

Major E. E. Austen objected to Prof. Yorke's unqualified statement that game is the reservoir of sleeping sickness. He supported the idea of an International Commission, for, in the special problems to be dealt with, political boundaries are often not natural ones. He emphasised the multiplicity of the problems presented by the various species of tsetse-fly and the consequent need for attacking them by every feasible method. Dr. A. G. Bagshawe pointed out that it is only within the last two years that we have been shown by Mr. Swynnerton that valuable land can actually be recovered from the fly. All efforts should be concentrated on making this work a success on a larger scale. Dr. G. A. K. Marshall observed that trypanosomiasis has to be dealt with on two main lines: the attack upon the disease, and the attack on the flies. A single comprehensive investigation in one place may be excellent on the medical side, but on the entomological side there are numerous problems that can only be solved by investigations in many different localities. While on the medical side further extensive research is the primary need, this is not the case on the entomological side, at least in those countries where the advance of the flies constitutes a dangerous menace. Here the primary need is for an immediate direct attack upon the flies by methods similar to those so successfully employed by Mr. Swynnerton, accompanied by appropriate research. One great difficulty in the past has been procuring the necessary funds; and the

reclamation of valuable land by a direct attack on the fly is more likely to appeal to the governments and commercial interests concerned than any programme of purely scientific research.

The chairman supported the idea of an International Commission as proposed by the League of Nations Conference, not only from the scientific point of view, but also from that of educating the general public and the administrators. Money is essential, and public interest must be directed to the economics of the problem. From this point of view the veterinary side is of enormous importance. A scheme that suggests the killing of big game when the smaller animals would remain is contrary to common sense, but a practical policy, such as that of Mr. Swynnerton, should obtain public support.

Before the Conference ended resolutions were passed recommending, among other things, that a similar conference should be held in London every five years; that meetings of entomologists and other scientific officers should be held in the Dominions and Colonies for the discussion of mutual problems; and that the work of the Imperial Bureau of Entomology should continue on the present lines and be somewhat extended in connexion with the export to Oversea Governments of beneficial parasites.

The Conference concluded with a dinner given by the Government in honour of the delegates, at which Mr. L. C. M. S. Amery, Secretary of State for the Colonies, presided.

Photographic Studies of Solar Prominences.¹

THE invention of the spectroheliograph, more than thirty years ago, made it possible to study in detail photographs of the prominences, those strange and beautiful forms rising from the chromosphere which were first made familiar to readers of NATURE by the drawings of Lockyer in the 'seventies. Systematic photographic work does not appear to have been initiated until it was taken up at Kodaikanal in 1905, and the Rumford spectroheliograph appears also to have begun recording prominences at about this period; but until recent years very little has been published regarding their movements. This is no doubt largely due to difficulties imposed by atmospheric conditions, for it is very rarely possible to secure a series of photographs of the same prominence at short intervals of time and with equally good definition in all the images. In the memoir under notice this is apparent in the statement that in about 4000 plates examined "very little material suitable for the study of the motions of prominences was found." We must congratulate Mr. Pettit on the very interesting results he has nevertheless extracted.

The work relates very largely to the eruptive prominences, which are defined as "those which rise from the chromosphere in a more or less vertical direction, and are dissipated in space at enormous altitudes." It had already been shown by observers of eruptions that the velocity of ascent increases with the height, and photographs of prominences of this class obtained at Kodaikanal and in Kashmir appeared to show a continuously accelerating velocity, indicating a force of repulsion from the sun, analogous to that which gives an accelerating velocity to the gases in comets' tails. The author, however, from a careful study of the great prominence of May 29, 1919, considers that the force in this case was discontinuous, the outward velocity increasing by a series of sudden

impulses, between which the motion was uniform. Other prominences observed later also displayed this very remarkable characteristic, and Mr. Pettit was led to examine all recorded observations of eruptive prominences, visual and photographic. The results are set out in 24 diagrams, giving the heights as ordinates and times as abscissæ. The evidence as thus presented appears strongly favourable to the principle of uniform motion and sudden impulses; for many of the diagrams indicate this very clearly, although others, e.g. No. 22, would seem to indicate a continuous acceleration. Of three cases which come within the knowledge of the writer of this notice, two decidedly favour continuous acceleration. These are numbered 8 and 9 in Fig. 3. In No. 8 there is an error in the height given at 9h., which should be 110,000 instead of 130,000 km. By substituting this height in the diagram, it appears that a continuous curve would better fit the observations than that shown. In the case of the prominence of May 26, 1916 (Fig. 3, No. 9), measures of the negatives published in Kodaikanal Observatory Bulletins III., 215, are not used in the plot, but instead a set of measures from half-tone prints. Had the original measures been used, a continuous curve would have resulted. Evidence in favour of uniform motion is admitted in the case of No. 24, which was photographed at Kodaikanal, but here the time interval is short, and no change of velocity is indicated from three observations of the height.

Obviously this question of the character of the motion is of the greatest interest and significance, and it will no doubt be exhaustively studied in future eruptions.

The material supplied by the Rumford spectroheliograph has enabled Mr. Pettit to study successfully both lateral and internal motions of prominences. Lateral motions are defined as "the motions of prominences which rise from the sun's surface, and, passing over a trajectory, generally re-enter the chromosphere." A very curious example is recorded

¹ "The Forms and Motions of the Solar Prominences." By Edison Pettit. Publications of the Yerkes Observatory, vol. 3, part 4, University of Chicago Press.

in which this trajectory appears as a circle of radius 73,500 km., and the motion along the circumference increases from 5 to 95 km./sec.

The tendency of prominences to form long horizontal streamers connecting one with another, or curving down towards the chromosphere, is familiar to all who have observed these objects. Mr. Pettit has found that motion takes place along these narrow filaments, which represent, therefore, stream-lines of luminous gas, and these lines often appear to converge towards "centres of attraction" in the chromosphere. The large prominence of May 29, 1919, afforded rich

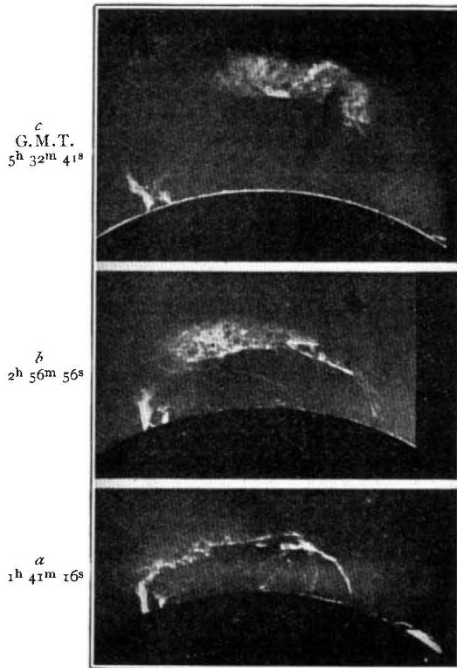


FIG. 1.—The great prominence of May 29, 1919. Scale: *a*, 1 mm. = 18,652 km.; *b* and *c*, 1 mm. = 16,832 km. From "The Forms and Motions of the Solar Prominences."

up. The streamers of the great prominence of May 1919, although they converge towards a sunspot, would appear to fall short of it by about 4° of latitude (Fig. 7), and at a later stage (Fig. 8) they seem to be repelled from the spot. Other "centres of attraction" for prominence streamers are shown to exist in regions remote from spots, and there is evidence that this attraction is felt far out into the coronal region.

The question whether gravity plays a part in the descent of matter in the streamers is investigated,

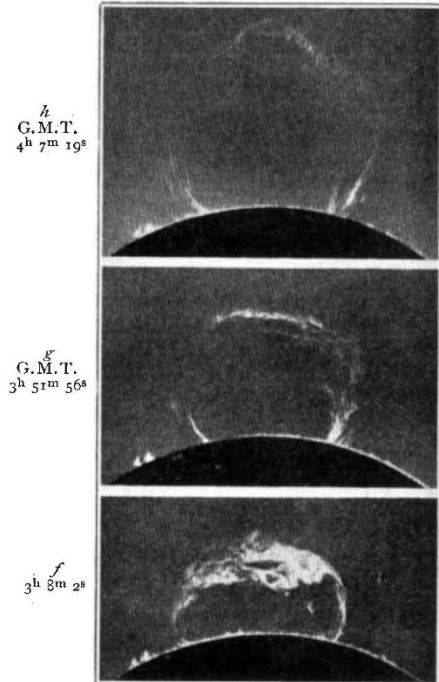


FIG. 2.—The prominence of July 15, 1919. Scale: 1 mm. = 19,144 km. From "The Forms and Motions of the Solar Prominences."

materials for a detailed study of these movements. One of the illustrations is here reproduced (Fig. 1).

As regards the supposed attraction of sunspots for prominences, Mr. Pettit finds many examples of knots in streamers, or the streamers themselves, moving inwards towards a spot-region, and a few in the reverse direction. Previous observations at Kodaikanal showed a predominance of outward movements.² That these filaments or knots actually enter the umbra of spots remains uncertain, and no case is recorded of an entire prominence being thus swallowed

² Monthly Notices of the Royal Astronomical Society, 73, 422.

and it is found that, in general, velocities are in the neighbourhood of one-third to one-fourth of that which gravity ought to give them. The velocity of ascent in the eruptive prominences seldom exceeds 400 km./sec., although line-displacements have been recorded which indicate much higher speeds.

The memoir concludes with a theoretical discussion of the nature of the repulsive force acting on prominences. Radiation pressure is rejected as inadequate, and the periodic ejection of showers of electrons from a disturbed area in the photosphere is suggested tentatively.

J. EVERSHERD.

Industrial Fatigue.

THE fifth annual Report of the Industrial Fatigue Research Board (H.M. Stationery Office, Price 1s. 9d.) has recently been issued. Its contents are nearly equally divided between six articles contributed by the Board's principal investigators and the report proper describing the Board's activities during 1924. Perhaps the most striking development in that period has been in the direction of the increasing laboratory research work, now conducted for the Board in the Universities of Oxford, Cambridge, London, Glasgow, and Manchester, and concerned

with accuracy of movement, muscular skill, repetitive work, weight-carrying, dynamic and static muscular effort, rest pauses, etc. The human factors relevant to accident causation, ventilation, illumination, and the like are also being studied. Research into vocational guidance has been undertaken in collaboration with the National Institute of Industrial Psychology, and into the design of machinery in conjunction with the Department of Scientific and Industrial Research. Three reports of specific investigations were published by the Board during 1924,