

OUR ASTRONOMICAL COLUMN

THE ROTATION PERIOD OF MARS.—The seventh volume of the *Annals* of the Leiden Observatory contains a very thorough and painstaking investigation by Prof. Bakhuyzen of the rotation period of the planet Mars. In previous determinations one of two courses has usually been adopted, either to compare drawings of Huygens or Hooke with the most recent observations attainable, or to discuss some modern series which seemed to promise to compensate for its restricted range by its greater accuracy. Prof. Bakhuyzen has, however, endeavoured to utilise the entire mass of observations at his disposal, so as to avoid the sources of error to which the other methods are liable, and he possesses a great advantage over earlier investigators, in having access not only to the numerous observations made in 1877 and 1879, but also to the great series of more than 200 drawings which Schroeter had prepared for his projected "Aerographischen Beiträge," and which, becoming the property of the University of Leiden in 1876, was edited and published by Prof. Bakhuyzen in 1881. Prof. Bakhuyzen, in the reduction of these drawings, has adopted provisionally Schiaparelli's position for the pole of Mars—R.A. $317^{\circ} 46' 0$, Dec. $53^{\circ} 25' 4$, mean equinox of 1833.0—and Proctor's rotation-period—24h. 37m. 22.74s.—and deduces corrections to these elements from a comparison of the results obtained by reducing the various observations at his command with them. His first step is, from a discussion of the drawings of Kaiser, Lockyer, Lord Rosse, and Dawes, made during the oppositions of 1862 and 1864, to obtain the time of transit on January 1, 1863, of his adopted prime meridian over the Martial meridian which passes through the earth's north pole, choosing as his prime meridian the one which lies 2° to the east of the centre of Mädler's point *a*, corresponding almost exactly to Schiaparelli's *Fastigium Aryn*, or to Proctor's *Dawes Forked Bay*, he finds the time of transit over the meridian passing through the north pole of the earth on January 1, 1863, to be 20h. 27.0m. ± 4 om, Berlin M.T. The areographic longitude of the centre of the *Oculus*, the conspicuous circular spot, called by Green the *Terby Sea*, and by Schiaparelli *Lacus Solis*, will be, with this prime meridian, $90^{\circ} 87'$. The second section contains the determination of the areographic longitudes of ten of the most conspicuous and easily identified markings on the surface of Mars as inferred by means of the above elements from the drawings of various observers from the time of Hooke and Huygens up to 1879. For the last-named year only Schiaparelli's observations are used, but for 1877 there is an abundant supply, there being available, besides the observations of Schiaparelli, the drawings of Lohse, Green, Dreyer, and Niesten. Beer and Mädler's drawings afford material for 1830, Herschel and Schroeter give a very full series from 1777 to 1803; and Huygens and Hooke supply a few drawings from 1659 to 1683, from which the longitude of Mädler's *f*, the *Kaiser* or *Hourglass Sea*, Schiaparelli's *Syrtris Major*, can be inferred. These longitudes are discussed in the third section, and a corrected rotation period is obtained of 24h. 37m. 22.66s ± 0.0132 s., a value exceedingly close to the mean of the best previous determinations, which are as follows:—

	h.	m.	s.
Kaiser, 1864	22.62
Kaiser, 1873591
Schmidt, 187357
Proctor, 1868735

Proctor's value is clearly too large, a comparison of the mean longitudes obtained for the *Kaiser Sea* with his period showing a steady decrease for successive oppositions; the only observations which stand conspicuously out from the rest being those of Hooke, upon which he had based his determination. There can be no doubt that Prof. Bakhuyzen's value is a distinct improvement upon the earlier ones, and that its uncertainty lies only in the second place of the decimals. A table for computing the time of transit of the prime meridian over that meridian of Mars which passes through the earth's north pole, completes the memoir.

Prof. Bakhuyzen supplies also a short note as to changes on the surface of Mars. The most conspicuous of all the markings on the planet's surface has always been the *Kaiser Sea*; but the drawings of Schroeter and Herschel, as Dr. Terby has already pointed out, exhibit a second marking near it, nearly as conspicuous, and very similar in shape and size. There can be no doubt that the only modern representative of this spot is *Hugin's Inlet*, Schiaparelli's *Cyclopus*, a narrow streak, by no

means easily observed, and now entirely unlike the *Kaiser Sea* in shape. Prof. Bakhuyzen also considers that there is sufficient evidence for thinking that Schroeter on several occasions observed Schiaparelli's *Læstrygonum*—one of the most difficult objects on the planet—which could scarcely have been the case had it not been much more conspicuous than it has been of late years. These changes, Prof. Bakhuyzen thinks, lend a high degree of probability to the theory that certain districts of Mars are covered by liquid.

THE SPECTRUM OF THE GREAT NEBULA IN ANDROMEDA.—Mr. O. T. Sherman, assistant at Yale College Observatory, reports in *Science* (vol. vi. Nos. 138 and 141) the discovery of three bright lines in the spectrum of this nebula. Of these the most refrangible corresponds to H β , and the wave-lengths of the other two are given as 5312.5 and 5594.0. It is suggested that the second of these lines is the well-known coronal line 1474 K, and that the third is one of the feebler coronal lines which Prof. Young observed in the 1869 eclipse, viz. the one at $1250 \pm$ of Kirchhoff's scale. The observation, if confirmed, will go far to settle the disputed question as to whether the *Nova* is really or only apparently connected with the nebula, for two bright lines, of which one is probably 1474 K, have been observed in the spectrum of the former at the Royal Observatory, Greenwich.

THE WEDGE PHOTOMETER.—Dr. Wilsing in the *Astronomische Nachrichten*, No. 2680, criticises at considerable length several points with regard to Prof. Pritchard's use of the wedge photometer at the Oxford Observatory. Dr. Wilsing considers that Prof. Pritchard's investigations as to the figure of the wedge and its selective absorption leave nothing to be desired, but that the state of our knowledge of the physiological side of the question is still very incomplete. Experiments which Dr. Wilsing has made with two wedges of his own have convinced him that the variations in the sensibility of the eye are neither slight nor unimportant, and that they occasion discordances in the observations considerably greater than Prof. Pritchard is inclined to admit. Dr. Wilsing also finds that comparisons of differently coloured stars give results not directly comparable with eye estimations. He objects to the use of the method of limiting apertures for the determination of the value of the wedge constant, and points out that the influence of the intensity of the background affects Prof. Pritchard's magnitudes of the fainter stars very perceptibly. Despite all these drawbacks, however, he regards the wedge photometer as a useful addition to our equipment.

Mr. Chandler, who must at Harvard College enjoy special facilities for making himself well acquainted with the working of different forms of photometers, has recently expressed his preference for Argelander's method. There can, however, be no doubt but that the labours of Profs. Pritchard and Pickering have greatly advanced our knowledge of the comparative brightnesses of the northern stars.

PHOTOGRAPHING THE CORONA IN FULL SUNSHINE.—Mr. W. H. Pickering, of Harvard College, made a series of attempts during the partial eclipse of last March 16, to obtain a photograph of the corona. In this he was quite unsuccessful, for, though his plates showed several corona-like markings, they were clearly not due to the true corona, as they were found in front of the moon as well as on the sun's limb. From this Mr. Pickering was evidently led to conclude that the results which Dr. Huggins had obtained were probably of a similar character, and he expressed as much in a letter to *Science*. Dr. Huggins in reply pointed out that Mr. Pickering's method was faulty and was calculated to produce such false images. The latter, therefore, somewhat modified his apparatus, without, however, altering the two points which Dr. Huggins considered most erroneous—viz. the use of an object-glass instead of a reflector, and the placing his drop-slit close in front of the object-glass instead of in its primary focus. The result has been that he has obtained photographs free from false coronæ, but showing no real ones. At the same time he has made experiments which convince him that to produce a perceptible image of a coronal rift it is necessary to be able to discriminate between degrees of illumination which do not differ from each other by more than one-tenth the intrinsic brilliancy of the full moon. He considers that the eye is more able to detect small differences of light than a photograph is, and states that the moon cannot be photographed in full daylight, even though it may be easily seen. His investigations also lead him to think that even in the clearest weather the atmospheric illumination is 300 times as

bright as it should be for it to be possible to obtain any image of the corona. To these points Dr. Huggins has replied in the *Observatory* for November. Dr. Huggins states that he has had no difficulty at all in photographing the moon in full sunshine, and that the observations of Prof. Langley and others of Mercury and Venus, which have been seen as black disks before they reach the sun, proves that the corona must have a sensible brightness as compared with the atmospheric illumination.

He also points out that Mr. Pickering fails to obtain any trace on his photographs even of the defects of his own instrument. Dr. Huggins declines further discussion, preferring to wait the result of the work now being carried on by Mr. Ray Woods at the Cape Observatory. Mr. Pickering replies in *Science* for October 23, admitting the possibility of photographing the moon in full sunshine, but contending that these very photographs of the moon supply an additional proof of his opinion that the light of the atmosphere near the sun is more than 300 times too intense for it to be possible to obtain a photograph of the corona, since the sky light near the sun was fifty times as bright as that near the moon, and coronal photographs, to be of any use, should be able to record differences of illumination of only one-tenth the brightness of the full moon.

He explains the visibility of Venus and Mercury as being caused by the refraction of the sun's light through their atmospheres, the black disk being thus surrounded by a narrow luminous ring.

ASTRONOMICAL PHENOMENA FOR THE WEEK, 1885, NOVEMBER 15-21

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on November 15

Sun rises, 7h. 21m.; souths, 11h. 44m. 48'4s.; sets, 16h. 9m.; decl. on meridian, 18° 37' S.; Sidereal Time at Sunset, 19h. 49m.

Moon (one day after First Quarter) rises, 13h. 18m.; souths, 18h. 37m.; sets, 0h. 31m.*; decl. on meridian, 8° 43' S.

Planet	Rises		Souths		Sets		Decl. on meridian
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
Mercury ...	9	6	12	54	16	42	24 8 S.
Venus ...	11	28	15	2	18	36	25 59 S.
Mars ...	23	40*	6	46	13	52	12 2 N.
Jupiter ...	2	14	8	23	14	32	1 5 N.
Saturn ...	18	48*	2	56	11	4	22 20 N.

* Indicates that the rising is that of the preceding and the setting that of the following day.

Occultation of Star by the Moon

Nov.	Star	Mag.	Disap.		Reap.		Corresponding angles from vertex to right for inverted image
			h. m.	h. m.	h. m.	h. m.	
17 ...	B.A.C. 8365 ...	6½	22	41	23	44	166 298

Phenomena of Jupiter's Satellites

Nov.	h. m.	Phenomenon	Nov.	h. m.	Phenomenon
16 ...	2 45	III. ecl. disap.	20 ...	6 56	I. tr. ing.
16 ...	5 51	III. ecl. reap.	21 ...	3 16	I. ecl. disap.
16 ...	6 47	III. occ. disap.	21 ...	6 34	I. occ. reap.

The Occultations of Stars and Phenomena of Jupiter's Satellites are such as are visible at Greenwich.

GEOGRAPHICAL NOTES

THE last number of the *Izvestia* of the Russian Geographical Society (xxi. 3) contains a variety of interesting papers. M. Ivanoff describes some Turkestan antiquities; namely, the Akhyr-tash, situated at the foot of the Alexander ridge, twenty-seven miles from Aulie-ata, one of the grandest buildings of antiquity, which covers nearly 20,900 square yards, and must have been some projected immense temple or palace; it was built from immense stones, weighing about one ton each, and brought from Tash-tube. M. Ivanoff gives for the first time a plan and a detailed description of the ruins of this immense building. Stone idols on the Issyk-kul, as also a burial-ground

on the shores of the same lake, are described and represented by drawings. The whole is a most valuable contribution. M. Trusman's paper on Finnish elements in the Gdov district of St. Petersburg will be welcome to Russian archaeologists. Capt. Gedeonoff gives a list of forty-three places in the Trans-caspian region, whose positions have been determined by means of astronomical observations, as also their heights, determined by barometrical measurements. We notice the following: Khiva (house of Mat-murat), 41° 23' 0" N. lat., 60° 22' 18" E. long., 351 feet above the sea-level; Merv (Koushut-khan-kala), 37° 35' 37" N. lat., 61° 50' 27" E. long., 565 feet; and Tchardjui, 39° 1' 33" N. lat., 63° 36' 12" E. long., 433 feet. M. Konshin's paper on the Sary-kamysh lake basin and the western basin deserves more than a short notice, as it sums up the latest researches in this region, and presents the whole question as to the bed of the Amu-daria in quite a new light. A report on cartographical work in Russia in 1884 will be summed up under a separate head, as also two letters from Col. Prjevalsky and M. Potanin. Finally, the same issue contains two most valuable maps, by Gen. Tillo. One of them, on a larger scale, gives the lines of equal magnetic intensity, full and horizontal only, for Russia in Europe, reduced to the year 1880. On this map all places where observations have been made, as also where anomalies have been observed, are marked. Two other maps, on a smaller scale, give the lines of equal secular variation, both of the horizontal and of the total magnetic intensity. All three have explanations in German. These maps thus complete the remarkable work on "Earth-Magnetism in Russia," undertaken a few years since by M. Tillo, and already mentioned in NATURE.

THE last news from M. Potanin's expedition is embodied in a letter, dated San-chuan, January 25, and published in the last issue of the St. Petersburg *Izvestia* (xxi. 3). Leaving San-chuan on November 14, M. Potanin followed the right bank of the Hoang-ho up to He-cheu. The same red sandstones and conglomerates, covered with loess, were met with; the ridge which separates the Hoang-ho from the Tao-ho, intersected by deep ravines, is all covered with cornfields and villages; the soil abounding with moisture, villages are situated as high as 2000 feet above the bottom of the valleys. Crossing the Tao-ho and next the Da-sya-ho, the little half-ruined town of He-cheu was reached. The Da-sya-ho River is formed by the junction of three rivers—the Huishu, the Tumun, and the Leu-guan—situated 70 li above the town. This last river was followed by the expedition, and its source was reached after a two days' march. Its valley is wide and well-peopled in its lower half, the upper one being a mere gorge thickly covered with brushwood, and quite unpeopled. Crossing a ridge at the sources of the Leu-guan and its tributary, Urunka, the broad valley of the Tchitai was next reached. Its banks consist also of sandstones and conglomerates, and it is thickly peopled with Salars, its upper part being occupied by Tanguts. Descending this valley, a two days' march brought the expedition to the confluence of the Tchitai with the Yellow River; and another two days' march brought them to San-chuan. On this stretch the Yellow River flows in a narrow gorge between steep crags of the red sandstones and conglomerates, and the road ascends these crags or follows their slope on narrow wooden balconies, or by flights of steps cut in the hard rock. The right bank of the river is inhabited by Salars. They have maintained their Turkish language in great purity. The men wear a Chinese dress, but the women wear broad trousers, and a broad overcoat with sleeves, and a pointed bonnet which covers the upper part of the back. They are all Mussulmans, but their mosques are of Chinese architecture, and are decorated with dragons, lions, and tigers. Above its gorge the Yellow River flows through a depression seven miles long and less than two miles wide, which has received the name of San-tchuan, or Gurban-tala, and is peopled exclusively by Mongolian Shirongols. Their central village is Ni-ja. The Shirongols seem to belong to the same stem as that described by M. Prjevalsky under the name of Dalda in the vicinity of Kuku-nor. Both are called Tu-ju by the Chinese. If this supposition is correct, they would appear to occupy the territory from the longitude of He-cheu to that of Gan-cheu. They speak Mongolian, with an addition of Chinese words, but have some words of their own which must be remains of the language they have spoken in their former territory, the Urdus. Their dress is Chinese, but the women have maintained the same trousers as the Salars, and their houses have much likeness with those of these last. They live