intensity of light. It was not until 1893, after the subject had been considered for twenty-two years, that he gave details of his investigation of it. He made many successful experiments on photography in natural colours, but his greatest self-contained achievement was his photography of the infra-red. The normal spectrum as photographed on his plates was more than five times the length of the visible spectrum, for they were sensitive to the ultra-violet right away through the visible spectrum to a wave-length of 2200$\mu\mu$. Abney was accustomed to quantitative work from the first, and perhaps the most important service he rendered was the introduction of methods of measurement into scientific photography.

THE *Comptes rendus* of the Paris Academy of Sciences for June 20 contains a note by M. Baille-Barrelle on the production of coke from Sarre coal. By the usual method of coking, this coal is well known to give a poor coke, but M. Baille-Barrelle shows that, by a special mode of heating, Sarre coal can be made to yield a coke comparable with the finest cokes from Ruhr coal. The experiments were made on a semi-industrial scale (charge of 500 kg.), and preliminary work on the extension to a full commercial scale has been commenced. The coal is first maintained at a temperature of 320° C. for some time; then the temperature is slowly raised uniformly to a final temperature of 750° C., or about 200° C. below the usual coking temperature. Figures for the resistance to crushing and shaking are given. It is also claimed that the by-products obtained are superior to those given by the ordinary coke oven, and an investigation into their nature is in progress. The yield of ammonia was unexpectedly high, about double that obtained when the coal is coked in the ordinary way; owing to the lower temperature a reduced quantity of ammonia was anticipated. It is probable that the actual quantity of ammonia produced was less, and that the increased yield was due to the lessened amount decomposed into nitrogen and hydrogen. If the process is successful on the large scale, the Lorraine iron industry will be freed from the necessity of using Ruhr coke.

THE National Physical Laboratory has issued a pamphlet dealing with "Tests on Volumetric Glassware Used in Dairy Chemistry," single copies of which may be obtained free of charge on application to the Director, Metrology (Glass Testing) Department, National Physical Laboratory, Teddington. The pamphlet contains specifications as to size and construction of butyrometers, test-bottles, and pipettes which can be accepted for test by the Laboratory.

Our Astronomical Column.

AURORÆ AT A HEIGHT OF 500 KM.—The careful auroral observations made in Norway and Sweden have established the remarkable fact that some of the streamers extend to the height of 500 km. above the earth's surface. This presumably implies that there is a certain amount of atmosphere at that height, which is a conclusion of cosmical importance.

Geofysiske Publikationer, vol. ii., No. 2, contains an investigation by Dr. Carl Størmer of the height of streamers during the brilliant aurora of March 22–23, 1920. There were seven photographic stations at work in Norway on this occasion, and telephonic communication enabled simultaneous exposures to be made, the cameras being directed to the same stars. The investigation is based on simultaneous photographs taken at Christiania and Kongsberg, which are 65·7 km. apart. The streamers photographed had well-defined edges, and crossed the constellation Cassiopeia, the brighter stars being visible on the plates. The heights of seven points in the streamers are determined as 597, 550, 607, 562, 528, 485, and 519 km. respectively. Two pairs of plates are reproduced, on which the streamers and the stars are clearly visible. The author notes that it is only the extremities of the long rays that attain these great heights. The bases may be as low as 85 to 90 km.

THE MINOR PLANET EROS.—This planet will make one of its near approaches to the earth early in 1931, when there will doubtless be another solar parallax campaign. A parallax still more accurate, however, than that obtained by direct measures will probably be determined by the very large perturbations produced by the earth on the planet's motion. For this purpose it is desirable to obtain accurate observations at every opposition. The planet will next be in opposition in mid-September in N. decl. 14°, magnitude about 10½. Mr. F. E. Seagrave has computed an ephemeris for Greenwich midnight, a portion of which is given below. Corrections, due to G. Stracke, of −22s. and −2′ 7″ have been applied to the right ascension and declination :—

		R.A. h. m. s.	N. Decl. ° ′	Log r	Log Δ
July	23	23 41 24	6 58·1	0·23754	9·98409
	27	23 41 23	7 50·6	0·23600	9·96672
	31	23 40 42	8 41·8	0·23438	9·94938
Aug.	4	23 39 17	9 31·1	0·23266	9·93211
	8	23 37 6	10 18·1	0·23088	9·91512
	12	23 34 8	11 2·1	0·22900	9·89861
	16	23 30 22	11 43·0	0·22700	9·88265
	20	23 25 49	12 19·8	0·22494	9·86759

JUPITER'S FOUR GREAT SATELLITES.—The Annals of Leyden Observatory (vol. xii., parts 1 and 2) consist of researches on these satellites by Prof. W. de Sitter and Dr. A. J. Leckie respectively. These parts were published in 1918 and 1919; they are therefore quite independent of Prof. Sampson's theory, which only appeared in print in 1921. One point of Prof. de Sitter's method is the use of a new intermediary orbit; instead of using the Keplerian ellipse, he substitutes for the eccentricity the great periodic inequalities. This is analogous to the use by Drs. Hill and Brown of the variation oval as intermediary orbit in the lunar theory instead of the Keplerian ellipse.

Prof. de Sitter finds for the masses of the satellites in terms of that of Jupiter 3796, 2541, 8201, and 4523 (units of the 8th decimal). In terms of the moon's mass these are 0·985, 0·659, 2·128, and 1·173. Using the diameters of the satellites found by the interferometer (mean of Hamy's and Michelson's results), viz. 1·00″, 0·905″, 1·325″, and 1·31″ at distance 5 units, the densities become 0·853, 0·788, 0·811, and 0·462 in terms of that of the moon.

Prof. de Sitter's final values of the mean daily motions of I., II., and III. referred to First Point of Aries are 203·48899280°, 101·37476180°, and 50·31764630°. These have been adjusted to fit the relation $n_1 - 3n_2 + 2n_3 = 0$.