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.

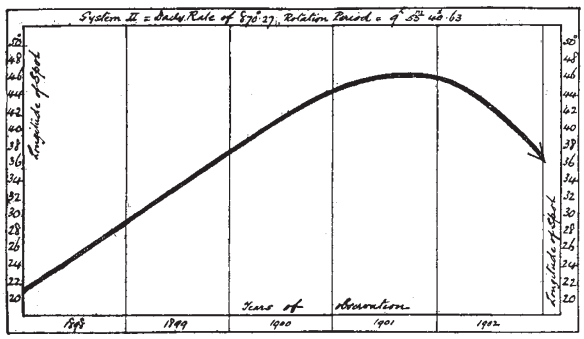
On July 11 and 13, 1902, Jupiter appeared in my 10-inch reflecting telescope under a power of 312, magnificently defined. The whole face of the planet seemed figured over with rugged detail. I saw many features on those nights which were not seen again, though repeatedly looked for with the utmost care. 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

The table shows that the "very good" and "good" nights, taken together, included little more than one-fourth of the aggregate number of observations during which the state of definition was recorded.

Though frequently marred by bad atmospheric conditions, a number of very interesting formations were visible on the planet in 1902. Perhaps the most noteworthy feature of the opposition was the very marked acceleration which occurred in the rate of motion of the great red spot. The longitude of this marking in April, 1902, was 46°, but early in January, 1903, it had declined to 37°, and the resulting mean rotation period during about eight months was 9h. 55m. 39s., or 3 seconds less than the period in 1899, when it was nearly 9h. 55m. 42s. The following diagram will exhibit the changes in the longitude of the spot during the last five years:—



The equatorial region of Jupiter was very brilliant during the past opposition, and the interval separating the dark belts on either side of it seemed filled with glowing material. The usual dark and white spots were distributed along the north side of the south equatorial belt, and the mean rotation period of these was found to be 9h. 50m. 26s. ·7, or about 2½ seconds less than last year. The observations indicate that this equatorial current became rather suddenly accelerated towards the close of the opposition. It will therefore be rather important to determine its rate as early as possible in the ensuing spring, when Jupiter reappears in the morning sky. It will also be interesting to observe the position of the red spot in order to find whether the recent marked increase in its motion has been maintained.

W. F. DENNING.

SOCIETY FOR PSYCHICAL RESEARCH.

SIR OLIVER LODGE, in the course of his address before the Society for Psychical Research on Friday last, said that a few friends who desired to remain anonymous had started an endowment fund, amounting at present to 2000*l.*, in order to set the Society upon a sound and permanent basis, and in order to provide the material means of attacking the problems which the future might bring before them. As soon as a capital sum of 8000*l.* had been attained, it was proposed to offer a research scholarship in psychical science, to which a holder, irrespective of sex or nationality, might be appointed for one year and from year to year as might seem good, his or her time to be devoted to the work of psychical investigation. When practical benefits could be definitely foreseen, people felt justified in spending money even on science, though as a rule that and education were things on which they were specially economical.

And why should not psychical investigation lead to practical results? Were we satisfied with our treatment of criminals? Were we, as civilised people, content to grow a perennial class of habitual criminals and to keep them in check only by methods appropriate to savages—hunting them, flogging them, locking them up and exterminating them? Any savage race in the history of the world could do as much as that, and if they knew no better, they were bound to do it for their own protection. Society could not let its malefactors run wild any more than it could release its lunatics. Until it understood these things, it must lock them up; but the sooner it understood them the better. Force was no remedy; intelligent treatment was. Who could doubt but that a study of obscure mental facts would lead to a theory of the habitual criminal, to the tracing of his malady as surely as malaria had been traced to the mosquito? And, once we understood the evil, the remedy would follow. It was unwise and unscientific to leave prisoners merely to the discipline of warders and to the preaching of chaplains. That was not the way to attack a disease of the body politic. He had no full-blown treatment to suggest, but he foresaw that there would be one in the future. Society would not be content always to go on with these methods of barbarism; the resources of civilisation were not really exhausted, though for centuries they had appeared to be. The thing demanded careful study on the psychical side, and it would be a direct outcome of one aspect of their researches. The influence of the unconscious or subliminal self, the power of suggestion, the influence of one mind over another—these were not academic or scientific facts alone; they had a deep practical bearing, and sooner or later it must be put to the proof.

They sought to unravel the nature and hidden powers of man; and a fuller understanding of the attributes of humanity could not but have some influence on our theory of divinity itself. If any scientific society was worthy of encouragement and support, it should surely be that. If there was any object worthy the patient attention of humanity, it was surely these great and pressing problems of whence, what and whither that had occupied the attention of prophet and philosopher since time was. The discovery of a new star, or a marking in Mars, or of a new element, or a new extinct animal or plant was interesting. Surely the discovery of a new human faculty was interesting too? Already the discovery of telepathy constituted the first fruits of that society's work, and it had laid open the way to the discovery of much more. Their aim was nothing less than the investigation and better comprehension of human faculty, human personality and human destiny.

THE MEXICAN AXOLOTL.

WHEN I was in Mexico during the last summer, I naturally paid attention to the Axolotl question, a problem which in spite of, or perhaps because of, the various articles written on this subject has remained in a state of confusion. I am now able to make statements which will afford a solution.

In the normal course of events, Amblystoma spawns in the water and the larvæ metamorphose into the entirely lung-breathing, terrestrial creature which alone is sexually ripe.

A. tigrinum, the image of the Axolotl, has a wide distribution, ranging from New York to Colorado and to the valley of Mexico. Velasco,[1] received metamorphosing larvæ of the typical *A. tigrinum* from the little lake Santa Isabel, near Guadeloupe, about five miles north of the capital. There is no reasonable doubt that this species occurs in the perfect form in various other parts of the valley of Mexico, for instance, around Lake Zumpango. A sure sign of the approaching metamorphosis is the appearance of large yellow, irregular patches on the surface, which is at first uniformly dark. By some individuals, this adult coloration is assumed early, when the larvæ are less than half grown; in others it is delayed.

There are various places in Mexico and in the United States where not all the larvæ metamorphose. Some remain more or less uniformly dark, retain their gills and fins, but become sexually ripe. Such typical Axolotl occur side by side with metamorphosing and with metamorposed specimens. Examples:—The Natural History Museum at South Kensington possesses a gravid female, a big typical Axolotl from Anclan, Jalisco; from the same locality are four half-grown larvæ which have assumed the tiger spots, a sure sign of approaching metamorphosis. There are further, from St. Mary's Lake, Estes Park, Colorado, 7400 feet altitude, two full-grown perennibranchiate males in breeding condition and one big female. Lastly, from the Cumbre de los Arrastrados, Jalisco, 8500 feet, there are several young larvæ of the unmistakable spotted type, and one large male larva which is dark and spotless and with all the appearance of not going to change.

In a few favoured localities, none of the larvæ change into the complete Amblystoma, but propagate as permanent Axolotl. This applies to that clan of *Amblystoma tigrinum* which inhabits some of the lakes near Mexico City. It is well known

[1] *La Naturaleza*, vol. iv. (1879), pp. 209–233, pls. vii.–ix.; *cf.* also Spengel, who gives a much condensed *résumé* with remarks upon Velasco's paper, *Biolog. Centralblatt*, vol. ii. (1882), pp. 80–83.