

OUR ASTRONOMICAL COLUMN.

FURTHER OBSERVATIONS OF HALLEY'S COMET.—In Bulletin No. 20 of the Kadaikánal Observatory Messrs. Michie Smith and John Evershed give an account of the observations of Halley's comet made with various instruments during April and May. A number of photographs, which may fill in the blanks between those taken in America and in Europe, were secured with a 5-inch Grubb portrait lens of 33.8 inches focal length. On certain of these there are many distinct tails and a number of fine details; other plates were exposed in a half-plate Ross camera giving a scale of 1 mm.=17.5'. Mr. Evershed used a 9½-inch reflector, of 74 inches focal length, fed by a 16-inch cœlostast, and secured a number of photographs showing the intricacies of the structure in the head, the scale being 1 mm.=110'.

Spectrograms were also secured, and show the differences between the radiations from the head and those from the tail observed in Daniel's comet 1907*d*; the continuous spectrum of the nucleus shows, faintly, a considerable number of Fraunhoferic lines attributable to reflected sunlight. In the head, the pair of "cyanogen" radiations at λ 3871 and λ 3883 appear to account for at least two-thirds of the total emission, and the preliminary examination shows no essential variation in the spectrum between April 19 and May 15. In the very strong band at λ 4645-4744, five or six separate lines can be distinguished on some of the spectrograms. Visual observations showed that the very bright comet lines in the green and blue could be traced a long distance into the tail and to some considerable distance on the other side of the nucleus.

Notwithstanding the small dispersion (1 mm.=73 A. at 4227), measurable displacements of the cometary lines, as compared with lines in the spectrum of Venus, were found, and on May 2 gave a relative approach of 77 km. per sec., the ephemeris value being 68 km. per sec.; but to this must be added the recessional velocity of Venus.

The programme for the detection of the comet during transit was very complete, and is described in detail, but, as has been stated before, no trace was found.

Observations of the tail were made by Mr. Evershed, who describes its appearance during May 18-21. He suggests that the persistence of the phenomenon in the east may be explained by supposing the tail to have been very broad in the direction of its motion, although relatively narrow in the direction at right angles to this; with a strong curvature, this would account for the apparent length of time for the earth to make the complete passage.

In the September number of the *Bulletin de la Société astronomique de France* there are reproduced some excellent photographs taken by M. Mascart at Teneriffe, as well as a number of drawings and accounts by various other observers.

Dr. C. D. Perrine, director of the Observatorio Astronómico of the Argentine Republic, writing from Córdoba on August 18, says:—"It will be of interest to your readers to know that we are still observing Halley's comet. It is some 2' or 3' in diameter, of about the ninth magnitude, with a nucleus of eleventh magnitude. It is getting so low in the west, however, that we will not be able to follow it much longer."

THE DISTANCES OF RED STARS.—Another contribution to the question of the correlation between spectral type and parallax, in the form of an abstract of a paper read by Dr. H. Norris Russell, appears in No. 195 (vol. xlix.) of the Proceedings of the American Philosophical Society. Dr. Russell compared the parallaxes of stars measured by Mr. Hinks and himself at Cambridge with the spectral types determined at Harvard, and found that the percentage of orange and red stars increases steadily as the distance from our system decreases. Further, a comparison of the observed parallaxes of stars having large proper motions with the parallaxes computed from Kapteyn's formula shows that while the formula stands for the stars of all classes taken together, there are marked deviations when spectra types are considered separately; the observed parallax of the red stars is nearly twice the computed value. As all the stars considered are similar in apparent brightness, it follows that redness is attended by intrinsic

faintness, the reddest stars averaging one-fiftieth the brightness of the sun. On the other hand, some bright-red stars, such as Arcturus and Antares, are known to be at great distances, and are probably at least one hundred times as bright as the sun.

This conclusion confirms the important hypothesis (now well established on other grounds) that there are two classes of red stars, one class getting hotter, the other cooling. In the intermediate stages the stars would be hotter, passing through orange and yellow to white, and back to red as it approached extinction.

"MOCK SUNS" AT EASTBOURNE.—From Mrs. A. M. Butler, of Reigate, we have received further particulars of the "mock suns" phenomena referred to in these columns last week as having been seen at Eastbourne on September 10. Mrs. Butler and her daughters watched the phenomena from 12.45 p.m., and saw everything described by Mr. Ronca except the fainter small circle to which the brilliant chromatic curve was tangential. In addition they saw, to the S.E. of the sun, part of another coloured curve, having its convex side turned towards the actual sun. From an effective coloured sketch of the phenomena, drawn by Mrs. Butler, it would appear that this second curve, which was seen at 1.20 p.m., was of about the same radius as the former, and would have barely intersected it had both been continued.

ASTRONOMY IN INDIA.—From the *Pioneer Mail* of August 26 we are pleased to learn that an association for the promotion of astronomy has been formed in India. It is to be known as the Astronomical Society of India, and has its headquarters at Calcutta.

The special objects of the society will be to assist observers by holding meetings, whereat papers will be read and discussed, and by disseminating astronomical news. It is proposed also to found a library of astronomical literature and to publish a journal for each month of the session. The president is Mr. H. G. Tompkins, Treasury Buildings, Calcutta, to whom all communications should be addressed.

THE CRUSADE AGAINST CONSUMPTION.

FOR many years the National Association for the Prevention of Consumption worked away unostentatiously but pertinaciously. The experience gained during these years must now be to them of great value in the educational crusade they have undertaken. During the past year an educational exhibition has been going the round of London, into the provinces, east and west and north, to Oxford, Cambridge, Liverpool, Edinburgh, &c. Nothing has been more gratifying or more promising for the ultimate success of this crusade than the keen interest that has been taken in this exhibition, and in the lectures and conferences by all sorts and conditions of men—and women, too, for that matter. We should, naturally, expect public health authorities to be interested, but all who have seen the audiences gathered together at these lectures and conferences cannot but have been impressed by the intelligent interest taken, even by the very poor, in the question of the prevention of the spread of tuberculosis. Some of the work undertaken by the association at one time appeared to come dangerously near interfering with or overlapping the work of the local medical authorities, and with hospitals and associations already in existence; but through the good sense of those who, though working in different directions, are mutually interested in putting a check on the spread of consumption, the danger of such overlapping is gradually being minimised.

The class amongst which tuberculosis is most prevalent, the badly housed and badly fed, has, up to the present, and very naturally, entertained a suspicion that those who looked upon tuberculosis as an infective disease might interfere too much with the liberty of the tuberculous worker, and by isolating him deprive him of his means of subsistence. Nowhere has the educational campaign done better work than in bringing home to these people the immense importance of observing certain fundamental principles of hygiene, not only in their own immediate interest, but in the interests of those with whom they are most closely associated. It is now well known what pre-

cautions tuberculous patients should take, and as soon as this knowledge can be brought to the patient and his friends there will be some chance of getting these precautions adopted. There seems to be little doubt that the National Association for the Prevention of Consumption has the power to help and cooperate with similar organisations already in existence, and that it may even be of assistance to the authorities working with and under the Local Government Board, but what they are best qualified to undertake is, undoubtedly, that national educational movement to which Mr. John Burns has given his official approval.

The carrying on of this movement requires funds, large funds, and a special appeal committee has been formed, which, acting under the presidency of the Earl of Derby, is setting about to collect, in the first instance, a sum of 5000*l.* annually to be devoted to this work. That the necessary fund will be obtained can scarcely be doubted, especially as a most elaborate system of collecting small sums has been organised; moreover, those who will be most immediately benefited are already taking a very keen interest in making this scheme a success, and the committee have announced that they have already received offers of assistance from working-men's clubs and institutes affiliated to the Institute Union, and the Billposters' Association of Great Britain; whilst the post-office authorities have promised assistance, or have granted facilities which will help to form the nucleus of a fund such as could be obtained in no other way. Further, those endowed with a larger share of this world's goods have manifested an equal willingness to help, but the object is such a good one, the outlet for expenditure is so wide, and the promise of such an enormous return is so great, that if five times the sum asked for be subscribed it may be advantageously spent. The time has come when the annual loss of 50,000 or 60,000 lives from consumption—a preventable disease—is a blot on our civilisation. When we *knew not* we could not be blamed for our want of initiative and lack of energy, but now that we *know*, inaction is criminal.

RECENT PAPERS ON PETROLOGY.

UNDER this head may be included work on the minerals that build up rocks, since modern petrology depends on the understanding of the causes that have brought certain mineral constituents into association. This is true even of the fragmental rocks, where the correct appreciation of a detrital mineral may lead up to the source and the relative age of the deposit. Experimental work on minerals has, moreover, almost always a geological aim, though compounds have a way of arising artificially under conditions that seem improbable in nature.

Improvements in methods of research will be found in Mr. F. E. Wright's paper on the "Measurement of Extinction Angles in Thin Section" (*Amer. Journ. Sci.*, vol. xxvi., p. 349), where the intensity of light for different positions of a crystal-plate between crossed nicols is dealt with mathematically. The methods of observation in general use are critically discussed, and the principle of the twinned selenite plate, introduced by Sommerfeldt in 1907, is further developed by the author in his artificial quartz twin plate (p. 374). Since the eyes of observers differ in regard to their sensitiveness to certain tints, this plate may be made wedge-shaped, so that the most serviceable tint may be selected. Mr. Wright also introduces (p. 377) a bi-quartz wedge-plate. A plate of right-handed quartz, cut normal to the optic axis, is fixed side by side with a left-handed one of the same thickness. Above each is set a wedge of quartz of the opposite sign of rotary polarisation, the two wedges tapering in the same direction. Except where the wedge and the plate below it are of the same thickness, the two similar wedges will show colours of similar intensity. If a crystal-plate lies beneath the wedge-plate, and is not in a position of extinction, a difference of intensity appears in the two wedges, and a thickness can be selected that gives, by the rotation produced, the most sensitive effect to meet the case of each experiment.

Dr. J. W. Evans (*Proc. Geol. Assoc.*, vol. xxi., p. 79) gives a useful paper for students on the systematic examina-

tion of a thin section of a crystal with an ordinary petrological microscope, in which his double quartz-wedge, described in 1905, is effectively introduced for determining the relative retardation of the rays in a section of a doubly refracting crystal.

Messrs. Allen, White, Wright, and Larsen (*Amer. Journ. Sci.*, vol. xxvii., p. 1) provide a characteristic synthetic study of diopside and its relations to calcium and magnesium metasilicates, in which the minerals produced at various temperatures are subjected to a thorough optical examination. Etch-figures are used to show minute crystallographic changes that result from dissolving one member of the metasilicate series in another, the resulting minerals being shown to be actual solid solutions (p. 39). Some of the substances produced are as yet unknown in nature, and a rhombic $MgSiO_3$ mineral arises at about 1365° , which resembles olivine in form, and which is quite distinct from enstatite (p. 30). The stable form of $MgSiO_3$ is, curiously enough, that known from meteorites only, and is styled clinoenstatite.

Messrs. Wright and Larsen also introduce us to new views on quartz (*ibid.*, p. 421). In treating of quartz as a geologic thermometer, they make use of Le Chatelier's observation in 1890 that quartz undergoes a reversible change at about 575° , as indicated by a sudden change in its expansion-coefficients, birefringence, and circular polarisation. Mügge regards the low temperature α -quartz as trapezohedral-tetartohedral, and the high temperature β -form as probably trapezohedral-hemihedral. "At ordinary temperatures all quartz is α -quartz, but if at any time in its history a particular piece of quartz has passed the inversion point and been heated above 575° , it bears ever afterward marks potentially present which on proper treatment can be made to appear" (p. 425). Quartz formed on the low temperature side, such as that of veins and geodes, shows trigonal trapezohedra, more regular twinning than the β -form (as discovered on etching), more frequent intergrowths of right- and left-handed forms, and an absence of the effects of shattering that appear in quartz cooled down from the high-temperature form. The authors verify these points by an examination of quartz from ordinary veins and from pegmatites.

M. Borisov (*Trav. Soc. imp. des. Nat. de St.-Petersbourg*, vol. xl., p. 46) describes quartz in druses from the Government of Olonetz; the form is the rhombohedron, with a polar angle reading $85^\circ 47'$, so that we have a rare type resembling cubes. Mr. R. S. Bassler (*Proc. U.S. Nat. Mus.*, vol. xxxv., p. 133) traces the remarkable changes by which fossils in the carboniferous limestone of Kentucky have been converted into geodes of chalcedony and quartz, and his photographs alone would claim the attention of petrologists and palæontologists alike.

Students of silicates will note the paper by Messrs. Shepherd, Rankin, and Wright (*Amer. Journ. Sci.*, vol. xxviii., p. 293), on the binary systems of alumina with silica, lime, and magnesia, in which andalusite and sillimantite receive experimental treatment. A very useful statement is included (p. 322) as to the six phases of crystallised silica now known, the α and β forms, respectively, of quartz, tridymite, and cristobalite. Mr. Larsen (*ibid.*, p. 263) examines the refractive indices and densities of some of his artificially prepared silicates and their glasses. Incidentally, he finds that glasses rich in lime and magnesia cannot be prepared, owing to their strong tendency to produce crystals—a tendency well recognised among basic igneous rocks. Messrs. Washington and Wright (*ibid.*, vol. xxix., p. 52) discover, in a feldspar from the Mediterranean islet of Linosa, a molecule corresponding to soda-anorthite, and look forward (p. 70) to naming the actual $Na_2Al_2Si_2O_8$ feldspar, when forthcoming, Carnegieite. Since the feldspar that they really possess is a new species, and receives the name of Anemousite, it seems quite grasping to look so far ahead, even from the very open windows of the Carnegie Institution.

Mr. F. Cornu (*Verhandl. k. k. Reichsanstalt*, 1909, p. 41), in a preliminary and slightly polemical demonstration, promises an important work on the importance of "Hydrogelen im Mineralreiche" which will need to be considered by all who deal with soils and products of decay. The author claims that our method of heating thin slices in Canada balsam removes the water from essential