

of the effects observed in the ternary system is impossible. It follows, therefore, that many of the data obtained are as yet purely empirical.

WE learn from the *Times* of December 27 that Major Klein is at work on a three-colour printing process in which the chief innovation is in the taking of the colour records. Instead of the usual light-filters attached to the camera he illuminates the object with light of the desired colour obtained by the well-known method of cutting off with opaque screens the light not wanted in a spectrum produced by suitable spectroscopic apparatus. It seems that he proposes to try the effect of reducing the width of the utilised portions of the spectrum so as to get a nearer approach to monochromatic light, and also the division of the spectrum into more than three parts for four or five, etc., colour processes.

IN the December issue of the *Journal of the Society of Chemical Industry* Dr. G. C. Clayton contributes an interesting summary of the effect of the war on the heavy chemical industry. The Leblanc soda in-

dustry is stated to be obsolete, and many of the by-products formerly obtained by it have now to be prepared by other methods. One of the main products, caustic soda, is now made either from ammonia-soda carbonate or by electrolysis. The two chief electrolytic processes operated in this country are the mercury process, by the Castner-Kellner Co., and the Gibbs diaphragm process, by the United Alkali Co. In the manufacture of chlorine the Weldon and Deacon processes have been displaced by the electrolytic methods. Electrolytic chlorine is produced by the Castner-Kellner, Gibbs, and Hargreaves cells, and is often liquefied. Chlorates are now made only by electrolysis of chlorides.

M. GOMBERG and C. C. Buchler describe in the August number of the *Journal of the American Chemical Society* the preparation of benzyl ethers of carbohydrates. Glucose, sucrose, dextrin, starch, and cellulose are readily benzylated, and some of the products may be of technical importance from their colloidal and plastic characters.

Our Astronomical Column.

THE EINSTEIN TOWER.—The *Observatory* for December contains an illustrated article on this tower, which has just been erected in the grounds of the Potsdam Astrophysical Observatory. It contains a vertical telescope of 50 cm. aperture and $14\frac{1}{2}$ metres aperture, fed by a cœlostat. There are two spectrographs, one with a plane-grating of $12\frac{1}{2}$ cm. aperture, the other with two large prisms giving a dispersion of two angstroms to 1 mm. The instrument will be chiefly employed to investigate the presence or absence of the Einstein shift, but it is available for general astrophysical work. It is in charge of Dr. E. Freundlich, under the general control of Prof. Einstein, who has now an appointment at Potsdam. Dr. Freundlich hopes to observe next year's eclipse from Christmas Island, with A. Kohlschütter and Dr. Voûte.

CHANGES IN THE CRAB NEBULA.—One of the very useful researches to which the great American telescopes have been applied is the study of changes in the nebulae, by comparison of photographs taken at intervals of a few years. The changes have been in many cases unexpectedly large, and imply either relative nearness to the solar system or very high internal velocities.

Mr. Lampland had already reported some changes in the Crab Nebula deduced from seventeen photographs taken with the Lowell 40-inch reflector during a period of eight years. Mr. John C. Duncan gives in *Proc. Nat. Acad. Sci.*, June, 1921, the results of a comparison of two photographs taken with the 60-inch reflector at Mount Wilson at an interval of eleven and a half years (1909 and 1921).

Twelve condensations were selected near the outer contour of the nebula, at tolerably equal intervals. Thirteen comparison stars were chosen, one near the centre of the nebula, the others fairly near the selected condensations. The results may be summed up thus: (1) the motions of the condensations are on the average quite three times as great as those of the stars; (2) while the star-motions are at random as

regards direction, those of the condensations are systematically outward from the centre, being greatest at the ends of the long axis of the nebula, where they amount to $2''$ in eleven and a half years, implying a linear speed of 25 km./sec. at an assumed distance of one hundred light-years. There is some (not very certain) evidence of a counter-clockwise rotation of the nebula. The mean motion of all the nebular condensations in eleven and a half years is $+0.10''$ in R.A., $+0.435''$ in Decl., referred to the mean of the stars.

THE ASTROGRAPHIC CATALOGUE.—The publication of this great work was considerably in arrear even before the war, which, naturally, did not tend to improve the situation. It is satisfactory to note that volumes are now appearing in rapid succession.

Mr. H. B. Curlew, director of Perth Observatory, West Australia, has catalogued the whole of zone -35° , the numbers of stars in each quadrant being 6879, 24,753, 22,139, 19,277. The paucity in the first quadrant is explained by its proximity to the South Galactic Pole. The magnitudes are given by letters, A denoting 8.5, B 9.0, and so on; the scale used is that of Chapman and Melotte, and differs from that used in earlier Perth volumes.

Mr. T. P. Bhaskaran has produced vol. 4 of the Hyderabad section, which catalogues the whole of zone -20° , the number of stars being 79,590. This volume completes the zone originally allotted to Hyderabad, about half the plates of which had been taken and measured before the death of Mr. Poock in 1918. The work has been completed on the lines laid down by him. Standard co-ordinates of all stars contained in the *Algiers Astr. Gesells. Catalogue* are given at the end of the volume.

Señor Leon Herrero, director of San Fernando Observatory, has produced the first half of the catalogue for zone -3° (R.A. 0h. to 12h.). It contains 58,387 stars, and differs from most of the catalogues in containing X_0 , Y_0 co-ordinates for all stars, in addition to the measured x "