traces of iodine. The phosphide of boron thus obtained is a brown powder, very light in texture, and insoluble in every solvent which has yet been tried. In contact with oxygen the compound ignites at a temperature about 200°, and burns with a very brilliant flame, forming boric and phosphoric anhydrides. With chlorine gas it inflames at the ordinary temperature, producing boron trichloride and phosphorus pentachloride. Vapour of sulphur converts it into sulphides of boron and phosphorus. When thrown into a little fused nitre instant incandescence and deflagration occur. Its behaviour with nitric acid is characteristic; it immediately becomes incandescent, and moves rapidly to and fro over the surface of the acid, all the while burning with a most dazzling flame. It reduces concentrated sulphuric acid to sulphur dioxide. Fused potash decomposes it with evolution of phosphoretted hydrogen and formation of potassium borate. Sodium or potassium, in an atmosphere of hydrogen, react upon warming with great energy, the mass becoming white-hot. Magnesium, heated with the phosphide to 500°, also reacts with incandescence. Even silver and copper react violently upon heating with phosphide of boron. Vapour of water decomposes it at 400°, with production of boric acid and phosphoretted hydrogen. Heated to 300° in ammonia gas it takes fire, and burns with formation of nitride of boron and deposition of phosphorus.

THE second compound of boron and phosphorus, P_3B_5, was obtained by M. Moissan by heating the compound PB just described in a current of hydrogen to a temperature near 1000°. Under these circumstances a portion of the phosphorus is eliminated, and condenses in drops in the colder part of the tube, leaving the P_3B_5 in the form of a light brown powder, which is distinguished from the normal phosphide BP by its indifference to chlorine and nitric acid. It is much more stable than the normal phosphide, but is, like the latter compound, decomposed with incandescence by fused nitre.

THE additions to the Zoological Society's Gardens during the past week include a Formosan Fruit Bat (*Pteropus formosus*) from Formosa, presented by Mr. Thomas Perkins, F.Z.S.; a Patagonian Cavy (*Dolichotis patachonica*) from Patagonia, presented by Mr. H. H. Sharland, F.Z.S.; a Blotched Genet (*Genetta tigrina*) from South Africa, presented by Mr. Edmund R. Boyle; a Grey Ichneumon (*Herpestes griseus*) from India, presented by Mr. G. F. Hawker; a Little Grebe (*Tachybaptes fluviatilis*), British, presented by Mr. T. E. Gunn; a Tuatera Lizard (*Sphenodon punctatus*) from New Zealand, presented by Mr. W. King; a Brush-tailed Kangaroo (*Petrogale penicillata*) from New South Wales, purchased; three Carpet Snakes (*Morelia variegata*) from New South Wales, received in exchange.

OUR ASTRONOMICAL COLUMN.

THE SECULAR ACCELERATION OF THE MOON AND THE LENGTH OF THE SIDEREAL DAY.—Laplace showed that the secular diminution of the eccentricity of the earth's orbit ought to produce in the longitude of the moon a term proportional to the square of the time, and which he determined as $+ 10''t^2$, where t is expressed in centuries. Adams and Delaunay have reduced this term to $+ 6''{\cdot}11t^2$. From a discussion of eclipses Airy concluded that the coefficient of acceleration is as much as 12″ or 13″; and accepting this, the question arises as to the cause, other than that indicated by Laplace, which will account for the difference of $6''t^2$. This forms the subject of a paper by M. Tisserand in *Comptes rendus*, No. 20, 1891. Prof. Darwin found that the tidal action between the earth and the moon was sufficient to furnish an apparent acceleration equivalent to the required complement. The accompanying decrease in the earth's rotational velocity produces an apparent acceleration of $3''{\cdot}8t^2$ in the case of Mercury, an amount which may make the longitude of the planet vary by as much as 15″ in a couple of hundred years. Since the observed transits of Mercury extend over more than two centuries, M. Tisserand has discussed them with the idea of determining whether the term $3''{\cdot}8t^2$ is really indicated by them. He finds, however, that the extreme transits are not so well represented with the new term as without it, although the difference is not very great. This result, therefore, is unfavourable to the idea as to the variability of the sidereal day, or at least to a variation sufficient to reconcile the result of Airy's research with the calculations of Adams and Delaunay. This being so, it is concluded that the increase in the length of the day, produced by tidal action, has nearly the same value as the diminution which results from the contraction of the earth caused by secular cooling, and that, on account of the compensating action of the two effects, the length of the sidereal day remains very nearly invariable.

STATE OF SOLAR ACTIVITY.—Prof. Tacchini gives, in *Comptes rendus* for November 30, a *résumé* of solar observations made at the Royal Observatory of the Roman College during July, August, and September of this year. The number of days of observation were 31 in July, 31 in August, and 19 in September, and the results obtained are as follows:—

1891.	Relative frequency of spots.	Relative frequency of days without spots.	Relative magnitude of spots.	Relative magnitude of faculæ.
July	18·65	0·00	76·26	82·03
August	8·84	0·06	49·06	70·81
September ...	17·52	0·00	114·45	61·10

A comparison of these numbers with those determined in the preceding quarter shows that solar activity has sensibly increased, for the spotted surface has twice the area. It will be seen that the minimum magnitude of faculæ occurred at the time of a maximum of spots. The following are the results obtained for prominences:—

1891.	Number of days of observation.	Prominences. Mean number.	Mean height.	Mean extension.
			″	°
July	30	8·37	40·2	1·4
August	30	6·77	41·0	1·9
September... ...	23	9·26	41·4	2·2

The number of prominences recorded is greater than during the preceding three months. The highest prominence (142″) was observed in August.

OBSERVATIONS OF μ CEPHEI.—Mr. J. E. Gore made some observations of the variable star μ Cephei, the "garnet star" of Sir William Herschel, between January 1888 and December 1890, which show that the variation of light is very irregular, and that the star sometimes remains for several months with little or no perceptible change of magnitude (Proc. Royal Irish Acad., January 26, 1891).

Astronomische Nachrichten, No. 3067, contains an account of the investigation, carried out by Herr Dr. Walter Wislicenus on the "Influence of Ring and Disk Blinds in Micrometic Measurements," in order to account for the following phenomenon. If one lifts a transit off its pillars and places it so that it does not interfere with the line of sight of the collimators, and then brings the central wires of each collimator exactly in coincidence, it is found that, by putting the meridional circle back again, and placing it in its vertical position with the apertures in the central cube open, coincidence of the wires no longer exists, but a slight displacement is noticed. It may be remembered that this question was raised at Greenwich as early as the year 1868, while in the two following years, from observations made in that interval, a correction of 0″·48 and 0″·58 was found for the difference of reading. In 1874 this discrepancy was accepted as real, and corrections for it were made, but no real origin for it was assigned. Mr. Turner, in the year 1886, also investigated this difference of reading, employing the collimators of the transit circle at Greenwich, and the numerical results obtained were given in vol. xlvi. p. 329, of the *Monthly Notices*. By using a wooden model of the central cube of the transit, he got essentially the same results as those given by the cube in the ordinary manner, but both were in discordance with the readings taken when nothing was interposed. To account for the difference he says: "The discrepancy is due to a real difference between the lines of collimation of the central and eccentric portions of the object-glasses of the collimators."

In Herr Dr. Wislicenus's experiments, six blinds of varying diameters were employed, and were placed on the cube of the Strassburg meridional circle to represent different central-cone apertures. He measured the difference between the readings taken with and without these blinds on five separate days, in the two positions, horizontal and vertical, of the collimator threads. To still further vary the method, he removed the meridional circle, and placed the blinds on the collimators, making another series of observations, the collimator threads being again in these two positions. From the above measurements he concluded (to state it very briefly): (1) that the differences obtained with the Greenwich circle are of a purely optical nature, and can be easily removed by making the aperture of the central cube somewhat larger than the full aperture of the collimators; (2) and also if the objective of a telescope be screened quite symmetrically by concentric rings or disks, or by such an arrangement as that in the Greenwich instrument, there occurs not only a variation in the focal image as regards sharpness and brightness, but there can also be found the same displacement. In discussing the observations and conclusions arrived at, he mentions that in the best objectives the same colour rays do not combine in a point on the optical axis, but in such a way that one does not obtain a focus but a focal line of unequal brilliancy, from the brightest point of which one deduces the focal plane of the lens; he then goes on to say that since the optical axis of the lens forms therefore an angle with that of the objective, the displacement of the brightest point of the focal line would not fall perpendicular on the focal plane of the lens, but one would have to observe it with the lens somewhat on one side, by this means one would be able to see its projection on the focal plane of the lens. Therefore, "by the existence of a centering-error the displacement of the focal image by the insertion of blinds before the objective would be explained."

THE *Annales* of the University Observatory in Vienna, vol. vii., contains all the observations of planets and comets made in the years 1887–89, with the Fraunhofer's, Clark's, and Grubb's refractors of apertures 16·2 cm., 30·1 cm., and 68·0 cm. respectively, together with the reduced results of the above. In addition to the work mentioned, the Grubb refractor was extensively employed in the study of the nebula in the Pleiades, special attention being given to the Merope nebula, which forms the chief topic of discussion in the interesting report towards the end of the volume; an excellent illustration also of the nebula itself is added, in which are shown all the fundamental stars with many others of smaller magnitude.

Of the other illustrations given, there are three very good pictures of the moon, taken with the same instrument. Plate I. is the result of an exposure of 6 seconds taken on an orthochromatic plate, and for sharpness and clearness is excellent. Plate II., which is an enlargement of a part of Plate I. enlarged four times is also very fine. Plates IV., V., and VI., contain drawings of comets and nebulæ, and are accompanied with descriptions of their peculiarities.

Altogether this volume is of a most interesting nature, and shows the result of a great amount of painstaking and useful work, which will be welcomed by all astronomers.

THE EASTERN TAURUS AND ANTI-TAURUS.

AT the meeting of the Royal Geographical Society, on Monday evening, the paper read was on the Passes of the Eastern Taurus and Anti-Taurus, by Mr. D. G. Hogarth.

The paper described the general characteristics, geographical and ethnographical, of the eastern half of the mountain system of Southern Asia Minor, and is based on experience gained by the author in the course of journeys in 1887, 1890, and 1891, undertaken under the auspices of the Asia Minor Exploration Fund, to which the Royal Geographical Society has been a generous contributor. In 1890, Prof. W. M. Ramsay was the head of the Expedition, and though in the other years the author was not accompanied by him, he followed lines which that great authority on Asia Minor had laid down. Mr. H. A. Brown (author of "A Winter in Albania"), the Rev. A. C. Headlam, of All Souls' College, and Mr. J. A. R. Munro, of Lincoln College, Oxford, took part in the expeditions in different years. The first object of the journeys was archæological, to carry on the brilliant work of Prof. Ramsay commenced in 1881, but the members of the expeditions have always taken geographical notes and observations in traversing the interior of Asia Minor, about many parts of which less is known in modern than was known in ancient times. In following old trade-routes across the mountains, he explorers have traced the modern tracks, for the limits of ancient and modern geography are very often not to be distinguished in Asia Minor. Much of the peninsula is a land of the dead, but much also possesses great interest in the present, and, may be, will acquire an interest of a different kind for England in the near future. It has been explored by many travellers, from Pococke, Hamilton, Leake, and Ainsworth, to the archæologists who have penetrated it in different directions during the past twenty years, and the trained surveyors, led by Sir Charles Wilson, who did so much geographical work in it ten years ago. But Asia Minor is very large, often very difficult to traverse, and of very varied character, as is to be expected in the meeting-place of so many civilizations and faiths, ancient and modern. Much has yet to be done before western geographers can claim even a superficial knowledge of its whole area, and many parts have never been visited by any explorer at all.

The first district described is the wild mountainous region between the beautiful lakes of Egerdir and Beysheher, remarkable for the absence of passes, for the great gorge of Eurymedon, and for the primitive character of the indigenous population who live cut off from the world. Not less noteworthy are the extraordinary ruins of the Pisidian city of Adada, which exist high up among the hill-tops, and are now called *Kara-Bavlo*, a name which recalls that of St. Paul, and probably is derived from a great church dedicated to the Apostle in commemoration of a sojourn on his way from Perga to Antioch in 45 A.D. These ruins preserve the most perfect specimen of an Anatolian city of Roman days. Passing by the sites of Lystra and Derbe, the Low Taurus is reached, a marked depression between the high inter-lacustrine ranges and the Bulgar Dagh, which begins about 70 miles west of the Cilician Gates (Gulek Boghaz). The waterless, arid character of the northern, and beautiful scenery of the southern slopes, especially in the Calycadnus valley, are described in connection with the routes radiating from Karaman. The remarkable ruins of the monastery of Koja Kalessi, which contain a very perfect church of the early fifth century at the latest, and of the city of Coropissos, add archæological interest to this section of the Taurus. The eastern part of this region is a veritable Pompeii, where Roman cities, villages, and roads have been left to decay in a deserted country.

The high Taurus is reached near Eregli. The famous defile known as the "Cilician Gates" has been often described, but not so the important passes further east, from Sis to Hadjin and Gyuksun; from Marash to Gyuksun, Zeitun, and Albistan; and from Adiaman to Besni and Malatia. The Eastern Taurus is a region of great beauty, richly wooded, and traversed by the tremendous cañons of the Samanti, the Saros, and the Jihan, not passable even on foot. Whenever a railway is made from Asia Minor towards the Euphrates, it will take the gorge of the latter river, which in ancient times was rendered possible for a road. The ethnographical and historical interest of this region is very great, as it formed the refuge of the last independent Armenians of Cilicia, whose robber-towns, Hadjin and Zeitun, are described by the author. Of late their exclusive possession has been disputed by Circassians and Kurds, the latter retaining curious traces of their pre-Islamite rites and customs.

Lastly, the principal passes into the Anti-Taurus from the west, and out on the east in the direction of the Euphrates, are briefly noticed. The Anti-Taurus district is one of the most curious in Asia Minor; man deserted it almost entirely from the eleventh century until less than a century ago, when nomadic Avshar and Kurds penetrated to its remote and lofty valleys. Thus has been preserved so much of the great Roman military road to the Euphrates in the valleys of the Saros and Gyuk Su, with a series of milestones recording its many restorations; to the same cause we owe the interesting ruins of Comana, and "Hittite" monuments, recalling very early days, when a great trade-route, afterwards identical with the Royal Persian road, already took this line. Of different but equal interest are the modern inhabitants, nomadic Avshar, and half-troglodyte Kurds, nominally Musulmans, but really worshippers of other gods than that of Islam; and newly-imported Circassians, settled near troublesome Armenian strongholds as a menace and a check. The medley of races in this remote region, for whose control the Turks seem able to make no adequate provision, suggests speculations as to the possible future of race-supremacy in the Ottoman Empire.