that rainfall production is usually a complicated process.

The writer has not had enough high flying to be able to make many observations of the upper clouds, but they certainly present an interesting field of investigation well within the possibilities of aeroplanes. C. K. M. DOUGLAS.

PHOTOGRAPHIC DETERMINATIONS OF STELLAR PARALLAX.[1]

THE determination of stellar parallaxes by photography has shown a striking improvement in recent years, and the results obtained with the Yerkes refractor are of the highest order of excellence. Two of the precautions observed in this and similar series of measures are the taking of all the plates at small hour-angles, so as to minimise the effect of unequal atmospheric dispersion in the stars, and the reduction of the magnitude of the parallax star to equality with the comparison stars. This latter precaution is necessary, since any inequality in the driving will have a different effect on the images of objects that differ much in brightness. The usual way of effecting this is by rotating a screen in the form of a sector of a circle in front of the brighter image. By altering the angle of the sector, any desired diminution of light may be obtained.

This method was used for most of the parallaxes in the volume under notice, which, however, mentions an alternative plan, due to Prof. Kapteyn, that has been successfully tried at Yerkes. It consists in taking an out-of-focus photograph of the required region, which on development exhibits the stars as discs of equal size but unequal density. This negative is then used as a screen for the parallax plate. Since the density of each disc is proportional to the photographic brightness of the star that formed it, it is clear that the use of the screen will give nearly equal magnitudes for the stars on the parallax plate.

The parallax work at Yerkes Observatory was begun in 1903 by Dr. Schlesinger, who was appointed director of Allegheny Observatory in 1905; it was continued by Messrs. Slocum, Mitchell, Lee, Joy, and van Biesbroeck (of the Uccle Observatory, Belgium). Up to the end of 1915 131 parallaxes had been determined. The present volume contains the details of the last eighty-five, and a summary of the earlier results, which have already been published. The parallax stars are mainly bright ones, but nearly one-third of them are faint stars with large proper motions.

The parallax of Algol is given as 0·02″; that of 61 Cygni, 0·27″; of 70 Ophiuchi, 0·21″; of ε Lyræ (the double-double), 0·00″ (all four components being measured); O.A. (N.) 17,415–6, 0·22″. There are six of the eighty-five parallaxes between 0·1″ and 0·2″, three above 0·2″, and seventy-six less than 0·1″. Four of the stars in the trapezium of the Orion nebula were measured, as there is little doubt that they are actually involved in the nebula. The results are negative for all four (−0·014″, −0·026″, −0·021″, −0·023″), presumably indicating that the trapezium and nebula are more remote than the comparison stars. The possibility is recognised that the latter may themselves be involved in the nebulosity, and a further investigation is suggested, using larger plates that would include stars more distant from the trapezium.

The probable errors of these parallaxes are all in the neighbourhood of 0·01″. The error that is reasonably possible is, of course, two or three times as great. A good illustration of this fact is afforded by the parallaxes found for the pair of stars O.A. (S.) 14,318–20, R.A. 15h. 5m., S. decl. 16°. They are 5′ apart, magnitudes 9·6 and 9·2, spectral types G_5 and G_4, P.M.s 3·693″ in 195·7° and 3·675″ in 195·6°, radial velocities +307 km. and +295 km. These striking facts leave no reasonable doubt that the two stars are physically connected, and have sensibly equal parallaxes. The present volume gives for the parallaxes +0·025″ ± 0·008″ and +0·061″ ± 0·012″ respectively. As Prof. H. N. Russell had previously obtained the values +0·014″ ± 0·023″, +0·045″ ± 0·022″, some astronomers have adopted the view that one star is really some three times as distant as the other. But the close agreement of their abnormally large proper motions renders such a conclusion wildly improbable. In fact, the weighted mean parallax is 0·040″ from the Yerkes plates, and 0·030″ from those of Prof. Russell, a quite satisfactory accordance.

An appendix to the volume gives a detailed description of the measuring machine in use for these photographs. It was made by William Gaertner and Co., Chicago. The screw is 18 mm. in diameter, with 249 threads 1 mm. apart. The nut is 50 mm. long, and the graduated head 18 cm. in diameter, having 1000 graduations. The errors of the screw are extremely small.

A. C. D. CROMMELIN.

[1] "Stellar Parallaxes derived from Photographs made with the 40-in. Refractor." Publications of the Yerkes Observatory, vol. iv., part i.

THE SIKKIM HIMALAYA.

NO section of the Himalaya is more fully known than Sikkim; Kashmir even has not been more assiduously investigated. The information regarding Sikkim is important for two reasons. This country, which extends, between long. 88° and 89° E., from the Bengal plain to the tableland of Tibet, is the only fully explored portion of the eastern Himalaya. Our knowledge of the more extensive territories of Nepal to the west, and of Bhutan to the east, is relatively scanty.

The pioneer explorer of this interesting land was Sir Joseph Hooker seventy years ago. Since 1848–49 many others have studied its fauna and flora, its geology and topography, its scenery and people. Explorers, surveyors, collectors, members of political missions, and expert mountaineers have found in Hooker's "Himalayan Journals," published in 1852, a pleasant companion and a

trustworthy guide. Hooker's maps have helped in settling boundary disputes and in conducting military operations.

Artists or climbers who have followed Hooker's path have rarely described their tours; there was little to tell that Hooker had not already told. Scientific travellers have deviated as much as possible from Hooker's track; their writings record facts already noted by Hooker; they less often allude to places he visited.

Among wanderers in Sikkim who have felt the spell of the region and the charm of Hooker's style is Lt.-Col. W. J. Buchanan, C.I.E., who has, in "Bengal Past and Present" (Calcutta Historical Society, vol. xiv.), taken us "In the Footsteps of Hooker through Sikkim and Nepal." The intrinsic value of this interesting article is enhanced by the testimony it bears to the accuracy of Hooker's observations and the soundness of Hooker's conclusions. It forms a fitting and graceful centenary memorial of the great traveller and naturalist.

Besides minor excursions, Hooker made two great Sikkim journeys. During the first—October, 1848, to January, 1849—he explored the upper catchment area of the Rangiet, in western Sikkim, and penetrated some way into eastern Nepal. The second journey—May to December, 1849—took him to the valleys of north-eastern Sikkim, drained by the Lachen and the Lachung, which unite to form the Tista. Wide as Hooker's interests were, he was primarily a botanist, and singularly few of the floral features of the land escaped his eye, especially during the second journey, one episode of which was his capture and imprisonment, along with the Political Officer, Dr. Campbell, by the Rajah of Sikkim.

Much, however, was still left to do. Hooker's friend and fellow-student, T. Thomson, who joined him at Darjeeling, and explored the Khasia Hills along with him in 1850, ultimately succeeded H. Falconer as superintendent of the Royal Botanic Garden, Calcutta, and continued the botanical investigation of Sikkim. T. Anderson, superintendent from 1858 to 1870, did the same.

Hooker, in his "Journals," describes the efforts made to prevent his reaching the Tibetan border. To the energy and tact of Sir G. King, superintendent of the Calcutta Garden from 1871 to 1898, we owe more than the systematic investigation of valleys and passes not visited by Hooker. Though political difficulties prevented King from supplementing Hooker's Nepalese results, he was able to explore the district of Chumbi, which, though politically Tibetan, is geographically Himalayan, as thoroughly as he did Sikkim. Among those whose share in the botanical survey of Sikkim during this period deserves especial mention were W. T. Blanford, C. B. Clarke, H. A. Cummins, D. D. Cunningham, Sir J. Ware Edgar, J. S. Gamble, G. A. Gammie, H. C. Levinge, J. L. Lister, R. Pantling, and Sir G. Watt.

One district, Lonakh, in northern Sikkim, behind the Kinchinjanga *massif*, still remained unexplored. Objection was not taken in 1849 to Hooker's attempt to enter this district, but his party was unable to cut a path through the dense rhododendron forest of the upper Zemu, which blocked the way. Political difficulties frustrated King's wish to explore Lonakh, the "great black south" of the Tibetan graziers, who drive their yaks to its poor alpine summer pastures. An expedition organised by him for the purpose in 1892, under Mr. G. A. Gammie, had at the last moment to be diverted to another district.

This region, difficult of access from the south, was at last traversed by Mr. Freshfield, whose account of his journey, "Around Kanchenjunga," published in 1903, now almost takes the place of Hooker's "Journals." The first Lonakh plants to reach the Calcutta herbarium were sent from the Naku-la by Sir F. Younghusband in 1903. It has been the good fortune of the present superintendent of the Calcutta Garden, Lt.-Col. A. T. Gage, to organise an expedition, led by Messrs. W. W. Smith and G. H. Cave, which in 1909, by investigating this district, has done much towards completing the botanical survey of Sikkim begun by Hooker.

NOTES.

THAT "prevention is better than cure" needs no argument, and yet it may be observed from time to time in the daily papers that the general idea of a Ministry of Public Health seems to be that the various organisations for *treatment* of disease are very specifically involved, and that, provided the interests of these organisations are secured, all might go well. It is only Lord Rhondda who appears to place *prevention* well to the front. Insurance against sickness is necessary where prevention fails, but surely every bed occupied by a sick man or woman is a possible censure upon the prevention side. There are, therefore, two distinct branches of work. Prevention involves the organisation of science, not merely laboratory science, but also the practical applications of the lessons learned in the laboratory, these applications being carried out by scientifically trained men. Treatment involves the reconstruction of our hospital system. If we are to have a Health Ministry and a really national Health Service it is the prevention side that demands, and must receive, the chief attention of our statesmen. For the cure of disease we may justly be proud of our doctors of all ranks. But what is their work? Nine-tenths of it is trying to remedy and cure easily preventable disease. King Edward asked: "If preventable, why not prevented?" and his question has not yet been answered. If the Health Ministry is to be a success its chief aim must be prevention. We who believe in the urgent necessity for a Ministry of Health want to answer King Edward's question, and so to deal with the health of the nation that the next generation will know nothing of preventable disease, or, if it occurs, will regard it as a disgrace, and that the sufferer from any disease the cause of which is known and preventable will be as ashamed to admit it as is now the case with those affections which are known to be the result of excesses and loose living.

FOR several years before the war various branches of science had gradually been acquiring the elements of an international organisation, and in several instances Germany had secured that the central bureaux should be associated with her own national institutions