XV. Experiments to determine the reflection at the second surface of flint glass at incidences at which no portion of the rays passes through the surface

R. Potter Jun. Esq.

To cite this article: R. Potter Jun. Esq. (1832) XV. Experiments to determine the reflection at the second surface of flint glass at incidences at which no portion of the rays passes through the surface , Philosophical Magazine Series 3, 1:1, 56-58, DOI: [10.1080/14786443208647822](https://doi.org/10.1080/14786443208647822)

To link to this article: <http://dx.doi.org/10.1080/14786443208647822>

Published online: 01 Jun 2009.

Submit your article to this journal [↗](#)

Article views: 3

View related articles [↗](#)

only by a rotatory motion about the axis would entirely destroy the surface, by producing rings." I maintain that with such a lateral motion no true figure of either an ellipse, a parabola, or an hyperbola, can be obtained; and I have found in my experience no ill result to arise from using, as I prescribe, the rotatory motion entirely, whilst producing the change of figure, even with the inferior dexterity which always accompanies an amateur hand.

XV. *Experiments to determine the Reflection at the second Surface of Flint Glass at Incidences at which no Portion of the Rays passes through the Surface.* By R. POTTER, Esq. Jun.*

THIS subject is one worthy of attention on several accounts. A prism producing total reflection has been proposed as a substitute for the small plane metallic mirror of the Newtonian telescope; and it is generally mentioned in all our optical treatises, that considerable advantage would arise from the substitution, without mention being made of the obvious attendant disadvantages, which would lead to the idea that these latter are trifling compared with the former. This would tend to lead many to make an experiment, bringing some trouble and expense, but in which they could experience no satisfactory result.

In telescopes of large size, where the prism in consequence must be large, and the quantity of glass through which the light passes proportionally so, there would, in addition to the aberration and confusion introduced by the prism, be a disadvantage in point of light also, when the prism became above a certain dimension, depending on the glass which was used. This arises from the property, which all transparent bodies possess, of absorbing a considerable portion of the light which passes through them; and it is greater, even in the most transparent of flint glass, than most persons have any conception of. It will be seen, from the experiments about to be related, that with prisms of only the size which I have employed, the light reflected and transmitted does not greatly surpass that reflected by a mirror of speculum metal which has been properly polished. The experiments furnish also a confirmation of the fact, to which I have drawn attention in a former paper, of the great quantity of light lost in achromatic object-glasses of large size, from the unavoidable thickness of the material through which the light traverses.

I hope this consideration will induce astronomers to inves-

* Communicated by the Author.

tigate the point for themselves; and I feel certain they will be convinced of the superiority of the reflecting telescope for all purposes, excepting perhaps the application to divided instruments; and increased patronage will undoubtedly bring the working opticians to attain a perfection in execution, which there is now so little encouragement to seek for, from the fashionable prepossession in favour of achromatic telescopes.

As a question in physical optics, this subject merits an attention much beyond any which I have been able to give to it, from the difficulty of obtaining a pure glass in sufficient bulk. But though these experiments were only made with prisms of common flint glass, and, as a matter of course, contained many of those waves and striæ to which it is subject, yet they give us results which may be taken as proving the truth of the general opinion,—that no light is lost in what are called total reflections in transparent bodies; and we should consequently conclude that it is the same for all incidences at which this effect takes place.

If there is *any* variation in the intensity of the reflections, it is evidently very small, and much more perfect prisms and longer attention would be necessary to determine it. It is on account of the imperfection in the glass that I have not so multiplied the experiments as would otherwise have been desirable, knowing that no decisive argument could be drawn from them where the differences to be detected, if any, were evidently so very small; and the experiments in photometry with lamps present nothing very enticing and pleasant in themselves, and require, besides, considerable practice and patience to get uniformly very exact results.

The only correct method of proceeding in this inquiry is to have the prisms formed so that the light may be incident and emergent perpendicularly to the surfaces, and falling at the required angle on the surface producing total reflection; and also, which is of equal importance, that the thickness of glass through which the rays pass may be the same in all. The prisms I have used were similar in shape to fig. 1. 2. and 3, where the distances $a b$, $b c$, are equal in all; and by a rectangular piece similar to fig. 4, where the length $a c$ is equal to the sum of the two lengths $a b$, $b c$ in the prisms, we learn the quantity of light transmitted under all similar circumstances, excepting the total reflection, which enables us to complete our deductions, by allowing for the loss attending a direct transmission.

The length $a c$, or the sum of the lengths $a b$, $b c$, was 1.98 inch, and the other dimensions of the sections of the prisms were proportionally as represented in the figures, the depths of each being equal to the depth $a e$ of the rectangular pieces.

The prism fig. 1. was cracked in the commencement of the experiments, by being placed too near the flame of the lamp ; but fortunately the light in this prism being incident at 45° on the second surface, it was allowable to use another part of the glass beyond the extent of the crack.

The rectangular piece

averaged from	rays incident.	rays transmitted.
3 measurements	. 100	78.56
4 —————	. 100	78.36
5 —————	. 100	77.95

The prism fig. 1, where the light was incident on the second surface at an angle of 45° ,

averaged from	rays incident.	rays reflected and transmitted.
8 measurements	. 100	76.97
6 —————	. 100	75.23

The prism fig. 2, where the light was incident on the second surface at an angle of 60° ,

averaged from	rays incident.	rays reflected and transmitted.
6 measurements	. 100	74.97
6 —————	. 100	78.46

The prism fig. 3, in which the light was incident on the second surface at an angle of 75° ,

averaged from	rays incident.	rays reflected and transmitted.
6 measurements	. 100	77.04
5 —————	. 100	76.90

Another set of measurements for the second prism gave 72.92 ; and thinking that there arose rather more of extraneous light in using the rectangular piece than in using the prisms, I made another set of measurements with it, taking additional precautions, and obtained 74.02 ; but it is probable that in these two last-mentioned cases some unnoticed cause of error had arisen, making the results come out too small.

XVI. *On the Action of Light in determining the Precipitation of Muriate of Platinum by Lime-water; being an Extract from a Letter of Sir JOHN F. W. HERSCHEL, K.H. F.R.S. &c. to Dr. Daubeny*.*

WHEN a solution of platinum in nitro-muriatic acid, in which the excess of acid has been neutralized by the

* Read before the British Association at Oxford, June 22, 1832; and communicated by request of the Author.