

OUR ASTRONOMICAL COLUMN.

OTTO STRUVE'S DOUBLE-STAR MEASURES.—The most important addition to double-star astronomy during the last year is without doubt the work which we owe to Otto Struve, and which is entitled "Mesures Micrométriques des Étoiles Doubles" (Observations de Poulkova Tome IX. (avec un supplément) et Tome X.). The period which the observations cover is very large when one considers that it is for one observer, commencing as it does with the observations made in the year 1837, when Otto Struve was only seventeen years old. Readers who are unable to approach these volumes themselves will find that M. Bigourdan, in the October number of the *Bulletin Astronomique*, gives a general summary of the whole of the contents. As one would expect, the introductions to the volumes contain a mine of important information, both with regard to the measures and to the puzzling question of the "personal equation," a question on which even to-day astronomers hold different views. Otto Struve busied himself especially in this direction, making, in the years 1853-1876, a series of measures of artificial double stars. The expressions for the corrections which he obtained assumed considerable proportions, as will be seen below, the first being that for angles of position, and the second that for distance:—

Position angle

$$\text{Corr.} = + \frac{5''.2}{1 + 0.20g^2} + \frac{4''.4 \sin(2\phi - 27^\circ 13')}{1 + 0.14(3.3 - g)^2} + \frac{5''.6 \sin(4\phi - 25^\circ 0')}{1 + 0.20g^2}$$

Distance

$$\text{Corr.} = + \frac{0''.050(g - 2.0)}{1 + 0.09(4.2 - g)^2} + \frac{0''.15 \cos(2\phi - 28.4)}{1 + 0.06(5.2 - g)^2}$$

when g represents "l'angle visuel du couple considéré expérimenté en prenant pour unité celui qui correspond au grossissement de 708 fois," and ϕ is the angle of the line between the two stars and the vertical.

Whether such corrections as these, made under non-observational conditions, should be applied to measures actually made in the sky is still open to much doubt. Otto Struve discusses also the observations made at Pulkova with those made at the same epoch by different observers; the comparison, to take an example, shows that Dawes's position angles in his early measures appear free from systematic error, while those made later require a correction of + 1''.8; his distances up to 8" seemed all to be desired. Dembowski's measurements of angles also required no correction, but his distances, especially about 6", demand a small positive correction (0''.22). In the second volume one finds the measures of W. Herschel's classes V. and VI., couples with large proper motion, including measures for the determination of parallaxes, and for the determination of the relation of the number of optical to physical binary stars discovered by M. Burnham and other astronomers, and a continuation of W. Struve's and O. Struve's measures. Double-star astronomy is already possessed of two fine monuments in the works of W. Struve's "Mensuræ Micrometricæ" and of Baron Dembowski's "Misure Micrometriche," and to-day we may, as M. Bigourdan adds, name a third in the "Mesures Micrométriques des Étoiles Doubles" of M. Otto Struve.

METHOD OF PIVOT TESTING.—By means of interference fringes, employed by M. Fizeau in his researches on crystals, M. Maurice Hamy describes a method of studying the form of pivots of a meridian instrument (*Comptes Rendus*, No. 20, Nov. 13th), which indicates errors not discernible by the ordinary course adopted. The great advantage to be gained by it is that the state of the pivots can be very easily, and with the expenditure of a very little time, ascertained. The arrangement consists in placing a metallic block astride a pivot, the block being supported further by a pointer fixed to a part of the telescope. The extremity of this pointer fits into the bottom of a horizontal groove, parallel to the meridian, in the pier. Contacts between the pivot and the pointer is thus ensured by the pressure of several weights, while displacements of the whole arrangement against slipping are totally eliminated. On the block rests, at one of its extremities above the centre of the pivot, a lever which is movable about an axis on the pillar on a vertical plane; this carries a small horizontal piece of glass, fixed in a certain manner. Between this mirror and the front of the lens of a fixed collimator are produced the interference fringes, the source of light (monochromatic) being placed at the focus of the lens. Turning the telescope on its

axis, the block remains still, but movements of a small nature in the vertical direction were observed which were sufficient to indicate the imperfectness of the pivot. To obtain at a glance the order of the magnitude of such errors, a plane mirror was fixed at some distance from the axis of the lever, so determined that the fringes were displaced by a row when the inclination of the telescope experienced a perturbation of 0.015, by the action of one of the irregularities. The method of observation consists simply in counting the number of fringes which exceed a fixed limit when the telescope is turned, the number thus obtained expressing in hundredths of a second in time the order of the error. A trial of the above method shows that irregularities on the surface of pivots can be easily observed, and, moreover, the errors "ne sont pas complètement négligeable au point de vue des observations."

A BRIGHT METEOR.—The following are a few facts about a bright meteor which Prof. Schur, of Göttingen, has been good enough to send us:—The meteor was observed on Monday, November 27, at 5h. 54m. mean time, and the direction of its path lay between ζ Perseii and towards α Piscium. At first it appeared as bright as α Tauri, and then quickly excelled Jupiter in brilliancy, the light gradually fading away afterwards. The duration of the phenomenon was estimated at about ten seconds, and the trail was observed to be of a yellowish-red colour. Curiously enough, three minutes later a fainter meteor shot across the heavens from the zenith, its direction being nearly at right angles to that of the preceding one.

ASTRONOMICAL PHOTOGRAPHY.—Mr. H. C. Russell, F.R.S., President of the Astronomy, Mathematics, and Physics Section of the Australasian Association for the Advancement of Science, traced the history of astronomical photography in his presidential address at the recent Adelaide meeting. "In many departments of astronomy," he declared in the opening paragraph, "the observer must stand aside while photography takes his place and works with a power of which he is not capable, and I feel sure that in a very few years the observer will be displaced altogether, while his duty will be done by a new sensitive being—a being not subject to fatigue, to east winds, to temper, and to bias, but one above all these weaknesses, calm and unruffled; with all the world shut out, and living only to catch the fleeting rays of light, and tell their story."

"VIERTELJAHRSSCHRIFT DER ASTRONOMISCHEN GESELLSCHAFT."—The third part of this year's publication gives an account of the work done at the observatories usually included in this list, each director, as has been done in former numbers, summing up in a few words, and stating the work being, and about to be, accomplished. We must refer our readers to the publication itself for individual information.

GEOGRAPHICAL NOTES.

L'Afrique gives a brief account of the last exploring journey of the late M. Georges Muller in Madagascar. He had returned to Antananarivo from a successful visit to Antsirabe, where he went to collect bones of *epiornis*, and in June he set out for Lake Alaotra, which, in company with Father Roblet, he explored, adding a number of features to the maps of the district. Parting from his companion, Muller pushed on with the view of reaching Mojanga on the west coast, but near Mandritsara he was attacked and murdered by a party of Fahavalos, one of the independent tribes who still contend against the Hova supremacy of the island.

The *Madras Mail* says that the Indian Marine Survey vessel *Investigator* has proceeded to the Laccadives to continue the survey of those islands, which has been in course of preparation during the last two years. From the Laccadives the *Investigator* will go to Madras, and will be engaged for a few weeks in completing the East Coast Marine Survey from Pulicat Lake, where work was left off last year, to Madras Harbour. Finally in February the *Investigator* will proceed to Palk Straits, and a thorough survey of the dividing sea between India and Ceylon will be made, ostensibly with the object of testing the practicability of constructing a canal and a railway. The distance from the Indian mainland to Ceylon is sixty miles, of which twenty constitute Adam's Bridge proper. The bridge is said to consist of an irregular ridge formed of rock and sand partly dry at low water, but intersected by small intricate channels navigable only for native boats of very light draught. Average