

he looks at the matter entirely from the enthusiastic botanist's point of view.

The Government of India does not wish every Indian forest officer to be a botanist. It is desirable that every now and then one of them should take up the subject as a speciality, but it would be disastrous if all took that line. I have no hesitation in saying that as soon as a forest officer takes up botany as a speciality he is, rare cases excepted, likely to become an indifferent forest officer. The ordinary officer of that class has no time for special botanical study.

Forestry is perhaps not a science in itself, but an industry based upon various branches of science, amongst which botany, geology and entomology are the most important. The forest officer cannot be an expert in each of these. To demand such a thing would be just as unreasonable as to demand that a medical man should be an expert in chemistry. The one is as impossible as the other; to become either takes practically a life-time. With the enormous growth of the several branches of science a very minute specialisation has become an absolute necessity, since only a very small fraction of men can be classed as geniuses, while the rest must be rated at the average capacity of the human race. The student of one branch must depend on the work of students in other branches. Thus the forester, instead of being the assistant of the botanist (as Sir G. King seems inclined to demand), must rely on the professional botanist for all the finer and more intricate problems of botany. All he requires is to acquire a sufficient knowledge of botany, so that he may utilise what the professional botanist tells him. For more he has no time, because he has to attend to quite another class of business. The Indian forest officer is an estate manager on a large scale; he must manage his estates in such a manner that they yield the largest possible amount of useful produce with the least possible outlay. For that end his time is taken up by sylvicultural and administrative duties, leaving but little of it for the special study of any of the branches of science upon which systematic forest management is based.

No doubt many of the pioneers of Indian forestry were botanists, but by no means all. Take, for instance, the protection of the forests against fire, a matter to which Sir G. King gives prominence. He himself states that Lieutenant (now General) Michael was the first who was successful in this direction in Madras. I may add that, as far as Central and Northern India are concerned, Colonel Pearson was the first to introduce successful fire conservancy. And yet neither of these two gentlemen will, I feel sure, claim to be a great botanist.

Sir D. Brandis, to whom, as Sir G. King points out, we owe, for the most part, the organisation of the Indian Forest Department, no doubt was a botanist; but he brought about that organisation, not as a botanist, but as an able forester and administrator of extraordinary energy.

Botany is a branch of science the study of which is most fascinating; but the faculties which produce a great botanist do not necessarily include those which are required to produce a great administrator; and herein lies the difficulty, in so far as the Indian Forest Department is concerned. I could point out more than one botanist who occupied the post of the head of the Forest Department in a province, and who could not possibly be counted amongst the successful forest administrators of India. In nearly all these cases so much time was given to botany that little—or, at any rate, not enough—time remained for the proper administration of the extensive Government forest estates which supply the people of the country with the necessary forest produce, and over and above yield now an annual net revenue of a million pounds. These results would be most seriously imperilled if our Indian forest officers were to take the line which Sir G. King recommends to them.

W. SCHLICH.

Coopers Hill, October 19.

Dark Lightning Flashes.

As an amateur photographer of cloud-scenes, I have taken the image of the setting sun surrounded by clouds on many occasions. I never remember developing a plate in which the image was reversed after an ordinary rapid exposure. Lightning flashes, one would think, ought to be still more rarely reversed, if the chemical reactions of the salts in the gelatine film are solely responsible for the phenomenon; yet dark lightning flashes are not infrequently visible in the developed plates of a thunderstorm.

Dr. Lockyer's interesting photographs (vol. ix., p. 570) of dark

flashes with bright cores suggest to my mind another interpretation. A lightning flash (and, for the matter of that, an electric spark) is doubtless a complex phenomenon. A disruptive discharge of high tensional electricity through the atmosphere represents, I take it, a core of rarefied (because incandescent) gases surrounded by an envelope of compressed air. Mr. C. V. Boys has shown (NATURE, vol. xlvii. p. 420) that "a wave or shell of compressed air gives rise to an image on the plate in which there is a dark line and a light line within it. Similarly, a wave of rarefaction must produce a light line with a dark line within it." Surely we have then in the lightning flash itself, when rightly illumined, the necessary data for the production of an image—a bright line edged with two dark lines, as represented in Dr. Lockyer's photographs. In such cases the advantages of a diffused illumination of the background of the scape are obvious. Possibly Mr. S. Bidwell's interpretation of the double flash is the correct one.

Hove, October 21.

W. AINSLIE HOLLIS.

It seems to me difficult to compare the photographic brightness of the disc of the setting sun with a brilliant flash of lightning. For my part I consider that lightning flashes give us every chance of obtaining photographic reversals, for they can be photographed at very close distances, amounting to a few hundred yards, while the rays from the sun's disc when near the horizon must pass through a long range of dense atmosphere which cuts off the most actinic and therefore photographic rays.

With regard to the second portion of Mr. Hollis' letter, the illustration in my article (NATURE, vol. ix. p. 573, Fig. 6) disproves rather than proves his suggestion in my estimation. If, as he assumes, the core may be considered the actual spark, and the outer portion the image of the wave or shell of compressed air, then, as the latter is not so luminous as the core, it ought to be best visible by reason of contrast against a bright background. A glance at Fig. 6 shows that this is not the case, for at c the core exists practically alone with an illuminated background, while without the background at A and B it is most developed.

I cannot convince myself that the large dark flash is a double one. A close examination of the negative strengthens the view that it is single, and the general appearance of the ramifications endorses it.

WILLIAM J. S. LOCKYER.

Solar Physics Observatory, South Kensington, October 24.

A Gutta-percha Plant.

IN your issue of October 19 you report a communication made to the French Academy of Sciences by Messrs. Dybowski and C. Fron regarding the cultivation of *Eucommia ulmoides*, a plant said by them to contain gutta-percha. I am naturally much interested in the possibility of this interesting tree, the "Tu chung" of the Chinese, becoming of economic importance, as some years ago I investigated the bark and leaves of this plant with regard to the peculiar cells containing a rubber-like substance (*Trans. Linnean Society*, 1892, vol. iii., part 7).

Gutta-percha and caoutchouc behave very similarly towards many solvents; but the fact that the contents of these cells were dissolved or partially dissolved by turpentine at ordinary temperatures, whereas gutta-percha is only soluble in hot turpentine, led me to the conclusion that the contents of these cells were caoutchouc. This substance is much more frequently met with in the laticiferous cells than gutta-percha, which is almost restricted to the natural order Sapotacæ. *Eucommia* will therefore, I think, be found to be a rubber, and not a gutta-percha yielding plant.

But in either case it is obvious that, with the opening up of China, this plant may become of great economic importance if, as seems probable from the investigations of Dybowski and Fron, it is easily cultivated and propagated.

F. E. WEISS.

The Owens College, Manchester, October 23.

Halo Round a Shadow.

ON a winter morning some years ago I was driving in a dog-cart from the Lizard across the Goonhilly Downs whilst a dense mist or cloud was matted down on the ground.

Our heads were in bright sunshine, which formed a coloured halo round the shadow of each of our heads on the mist as we travelled on. Half an hour later the mist was more diffused, and we saw a white mist bow in the sky.

Falmouth, October 28.

HOWARD FOX.