The Queen's Jubilee Prize Essay of the Royal Botanic Society of London.

In your issue of October 18 appears (p. 594) a review of the essay for which I was awarded the medal of the Royal Botanic Society, in which the writer makes a great point of my omitting all reference to drugs. He does not state, for the information of your readers, that the prize was offered for the best (not necessarily complete) essay on the "Vegetable Substances introduced into Britain for use in the Arts, Manufactures, Food, and Domestic Economy during the Reign of Her Majesty Queen Victoria." It is not necessary that one should be either "a member of the medical profession" or have "a wholesome dread of drugs" to know that drugs used as medicines could not with any fitness be introduced into this essay; indeed, inquiry from the Secretary elicited the fact that they had been purposely excluded.

Had your reviewer read the essay with any care, he would have observed that I quote Dr. Forbes Watson to the effect that China grass and rhea fibre are products of the *same plant*, but prepared in different ways; while an unprejudiced reviewer would have mentioned that the quotation having reference to *Phormium tenax* is preceded in the essay by the words, "In one of the authorities consulted it is stated that New Zealand flax . . . was introduced into England about 1840; but the author has found a reference to an unsatisfactory attempt to weave it at Knaresborough at a much earlier period than this, and that it had been experimented upon in the Portsmouth Dockyard about 1819, the ropes made from it being satisfactory."

It was evident that the judges considered that "gun-cotton and its derivatives" *are* "direct products of the vegetable kingdom," or they would not have printed this chapter of the essay.

The limited time allowed for the preparation of the essay (about four months), and the inability of the author to avail himself of any collection of economic botany and of many of the most recent books on the subject, naturally led to many deficiencies in the list of substances mentioned, and of this no one was more conscious than the author himself; and all he claims for his essay is that, in the opinion of the judges (one of whom was Prof. Bentley), it was the best of the half-dozen sent in in competition. John W. Ellis.

3 Brougham Terrace, Liverpool, October 23.

I have but few remarks to make in answer to Mr. Ellis's letter. First, I cannot follow his reasoning that completeness should not in some measure count as a test of quality, nor can I see anything in the preamble of the offer of the prize to exclude drugs. Mr. Ellis is justified, however, in having done so by receiving direct information from the Secretary to that effect.

On the subject of China grass and rhea, the author, in his essay, distinguishes them under separate heads, describing the first rightly as the produce of *Bœhmeria nivea*, and the second as "the produce of the East Indian *Bœhmeria* (*Urtica*) *tenacissima*, a congener of the species producing China grass." It is after this authoritative statement that he refers to Dr. Forbes Watson's opinion.

Regarding New Zealand flax (*Phormium tenax*), Mr. Ellis, in his essay, follows up the quotation given in his letter by the following paragraph: "Not having been introduced during the period to which this essay refers, any further mention of this interesting fibre—for which it has frequently been attempted to find a place in the British market—is unnecessary;" thus justifying my remarks on this head.

I leave it to anyone who has read Mr. Ellis's chapter on "Gun-cotton and its Derivatives," to say whether they are direct products of the vegetable kingdom.

The latter part of Mr. Ellis's letter, I think, supports the truth of my review generally. The Reviewer.

October 27.

MODERN VIEWS OF ELECTRICITY.[1]

Part IV.—Radiation.

XII.

We must now mention one or two phenomena which depend entirely upon a modification of ether by the neighbourhood of matter, and which we have reason to believe would not occur in free ether at all. These are the optical phenomena of Faraday and Kerr, and the electric phenomenon of Hall.

Faraday discovered, long before there was any other connection known between electricity and light, that the plane in which light-vibrations occur could be rotated by transmitting light through certain magnetized substances along the lines of magnetic force. To make this effect easily manifest, one uses plane-polarized light and transmits it through a fair length of magnetized substance, analyzing it after emergence, and showing that, though it remains plane-polarized, the plane has been rotated, possibly through a right angle or more.

Now, in a general way it is easy to imagine that, inasmuch as something of the nature of a rotation is going on in a magnetic field round the lines of force, vibrations travelling into such a field along these lines should be twisted round, corkscrew fashion, and emerge vibrating in a different plane. But when one tries to follow out this process into detail, one finds it not quite so simple a matter. It has no business to be a very simple and obvious consequence of the existence of a magnetic rotation round the rays of light, else would it occur in free space, and in the same direction in all media. But the facts are that in free space—that is, in free ether—it does not occur at all, and the direction of rotation is not the same for all media: substances can, in fact, be divided into two groups, according to the way in which given magnetization shall rotate the plane of polarized light passing through them.

Similarly with the electrostatic optical effect discovered by Dr. Kerr, who showed that plane-polarized light transmitted across the lines of force in an electrostatic field could, in certain media, come out elliptically polarized. Now, inasmuch as an electric field is a region of strain, and strain in transparent bodies is well known to make them slightly doubly refracting and able to turn plane-polarized into elliptically-polarized light, it is very easy to imagine such a result in an electric field to be natural and probable. But the explanation is not so simple as that, else it ought to be a large effect, occurring in all sorts of media in the same direction, and likewise in free space. But the facts are that it does not occur at all in free space, and it occurs in different senses in different substances; so that again they can be grouped into two classes according to the sign of the Kerr effect.

Thus, then, the rotatory effect of a magnetic field upon light, discovered by Faraday, and the doubly refracting effect of an electrostatic field upon light, discovered by Kerr, agree in this: that they are both small or residual effects, depending on the existence of a dense medium, and both varying in sign according to the nature of the medium.

The only substance in which the Faraday effect is large is iron, including with iron the other highly magnetic substances. The discovery of the effect in these bodies was likewise made by Kerr. The difficulty of dealing with them is that they are very opaque, and hence that the merest film of them can be used. The film can be used either by way of transmission or by way of reflection, it matters not which, but reflection is perhaps the more convenient. Light reflected from the pole of a magnet has indeed barely penetrated at all into the substance of the iron before being sent back; still, it has penetrated deep enough to be distinctly rotated by the tremendous magnetic whirl which it finds there. All these highly magnetic substances are metallic conductors, and are therefore very opaque.

Whether there is any real connection between high magnetic susceptibility and conductivity is more than I can say. But it is quite natural, and indeed necessary, that the greatest portion of light should be reflected on entering a highly magnetic medium, because in such a medium the ethereal density, μ, is so great, and hence the

[1] Continued from vol. xxxviii. p 592.