

to 1450° C. (within the δ range) and similarly cooled. On examination, a striking difference in structure between the two was found, constituting evidence that there is a distinct change in crystal structure at the δ to γ transformation. This may be regarded as a confirmation of Westgren's conclu-

sion,¹ based on X-ray analysis, that δ and γ iron are constitutionally different. He found that the former has a body-centred and the latter a face-centred cubic lattice. H. C. H. C.

¹ Journal of the Iron and Steel Institute, 1922, No. 1, p. 247, and NATURE, June 24, 1922, p. 817.

The Indian Eclipse Expedition, 1922.¹

THE story of an expedition to observe the total eclipse of the sun, seen under the most perfect atmospheric conditions, but which failed to achieve any results, is described by Mr. Evershed in the report before us. Mr. Evershed's programme was of a high-class order, and those who know him and his great ingenuity in the construction and manipulation of astronomical apparatus will share his regret at his extreme misfortune on this occasion.

Originally Mr. Evershed proposed to occupy the Maldive Islands as his observing station, but, owing to difficulties of transportation, he and his party went to Wallal, near Broome, situated on the north-west coast of Australia, and joined Dr. Campbell's expedition. For the Einstein effect he took out with him a 12-inch photo-visual lens particularly well adapted for this problem, giving, as he states, "a large field of good definition and a larger scale than the lenses used previously, or that would be likely to be used by other expeditions." It was worked in conjunction with a 16-inch cœlostast, and it was the erratic behaviour of this instrument that spoilt the results. In spite of constructing a new tangent screw and refiguring the teeth of the driving sector to secure better driving qualities, the fifteen seconds exposure plates showed movement of the star images and poor definition of the corona due to the bad driving of the cœlostast. Two short exposure plates were badly fogged "in some unexplained way" over two-thirds of the surface, but otherwise the remaining portion showed the ends of the coronal streamers beautifully defined.

The second main effort of the expedition was to photograph with large dispersion the spectrum of the corona on the east and west limbs simultaneously, in order to determine the displacement of the green corona line due to the solar rotation, and to secure a more accurate wave-length of this line. Here again disappointment was experienced, for the corona line did not appear at all on any of the plates owing, probably, to the unusual faintness of this radiation at this eclipse. Perhaps Mr. Evershed rather courted disaster on this occasion, as it is generally conceded that during the time at and near a minimum of solar activity this radiation is also near a minimum of brightness.

¹ Report of the Indian Eclipse Expedition to Wallal, Western Australia, by J. Evershed, F.R.S. (Kodaikanal Observatory, Bulletin No. 72.)

It will be remembered that the Greenwich expedition to Christmas Island purposely eliminated the use of a cœlostast in its work by taking out a complete equatorial photographic telescope. This was done because experience at the eclipse of May 29, 1919, seemed to suggest that the definition of the star images on the astrographic plates was poor, owing probably to the distortion of the cœlostast mirror by the heat of the sun. Mr. Evershed's view regarding the employment of a cœlostast is that it is "good for the Einstein effect. For only with a cœlostast is it practically possible to get an adequate scale." That he is emphatic on the point is shown by his statement that "the question of the cœlostast mirror introducing complications is, I think, a bogey. Plane mirrors can now be constructed of large size and perfect figure, and experience with mirrors, good and bad, has shown that little is to be feared from distortion of the surface when the silvering is fresh and good, and simple precautions are taken."

In the opinion of the present writer, the great drawback to the use of a mirror during eclipses, whether mounted as a cœlostast or siderostat, is due to the change of figure of the plane surface of the mirror, which causes an alteration in the position of the focus of the object glass. On many occasions during eclipse expeditions, although extreme care had been taken to secure a "perfect" focus on star spectra at night (the mirror then being comparatively cool), the focus was quite different for the solar spectrum during the daytime. Thus during eclipse work it was always found most necessary to watch very carefully the disappearing crescent of the sun on the ground glass almost right up to the time of totality, and if necessary alter the position of focus accordingly.²

It is satisfactory to note that Mr. Evershed did not return to India with an empty bag. During a short stay at Broome on the return journey he set up the 16-inch siderostat and 12-inch lens and succeeded in obtaining a good high dispersion spectrum of Canopus and Achernar to use in connexion with his work on the spectrum of Sirius.

During this expedition Mr. Evershed was ably assisted by Mrs. Evershed and by Mr. Everson of the physics department of the University of Western Australia. WILLIAM J. S. LOCKYER.

² See Phil. Trans. Roy. Soc. A, vol. 198, p. 406.

Liberal Education in Secondary Schools.

ON Saturday, June 9, a conference of educationists in Yorkshire was held in the University of Leeds under the presidency of the vice-chancellor, Sir Michael Sadler, in response to a widespread desire to discuss certain questions affecting the supply of full-time education for boys and girls beyond the age of eleven years, and the choice of subjects in the School Examinations. In order to make the conference widely representative of educational opinion in Yorkshire, invitations were issued to the local education authorities, the universities,

the training colleges, secondary schools, associations of secondary and elementary teachers, and other persons of educational experience. Upwards of 270 representatives attended the conference and were welcomed by the pro-chancellor, Mr. E. G. Arnold.

In an introductory speech, the chairman referred to the growing desire for wider opportunities of a liberal education in various parts of the world. This desire cannot be wholly explained as due to self-regarding motives. Ambition for advancement is no doubt a strong motive, but is not in itself