

silver bromide, he can produce an emulsion in gelatin of this unique substance, which shall have a pre-determined size of grain, of contrast-giving power and rapidity. He can make it sensitive to all the colours of the spectrum, to the invisible infra-red and ultra-violet rays, to the X-rays and shortest wave motions produced by radium." Mr. Thorne Baker explains that the sudden disappearance of pictures transmitted by telegraph was because the cost of transmission proved to be "altogether prohibitive." He hopes that before long a new system will be available on a really commercial scale—the time of transmission being reduced to $2\frac{1}{2}$ minutes.

WE have received No. 118 of Abderhalden's "Handbuch der biologischen Arbeitsmethoden" (Lieferung 118, Abt. 2, Physikalische Methoden, Heft 4. Die meteorologischen Messmethoden, von Walter Georgii; Die Makrophotographie, von Marie Kundt; Farbenphotographie, von Walter Thiem. Pp. 483-618. Berlin und Wien: Urban und Schwar-

zenberg, 1924. 6.40 Schw. frs.). It deals with meteorological measurements, such as temperature, pressure, moisture, wind-strength, etc.; macro-photography and colour photography. The matter is strictly practical, and not overburdened with a variety of methods or formulae. In the photographic section, the support and manipulation of the camera and the support of subjects of various kinds are dealt with at length, as well as the numbering of series, as for indexing purposes, the copying of diagrams, engravings, and so on. The few pages on colour photography give just the extra assistance needed for the use of autochrome and "Agfa" colour plates by daylight and artificial light.

MR. F. S. SPIERS, secretary and editor to the Faraday Society and secretary to the Institute of Physics, has moved his office to 90 Great Russell Street, W.C.1 (Telephone, Museum 5718). The publishing office of the *Journal of Scientific Instruments* is now also at this address.

Our Astronomical Column.

THE LESSER MAGELLANIC CLOUD.—There have already been several estimates published of the distance of this object. Prof. Harlow Shapley (Harv. Coll. Obs., Circ. No. 255) revises these in the light of new photographic determinations of the magnitudes and periods of the numerous Cepheid variables in the Cloud. The results point very consistently to a distance of 31 kiloparsecs or 100,000 light-years. He notes that Dr. R. E. Wilson's researches on the proper motions of galactic Cepheids tend to make the estimated distances of clusters and the Magellanic Clouds smaller by 20 or 30 per cent.; but that this reduction may be cancelled if Kapteyn's suggestion of systematic errors in the accepted proper motions in declination should be correct. He proposes, therefore, to postpone any correction till the question is settled.

The diameter of the Cloud is 6500 light-years, and its depth in the line of sight is presumably of the same order, so that it is no inconsiderable universe in itself. Its brightest stars are estimated to be of absolute magnitude -7.0 , and diameter 1000 million kilometres, thus exceeding Betelgeux and Antares in size. It has been found possible to ascertain the general spectral types of some of them: types K5 and M occur among these, and the largest diameters are to be expected in these types.

The Cloud is receding with a speed of 170 km./sec., equivalent to a kiloparsec in 6 million years; Prof. Shapley suggests that it may have been a galactic star cloud 200 million years ago.

DISTRIBUTION OF ENERGY IN STELLAR SPECTRA.—The spectral energy curves of stars of types F5, A, and B have been measured by M. J. Baillaud, *Comptes rendus* of the Paris Academy of Sciences, May 12, and are found to be distributed into three groups, one for each type. The curve of Procyon (F5, dwarf) is the only one of those measured which approximates throughout the "black body" form; those for types B and A have no relation to a black body curve, whatever temperature is assumed, at any rate for wave-lengths shorter than $500\text{ m}\mu$; it is thus impossible to use the curves for the determination of temperature. The author concludes that the origin of the observed continuous spectrum is not the same for the white stars as for the yellow; for the sun

and dwarf stars like Procyon, the continuous spectrum apparently comes from a photosphere consisting of incandescent solid particles; for A and B stars the radiation seems to come from masses of gas at high temperatures; hydrogen and certain metallic vapours have been observed to emit continuous spectra, of a similar nature to those of these stars, in the laboratory. In certain cases, there appears to be a combination of the above sources of radiation; this may be due to the emission of black body radiation by a central nucleus, and of a high peaked continuous spectrum by surrounding gases.

SPIRAL STRUCTURE IN STAR CLUSTERS.—Attention is directed by Dr. P. ten Bruggencate, in the *Zeitschrift für Physik* for June, to the discovery of remains of spiral structure in the B stars of the star cluster Messier 13, by Freundlich and Heiskannen. Dr. Bruggencate has plotted the bright and the fainter stars separately, on millimeter paper, for Messier 3 and Messier 15; and finds that the 150 bright stars of the former cluster show distinct signs of a spiral structure, while 270 fainter stars indicate an elliptical arrangement, the direction of the major axis of the ellipse being estimated with considerable certainty. Apparently the line joining the two points on either side of the cluster from which the arms of the spiral proceed, coincides in direction with the major axis of the cluster, as is required by the theory of Jeans. For Messier 15 there is not much evidence of spiral structure; but the Bonn catalogue is not sufficiently complete for accurate investigation of this cluster. Messier 37, which is an open cluster, shows Shapley's phenomenon, *i.e.* the giant stars are brighter the redder their colour, which indicates that they have a common origin; the complete catalogue of this cluster by v. Zeipel and Lindgren was employed, and it was divided into four concentric rings, the principal axis of inertia for the B and A stars of each ring being determined by counting. The direction of this axis was found to be constantly twisted in the counter-clockwise direction in proceeding outwards, the total observed twist being a little more than 45° . Thus even in an open cluster remains of a spiral structure may be found when the larger stars belonging to it are examined, the smaller stars which originally had a similar structure having become irregularly scattered.