physics having but a slight knowledge of German could easily follow Prof. Mach's writings, and would gain both pleasure and profit by becoming acquainted with his many suggestive views.

AMONG scientific articles in the magazines for February, the following are noteworthy. In the *Fortnightly Review*, Mr. Maurice Maeterlinck writes of the beauty of field flowers in his usual charming style. Prof. R. A. Gregory contributes to the *Cornhill Magazine* a paper on the astronomy of the unseen, in which he describes the evidence which has been accumulated in recent years as to the existence of dark stars and other non-luminous matter in the stellar universe. The *Royal Magazine* contains an account, by Mr. W. M. Webb, of school gardens in connection with a number of English schools of different grades; the educational value of nature-study in the open air is accentuated in this essay. Mr. F. W. Stokes contributes to the *Century Magazine* an article on the Aurora Borealis, which is illustrated with four coloured plates reproduced from the author's own paintings.

THE additions to the Zoological Society's Gardens during the past week include a Fennec Fox (*Canis cerdo*) from North Africa, presented by Dixon Bey; a Mandrill (*Cynocephalus mormon*) from West Africa, presented by Mr. M. Vickers; a Buffon's Touracou (*Turacus buffoni*) from West Africa, presented by Mr. V. G. Gane; an Elate Hornbill (*Ceratogymna elata*) from West Africa, presented by Mr. Francis Hart; a Water Rail (*Rallus aquaticus*) British, presented by Lieut.-Colonel L. H. Irby; a Kinkajou (*Cercoleptes caudivolvulus*) from South America, a Great Wallaroo (*Macropus robustus*) from South Australia, deposited.

OUR ASTRONOMICAL COLUMN.

COMET 1903 *a* (GIACOBINI).—The following observations of this comet are reported in No. 3841 of the *Astronomische Nachrichten*:—

January 20, 6h. 54m. 12s., Göttingen, $\alpha = 22h.\ 58m.\ 4s.\cdot8$, $\delta = +2^\circ\ 30'\ 4''$. No nucleus.

January 21, 6h. 22m. 0s., Strasburg, R.A. = 22h. 59m. 51s., Dec. = $+\ 2^\circ\ 44'\ 8''$.

January 21, 7h. 9m. 30s., Heidelberg, R.A.(app.) = 22h. 59m. 52s.·4, Dec. = $+2^\circ\ 44'\ 38''$, mag. = 10·0.

January 22, 6h. 29m. 30s., Heidelberg, R.A.(app.) = 23h. 0m. 54s.·6, Dec. = $+2^\circ\ 58'\ 37''$.

RETURN OF PERRINE'S COMET, 1896 vii.—Herr Ristenpart has calculated the corrected elements and the ephemeris, given below, for the return of this comet during the present year.

T = April 26·6, 1903.

$$\left.\begin{array}{rl} L = & 35^\circ\ 50'\cdot84 \\ \pi = & 49\ \ 4\cdot02 \\ \Omega = & 242\ 20\cdot40 \\ i = & 15\ 41\cdot28 \end{array}\right\} 1903$$

$\log q = 0\cdot54313$

Ephemeris 12h. M.T. Berlin.

Date	α 1903·0 h. m.	δ 1903·0 ° ′	log r	log Δ	Brightness.
Feb. 6·5 ...	22 5·9	− 1 27	0·1840	0·3856	0·22
,, 14·5 ...	22 28·0	+ 0 21	0·1670	0·3780	0·25
,, 22·5 ...	22 52·5	+ 2 17	0·1501	0·3703	0·28
March 2·5 ...	23 17·4	+ 4 20	0·1337	0·3627	0·31
April 3·5 ...	1 9·0	+12 47	0·0806	0·3385	0·44
May 5·5 ...	3 12·7	+18 49	0·0690	0·3354	0·47

Unit brightness at time of discovery (*Astronomische Nachrichten*, No. 3841).

PHYSICAL CONSTITUTION OF JUPITER.—As chairman of the Mathematics and Astronomy Section of the American Association for the Advancement of Science, Prof. G. W. Hough read a paper on the above subject at the Washington meeting held on December 29.

After reviewing the history of the observations of Jovian phenomena, Prof. Hough gave a detailed account of his own observations, which date from 1879. All the measures made by him were micrometrical, and he strongly deprecates the making of mere visual observations wherever it is possible to use a micrometer. Details are given of his measurements of the change of latitude and the rotation period of the Great Red Spot, and the variations are illustrated by four curves which accompany the paper. From the fact that some spots have shorter periods than others, Prof. Hough deduces that the spots must exist at various heights in the planet's atmosphere.

Some observations of transits and eclipses of the satellites led to the deduction that the satellites have no inherent light of their own and that the planet is not hot enough to produce light.

Prof. Hough also draws some very interesting conclusions as to the density and general physical constitution of the planet, and the nature of the various markings seen projected on its surface, and these conclusions argue strongly against the theory that the markings—excepting the belts—are of the nature of clouds in the planet's atmosphere.

The complete address is published in *Science* for January 16.

OBSERVATIONS OF VARIABLE STARS.—Mr. A. Stanley Williams communicates his observations of thirteen recently discovered variables to No. 529 of the *Astronomical Journal*.

DEFINITION OF JUPITER'S MARKINGS. ACCELERATION IN THE MOTION OF THE GREAT RED SPOT.

THE study of Jovian markings has been rendered very difficult for European observers in recent years owing to the position of the planet far south of the equator. Telescopic definition has been rarely good, and the more delicate and diminutive of the surface features have usually been obliterated amid the turmoil of seething vapours in which the image has been involved. The effect of unsteady, confused definition is to smooth off objective irregularities and to produce momentary displacements and contortions, giving rise to false appearances which are sometimes considered real by imaginative or inexperienced observers. When the disc is affected by rushing vapours, the belts often appear as the only distinguishing marks on the planet, and they look even and spotless, so that the observer may readily conclude that Jovian phenomena are temporarily quiescent. But when the disc is outlined with livid sharpness and the details stand out boldly, as they often do in the comparative absence of atmospheric ebullition, the aspect of the planet seems to have been transformed, and a crowd of interesting features immediately present themselves for examination. On special occasions of this kind, it is possible to take between fifty and a hundred transit-times of well-defined marks in the course of a few hours.

On July 11 and 13, 1902, Jupiter appeared in my 10-inch reflecting telescope under a power of 312, magnificently defined. The whole face of the planet seemed figured over with rugged detail. I saw many features on those nights which were not seen again, though repeatedly looked for with the utmost care. The belt scenery was very diversified, and it struck me as being totally dissimilar to the smooth indefiniteness commonly displayed under less suitable conditions. During the progress of my observations at Bristol in recent years, I have usually recorded the state of the seeing, and the following is a summary of the records for the last five oppositions of Jupiter:—

Observations of Jupiter, 1898–1902.

Opposition.	South declination of Jupiter.	Nights of observation.	Nights when seeing recordd	Definition. Very good.	Good.	Fair.	Bad.	Very bad.	Transit-times taken.
1898	° 1	51	41	5	8	11	11	6	280
1899	12	76	69	7	13	20	19	10	668
1900	20	36	30	2	7	9	8	4	307
1901	23	76	71	5	10	11	24	21	547
1902	18	89	81	6	14	15	31	15	1005
5 years		328	292	25	52	66	93	56	2807