together with the deduced ratio of the radius of the planet to that of the Earth compared with the measured values. The formula gives the radius of the Earth with great accuracy, the ratio deduced measured being 1·0001, according to our calculation ; for Mars also the deduced radii are almost identical *inter se*, and with the measured value. For Jupiter and Saturn, whilst the deduced values are highly consistent among themselves, except that given by Saturn's ninth and most distant satellite, they are slightly in excess (approx. 6 per cent. and 2 per cent. respectively) of the measured radii. For Uranus and Neptune the formula gives results roughly 50 per cent. and 100 per cent. too high respectively. [*Nature.*]

The Smithsonian Astrophysical Observatory.

The report of the Astrophysical Observatory for 1913, under the direction of the Smithsonian Institution, contains a good account of progress made: in fact, the Director, Mr. Abbot, refers to the work of the observatory as "uncommonly successful." We notice that for the solar work at Mount Wilson there has just been erected a Tower telescope, 40 ft. high, for use with the spectrobolometer, for the study of the distribution of radiation over the Sun's disc. The report states many results of the year's work. Thus the mean value of the solar constant of radiation at the Earth's mean distance from the Sun, from about 700 observations made at high and low stations between 1902 and 1912 is 1·932 calories per square centimetre per minute. The fluctuation of the 'Solar constant' values is attributed to the variability of the Sun, and in addition to the periodicity due to the sun-spots, there is another irregular, non-periodic variation, sometimes running its course in a week or ten days, at other times in longer periods and varying over irregular fluctuations of from 2 to 10 per cent. of the total radiation in magnitude. Further, a combination of the effects of sun-spots and volcanic haze is put forward as explaining the principal outstanding irregularities in the temperature of the Earth for the last thirty years. Finally, in the Californian expedition, in which sounding baloons were employed, the solar radiation values at very high altitudes indicate that the direct pyrohelion metric observations gave results of the same order of magnitude as the solar constant work of 1902—1912 by high and low Sun observations on homogeneous rays, according to Langley's methods.

The New Solar Cycle.—The long period of apparent rest which the solar atmosphere has been recently undergoing has now been broken by the comparatively large sun-spot which developed during the course of last week. The sun-spot activity of the last few years has been well summarised in the annual report of the Council of the Royal Astronomical Society (Monthly Notices, February 1914). In this we are told that the past year has been a year of minimum activity of sun-spots, more than a century having elapsed since the Sun exhibited such complete and prolonged quiescence. The following brief table is gathered from the report above mentioned, and brings out clearly the exceptional nature of the year 1913 :—

Year.	Days without spots.	Mean daily spotted area in millionths.	No. of separate groups.
1911 ...	... 183	64	62
1912 ...	... 246	37	39
1913 ...	... 320	5	15

It is stated that no year since 1810 has given such a barren record as that just elapsed. The new cycle was indicated last year by two groups in high latitude, the chief criterion for the beginining of a new cycle.

Relation between Stellar Spectra, Colours and Parallaxes.— In Astronomische Nachrichten, No. 4722, Herr P. Nashan describes the results he has obtained in comparing the colours, spectra and parallaxes of a number of stars. Dealing first with 101 stars, he divides them first into three classes: α, β and τ, according as the stars are white, yellow, or re: the parallaxes are also grouped with three divisions as follows :— 0·000″ to 0·050″, 0·050″ to 0·100″, and 0·100″ to 0·200″. The comparison shows that the white stars decrease with increasing parallaxes : on the other hand, the red stars increase with increasing parallaxes. The fact that there is a close relationship between the colour and the spectrum of a star has led him to compare the sepectra of 246 stars with their parallaxes. The results are best shown as follows :—

Spectrum.	No. of stars.	Parallax. 0″·000—0″·050		0″·050—0″·100		0″·100—0″·150		0″·150 +	
		n	%	n	%	n	%	n	%
B	11	7	63·6	3	27·3	1	9·1	0	0
A	28	8	28·5	8	28·5	7	25·0	5	18·9
F	59	19	32·2	22	37·3	15	25·5	3	5·1
G	64	13	20·3	22	34·4	27	42·2	2	3·1
K	70	13	18·6	21	30·0	23	32·9	13	18·5
M	14	3	21·4	2	14·3	5	35·7	4	28·6

Herr Nashan then couples up the B and A stars into a white group, and F and G into a yellow group, and the K and M stars into a red group, and concludes that the relative number of white stars decreases with increasing parallaxes, while the relative number of the red stars increases with increasing parallaxes, a result similar to that obtained with colour alone. The communication concludes with the list of the 246 stars employed, giving their positions for 1900·0, a parallax, type of spectrum and colour.

[*Nature.*]

Memoranda for Observers.

[Standard Time of India is adopted in these Memoranda.]

For the month of June 1914.

Sidereal time at 8 p.m.

		H.	M.	S.
June	*1st*	12	36	54
,,	*8th*	12	4	30
,,	*15th*	13	32	· 6
,,	*22nd*	13	59	42
,,	*29th*	14	27	18

From this table the constellations visible during the evenings in June can be ascertained by a reference to a star chart, as the above hours of sidereal time represent the hours of Right Ascension on the meridian.

Phases of the Moon.

			H.	M.	
June	*1st*	First Quarter ...	7	33	P.M.
,,	*8th*	Full Moon ...	10	48	A.M.
,,	*15th*	Last Quarter ...	7	50	P.M.
,,	*23rd*	New Moon ...	9	3	,,
,,	*30th*	First Quarter ...	12	54	,,

Meteors.

	Radiant. R. A.	Dec.	Character.
May-June ...	353°	+39°	Swift ; streaks.
May-June-July ...	252°	−21°	Slow ; trains.
June-July-Aug. ...	302°	+23°	Swift.
June 4th—13th ...	312°	+61°	Swift ; streaks.
20th ...	335°	+57°	Swift.