

added, the increase being necessitated by the rapid growth of experimental or physiological psychology during the past few years. The character of the work remains the same, and has been sufficiently described in reviews of earlier editions. The price of the present volume is thirteen marks.

OUR ASTRONOMICAL COLUMN.

DANIEL'S COMET, 1907d.—A continuation of Herr H. H. Kritzing's ephemeris for Daniel's comet appears in No. 4245 of the *Astronomische Nachrichten* (p. 345, April 29). From this ephemeris we see that the comet is now apparently travelling very slowly through the constellation Virgo, nearly parallel to, and some 15' south of, the equator. Its positions on June 1 and 13 will be $\alpha=13^{\text{h}}.52^{\text{m}}$, $\delta=-0^{\circ}14'.3$, and $\alpha=13^{\text{h}}.48^{\text{m}}$, $\delta=-0^{\circ}20'.2$, respectively. The comet is now a little brighter than the twelfth magnitude, and crosses the meridian about 9.30 p.m.

SPECTROSCOPIC BINARIES.—For some time past the observers at the Dominion Observatory, Ottawa, have been endeavouring to complete their set of observations of the spectroscopic binary ι Orionis by obtaining spectrograms at a critical part of the velocity curve where it changes its form rapidly. According to a note in No. 2, vol. ii., of the Journal of the Royal Astronomical Society of Canada (p. 106, March-April), the necessary spectrograms were secured at the end of January. The following principal elements have been calculated from measurements of 107 plates:—period=29.136 days, eccentricity=0.75, longitude of the apse 110° , projected length of semi-major axis=29,680,000 km., and velocity of the system=+20.7 km.

Elements for ψ Orionis, of which the radial velocity has a remarkably short period, have also been obtained; they are:—period=2.5259 days, $e=0.063$, $\omega=186^{\circ}$, and $a \sin i=5,103,000$ km.

Mr. Harper has recently discovered that the star δ Herculis has a variable radial velocity with a fairly wide range; this star has therefore been added to the observing list at Ottawa.

RECENT OBSERVATIONS OF JUPITER.—Some interesting observations of Jupiter were reported to the March meeting of the British Astronomical Association by the Rev. T. E. R. Phillips, who directed attention to the fact that the great south tropical disturbance was once more passing the great Red Spot. The dark material of the disturbance was observed to be passing round the south side of the Red Spot by the south temperate belt, leaving a sharply defined oval in which the Red Spot lay; the latter feature was very difficult to see, and appeared at times to be distorted and irregular in form, as though clouds were passing over it. Since the beginning of the apparition the disturbance has increased considerably in length, from about 60° in September to 115° at the end of January. The rotation period of the Red Spot was less during the earlier part of the apparition, but the diminution was not so marked as it was during the conjunction of 1906, when it amounted to 14° between April and August. At each conjunction of these two features, since the first appearance of the south tropical disturbance in 1901, the Red Spot has, for the time being, appeared to be pushed forward (the *Observatory*, May, No. 396, p. 196).

DOUBLE-STAR OBSERVERS.—In continuing his series of articles on double-star observers in the *May Observatory* (No. 396, p. 205), Mr. Lewis gives a very interesting account of the work performed by Baron Dembowski between 1852 and 1878. With a telescope of 5 inches aperture, and fitted with neither position circle nor driving clock, Dembowski commenced a revision of the brighter pairs given in the "Mensuræ Micrometricæ," and did most excellent work. After mentioning the double-star work of Schiaparelli and other observers, Mr. Lewis proceeds to the consideration of what he calls the third period of double-star astronomy, which began when Burnham submitted a catalogue of eighty-one new double stars to the Royal Astronomical Society in 1873; all these doubles had been observed with a 6-inch refractor mounted in

Burnham's back yard. In 1900 this same observer published a catalogue of 1290 doubles discovered by himself between 1871 and 1899. Mr. Lewis also gives a long list of observers of this third period, and the sizes of the instruments with which they worked.

In the note on the relative accuracy of various double-star workers, which appeared in these columns last week, the mean value given in the last line should, obviously, be $0''.0698$, and not $0''.698$ as printed.

THE COLOUR FILTER AND ISOCHROMATIC PLATE IN ASTRONOMICAL PHOTOGRAPHY.—An important paper by Mr. R. J. Wallace, on the function of a colour filter and "isochromatic" plate in astronomical photography, appears as a reprint from the *Astrophysical Journal* for March. Mr. Wallace discusses at length the use of various filters and stained plates, and shows, by reproductions of some of his photographs taken at the Yerkes Observatory, the immense gain in definition resulting from such use.

In the course of his discussion Mr. Wallace also refers to the results recently published by Prof. Lowell in his paper on the sharpening of celestial photographic images, and states a number of points whereon he disagrees with the conclusions arrived at by Prof. Lowell.

A NEW ASTRONOMICAL JOURNAL.—The first number of a new journal, printed in Japanese characters, has just appeared under the title of the *Astronomical Herald*, and is published by the Astronomical Society of Japan. This first number is dated April, and contains, among other articles, a note on sun-spots by Mr. S. Hirayama, and one on ancient astronomy.

ALTERNATE CURRENT MEASUREMENT.

THE ordinary dynamometer is as well adapted for direct as for alternate current measurements; but while it is generally regarded as the best available instrument for alternate currents, its use with direct currents is almost restricted to standard instruments of the ampere balance type. This is due to the immensely greater sensitiveness obtainable with direct current instruments constructed on the heterostatic principle, as exemplified in galvanometers with permanently magnetised needles or magnets. The latter instruments, due originally to Kelvin and Maxwell, and first developed commercially by Ayrton and Perry, have been brought to a high state of perfection in recent years, with the result that ordinary measurements on direct current circuits are much more precise and satisfactory than those on alternate current circuits.

The only likely way at present of improving alternate current instruments is to use iron-cored electromagnets to increase the strength of the field acting on the moving system. The well-known difficulties due to the varying permeability, hysteresis, &c., of the iron cannot be overcome, but may be entirely avoided by exciting the electromagnet in shunt.

The excitation of an electromagnet can be governed either by controlling the current through the exciting coil or by controlling the voltage applied to the winding. On direct current circuits the two methods are identical owing to the operation of Ohm's law, but with alternate currents the two modes of control lead to widely different results if the resistance of the winding is made small compared with the impedance. With current control, the magnetism produced depends on the properties of the core, but is independent of the resistance of the winding. The reverse is true of the voltage controlled magnet, for, if this is suitably designed, the magnetic flux is connected with the applied voltage by a strict mathematical law not dependent on the physical properties of the core, except for a small correction term due to the resistance of the winding. The shunt magnet in another way contrasts sharply with the series magnet. In each case the strength of the magnet is increased by diminishing the air gap, but the smaller this is made the more accurate the shunt magnet becomes and the less accurate the series magnet. The field due to the shunt magnet is not in phase with the applied voltage, so that special means must be used to supply the moving coil of the instrument with a suitable current if the deflection is to indicate truly the quantity to be tested. But