

bromine—the one on which the most trustworthy data have been obtained. Instead of the fluorescent radiation in the particular case carrying away 50 per cent. of the energy of the primary radiation specially absorbed, experiments indicate about 47 per cent. and approximately an equal value for the corpuscular radiation. But there is evidence that with elements of higher atomic weight a limiting value of about 50 per cent. would be obtained. The indication of such a limit gives strong support to the whole theory. On the other hand, from an element of low atomic weight, the experimental value for the fluorescent radiation comes below 30 per cent., and there are indications of even lower values.

It would, however, be remarkable if such a simple theory gave perfect agreement for all elements, and correspondingly all X-radiations. The facts indicated appear of fundamental importance; deviations—real or apparent—will receive investigation and discussion later.

Other important conclusions based on the investigation are that the absorption by an atom is not necessarily in whole quanta of the primary radiation; we have evidence of absorption of primary radiation in quantities of any magnitude between one and two quanta of the primary radiation, or just possibly in fractions of one quantum.

The transformation of primary radiation into fluorescent radiation in certain cases at least is accompanied by little, if any, appreciable loss of energy within the atom.

The energies of X-radiations differing widely in penetrating power are approximately if not accurately proportional to their total ionising powers.

Details of these investigations will be published shortly. C. G. BARKLA.

Physical Laboratory, The University,  
Edinburgh, February 8.

### The Green Flash.

So much has been written about the green-ray at sunset that I am somewhat diffident about adding anything. But as I find myself unable to accept the orthodox explanation of the phenomenon usually seen I write this note. This phenomenon, as seen by me on several occasions during the last summer on my way to Australia, always consisted in the last segment of the red sun before disappearance becoming a bright green (without any transition through intermediate tints); this green was as nearly as could be judged the complementary to the red of the sun itself. On one occasion I shut my eyes immediately after the green tint appeared, and it *remained visible*. There could be no doubt that what I saw was the purely subjective after-image of the disappearing segment of the sun. Of course, if this is so, it should be easy to set up a laboratory experiment to imitate the natural phenomenon; and on returning I asked Mr. E. Talbot Paris, research student in this department, to arrange an experiment in illustration. An eccentric hole was made in a disc mounted on an axle. Red glass or gelatine film was fixed over the hole, and a bright light placed behind illuminated the film and produced thereby a miniature sun, which by slow rotation, could be made to "set" behind an interposed card. At the instant of setting, the artificial sun exhibited an exact reproduction of the phenomenon of the green-ray. It was easily possible in this way to obtain a red-ray using a green sun, or a blue-ray with a yellow sun, and so on.

It is easy to give the rationale of the effect. The positive light gradually diminishes as the artificial

sun passes below the horizon; and it only requires a little adjustment of the rate of disappearance in order that the negative after-image excited at a previous instant when the segment was brighter, shall overpower the simultaneous weaker positive image of the remaining segment itself.

It would not be fair for me to dogmatise and assert that this is the only phenomenon which comes under the head of the green-ray. But it is certainly the only one which I succeeded in seeing; and it *must always be present even on the possible rarer occasions when colour changes arising from dispersion are also evident*. It is certainly also what many others saw. At the same time, it must be added that the phenomenon as observed by different persons, even on the same night, was so variously described as to lead one to suppose that the subjective element is sometimes present to even a greater degree than is implied in the above note.

ALFRED W. PORTER.

Physical Department, University College,  
London, February 7.

### Trenching Ground and Spraying Potatoes.

IN the notice in NATURE, of February 4, of the fourteenth report of the Woburn Experimental Fruit Farm it is suggested that the negative results obtained by us in bastard trenching might have been different had we experimented on vegetables, instead of fruit trees. No doubt the suggestion is correct; and a chance observation last year gave a striking illustration in point. Brussels sprouts were grown in a piece of ground partially occupied by trees; the ground had all been dug, but there were four patches of about four square yards each where it had been practically trenched, by the removal of trees and the digging out of their roots. In each of these patches the sprouts were two to three times larger than those in the intermediate dug ground. Universal experience indicates that a good depth of rich soil is essential for successful vegetable growing; this can only be obtained by trenching and liberal manuring, and nothing in our results should be taken as discountenancing such a practice.

It is also suggested that we should accumulate results on potato spraying to see whether such treatment pays on the average. We are doing so, and those already obtained are nearly sufficient for the purpose. They extend over eight seasons, and are on a fairly large scale, though the diversity in conditions, adopted for other reasons, renders it somewhat difficult to deduce a fair average from them. As it stands, this average is 7.8 per cent. increase on the weight of sound tubers as a result of spraying. Putting the average yield at 7 tons to the acre, and the net price realised at 3l. 10s. per ton, the value of the increment will be 1l. 18s. Two sprayings would cost, for materials, labour and use of plant, about 18s. to 1l. 13s., according to the substance used, and this would leave a margin of profit of from 5s. to 20s. per acre.

SPENCER PICKERING.

Harpden, Herts.

### Early Representations of the Giraffe.

THE discussion in NATURE during the past year concerning the first mention in literature of the opossum and kangaroo has suggested a similar inquiry with regard to certain other well-known animals of the New and Old World.

When one examines into the sources whence were derived the illustrations in early printed books on

natural history, it is found that many are copied after drawings in old manuscripts.

A good example is furnished by Conrad Gesner's figure of an ichneumon, taken from an ancient MS. of Oppian, as the author declares.



FIG. 1.—Giraffe from mural painting at Villa Pamfili, near Rome. (After Keller, from Jahn).

In the case of the giraffe, what is thought to be the earliest portrait taken from life and engraved in a printed book, occurs in a work published in 1486 by Bernard de Breydenbach, a canon of Mayence, under the title of "*Opusculum sanctorum perigrinationum*." The figure is, however, inferior to those

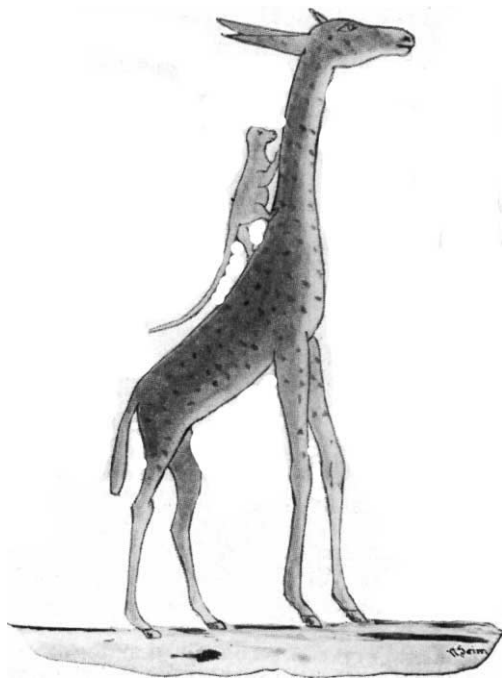


FIG. 2.—Giraffe and Cercopithecus, from ancient Egyptian monument at Thebes. (After Ehrenberg).

of the same and other African mammals which are introduced in the Ebsdorf and Hereford maps of 1282.

Pictorial representations of the giraffe by Roman artists have been preserved from the time of classical

antiquity, and still earlier designs have come down to us in the form of ancient Egyptian hieroglyphics and inscriptions. That some of these were remarkably faithful likenesses may be judged from the two accompanying figures, one of which is reproduced from O. Keller's "*Die antike Tierwelt*" (1909), and the other from a memoir by C. G. Ehrenberg, "*Ueber den Cynocephalus und den Sphinx der Aegypter*," published in 1834.

C. R. EASTMAN.

American Museum of Natural History.

### The Economic Status of the Blackcap.

MR. COLLINGE does not meet the question whether the good the blackcap does in the spring balances the value of the fruit it takes in the summer. But he mentions having found a few aphids in the stomachs even in the fruit season, from which it may be inferred that more would be eaten, when there was no fruit in the spring. Now considering the enormous reproductive powers of the female aphid and that every female destroyed in the spring represents a diminution of many hundreds of the most mischievous pests that the farmer has to contend with in the summer, it seems only reasonable to conclude that the bird does at least as much good as harm. But the latter is seen while the former is not.

ALFRED O. WALKER.

Ulcombe, Kent, February 5.

My experience of the blackcap is that the good it does in the spring by no means balances the harm it does during the rest of the year in fruit-growing districts.

The aphids found in the stomachs were all pea lice (*Macrosiphum pisi*, Kalt.), and were probably obtained accidentally when feeding upon peas.

I have elsewhere pointed out (*Journ. Board Agric.*, Sept., 1912) that all birds, other than doves and pigeons, feed their young upon an animal diet, of which insects form a large proportion, whatever may be the character of the food of the adult; the blackcap would, however, seem to form an exception, judging from the four nestlings I examined, whose stomach contents consisted of seeds or remains of fruit and fruit pulp.

WALTER E. COLLINGE.

8 Newhall Street, Birmingham.

### The Rusting of Iron.

I DO not know if any account of experiments such as the following on the rusting of iron has appeared in print before, but if not they may be of interest to others of your readers besides myself. Briefly, they are as follows:—

(a) A small flask (100 c.c. flask with long narrow neck does well) is filled to the bottom of the neck with potassium ferricyanide solution, and then the neck is filled to the top with ordinary water. A long bright iron nail is then suspended in the water without disturbing the ferricyanide solution, and in a few minutes a blue colour will make its appearance in the neighbourhood of the boundary between the water and the ferricyanide. The formation of Turnbull's blue goes on regularly, and it settles to the bottom instead of iron rust.

(b) A bright iron nail is placed at the bottom of a solution of potassium ferricyanide in a similar flask, and in a short time spots of blue make their appearance on the nail instead of the usual deposit of iron rust.

The explanation according to the ionic theory seems obvious.

E. J. SUMNER.

The Grammar School, Burnley, Lancs, February 5.