

**INCIDENTAL REMARKS ON
SOME PROPERTIES
OF LIGHT, PART V.
OF AN ESSAY ON VISION**

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Incidental remarks on some properties of light, part v. of an essay on vision by Robert William H. Hardy

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ROBERT WILLIAM H. HARDY

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P R E F A C E.

As an explanation would seem to be necessary for commencing the publication of this Essay with one of its Parts only, and that not the First, I beg to state, that distrust of my own powers to do justice to the subjects severally treated of in them naturally deters me from venturing upon the publication of the whole work at once; for however encouraging may be the criticism of partial friends, their verdict might be reversed, or at least much modified, by the sterner tribunal before which it would have to appear.

I have selected the Fifth Part, because it is a fair specimen of the design and general scope of the work; and by the reception which it may meet with, I shall be mainly guided in dealing with the remaining portions. As a lover of TRUTH I do not deprecate, but rather court, the commentaries, and, if need be, the censure of the critic; well knowing, that whatever be my individual loss or gain, the cause of TRUTH (which alone should be the object of every dabbler in science) will benefit by the free discussion of scientific subjects.

I now commit this Part of my Essay to the consideration of those who feel an interest in the subject on which it treats; and I earnestly solicit their unreserved communications, whether they be for approval or for blame.

I hope, in a future Part, to make honourable mention of the friends by whose advice and assistance I have benefited in the composition of this Essay, and in the publication of this portion of it. I cannot, however, dismiss the present one, without paying a tribute to the memory of my departed friend, Henry Lawson, Esq., F.R.S., who spent the latter part of his life, and finished his earthly course, in this city. He was ever ready to assist me with his counsel, and to forward my labours

PREFACE.

by the loan of such scientific volumes as I required from his library. Kind to the poor, and friendly to his neighbours, he was anxious at all times to promote works of public utility, especially if connected with the favourite studies which he himself pursued with unabated zeal as long as health and strength were granted to him. And as he completed in this city his allotted time, so did he carry with him to the grave the affectionate regards and kindly regrets of those among whom the evening of his days was spent. It were to be wished that the last year of his life had not been saddened by the failure of his fondly-cherished plan of seeing his beloved instruments domiciled in a midland observatory. But this trial, destined as it was to be a portion of the discipline of his closing career, was acquiesced in with patience and resignation. In the memory of many pleasant hours passed in the society of my departed friend, I cast this slender garland upon his tomb :

*"His saltem accumulæ donis, et fungar inani
Munere."*

KILKENNY HOUSE, STON HILL, BAYN,
June 1856.

NOTICE.

THIS Essay, when complete, will contain Seven Parts, and the subjects to be treated in each Part are as follows:

I. On the causes of certain impediments to distinct Vision, as determined by experiment.

II. On the structure and external configuration of the cornea of the human Eye, and considerations on the use and abuse of small apertures, as aids to Vision.

III. On the practical education of the Eye; shewing experimentally the mode by which that organ is adjusted to the distinct view of objects situated at various distances from the observer.

IV. On the proper adaptation of optical instruments to the physical condition and structure of the Eye, and to the external circumstances by which it is affected.

V. Incidental remarks on some properties of Light.

VI. Conjectures, founded on the analogy of Light, as to the cosmical distribution of Matter; and

VII. Analysis of certain Papers communicated to the Royal Society, and published in their Transactions; and of certain Papers and Statements elsewhere published: thereby shewing how to guard against erroneous deductions and false judgments in Vision.

PART V.

INCIDENTAL REMARKS ON SOME PROPERTIES OF LIGHT.

IN this division of the subject I propose to enter upon a practical investigation of certain properties of light, which, though not entirely unnoticed by writers on Optics, appear not to have been clearly understood, or even correctly stated.

The basis upon which I have grounded the argument is to be found in data distributed throughout the several parts of this Essay; and it is intended, in the present part, to bring the scattered elements into a narrow compass, so as to exhibit, as it were at one view, the co-ordinate principles of *lateral shadows* and *light of collateral irradiation*.

But in the treatment of a subject of this nature, our progress is impeded *in limine* by the principal difficulty; What do we know of LIGHT? What do we know even of solar light, save by the superficial glances we obtain of the chemical action which it is wont to exercise upon bodies, and by its mechanical effect upon the organs of sight? Some have made it a question whether the sun have any inherent light, and whether he be more than a passive agent for its diffusion by reflexion from an external cause. Hypotheses, indeed, respecting both his light and heat, have been many, some of which possess little merit beyond an ingenious plausibility; while others, more congruous, seem to have seduced their authors into the pleasant fields of Fancy, where, listening to the music of some purling stream, or pouring forth their voice in measured

strains to the tones of the melodious pipe, they sang of Nature and the things that be. And if, yielding to the same enchantment, and wandering amid the pastures of Arcadia, I, too, sound my feeble reed, may the allurements of those peaceful regions not lead my footsteps astray, or leave me friendless in the happy land!

Entering then upon the inquiry, namely, *what is LIGHT?* we can only reply to the question by saying; That its source is unknown, its supply inexhaustible: ever flowing and never exuberant;

"Largus item liquidi fons lamine, æthereus sol
Irrigat assidue cœlum candore recenti."¹

That the luminous flood cannot be accelerated, and, when partially obstructed, that additional energy is thereby given to the stream. That in its effusion from the sun, it proceeds at the rate of 190,000 miles in a second of time, and with a momentum estimated by Mr. Michel² at the 1800 millionth part of a grain on a square foot of the earth's surface. Yet such is its astonishing tenuity, that the least substantial vapour breaks its rays into fragments, and scatters them, split and trembling, to the earth. That its waves, though dashing with impetuosity against the pupil of the eye, yet inflict upon the exquisitely organized retina only the most pleasurable sensations. That it plays on the wings of the icineumon, and quickens the pulse of the sphemera. It illuminates the Milky Way, and marks the track of the comet. It flashes in the gem, sparkles in the wave, lives in the laughing eye, and expires in the fleeting dew-drop. It imparts beauty to the lily, pertness to the daisy, grace to the oxalis, and extracts perfume from the rose. The sun-loving pimpernel closes her bright eye in sadness at the departure of her lord, the lark ceasing her song, and the dove retiring to her cote. The shepherd counts the lingering hours by the circling light of the Wain; the sailor steers for the hoped-for haven by the flickering beams of the pole-star; and the incautious traveller rushes on his doom by following the treacherous blaze of the ignis fatuus.

¹ Lucret. lib. v. ver. 281.

² Walker's Lectures, Art. Optics, p. 72.

Lo, it warms in the lamp of the glow-worm, and burns in the torch of the fire-fly. It ripens the golden harvest, mellows the juice of the vine, and gives potency to the pain-soothing poppy. It thrills in the nerves of the gymnotus and torpedo, is resplendent in the aurora, majestic in the meteor, fearful in the lightning's dart, and terrible in the throes of the volcano.

If, then, so much, and all too little, can be said of the light, which, obeying the fiat of THE OMNIPOTENT¹, sprang suddenly into existence, and filling sidereal space with its effulgence, instantly lighted up the orbs of heaven, how shall we be able even remotely to appreciate the attributes and perfections of HIM who created that light, who in the beginning made the heavens and the earth, and whose Spirit moved upon the face of the waters²; who spake in the burning bush³; and who, by the pillar of a cloud, and by the pillar of fire led, HIS people through the waters and preserved them in the wilderness⁴; whom "the heaven of heavens cannot contain"⁵; whose coming in the flesh was denoted by the leading of a star⁶; and who HIMSELF was that Light which "shineth in darkness, and the darkness comprehended it not."⁷ Since, therefore, "such knowledge is too wonderful for us," we will henceforth confine our efforts to an examination of that material light which comes more immediately within the province of this Essay.

EXP. 21. Having placed a certain number of candles in a row, I held a card finely perforated immediately parallel to the line of lights, so that, were it possible, rays from each flame might pass freely through the aperture, and, emerging therefrom, fall directly on a screen held at a short distance behind the card. On looking at the screen, I observed as many spots of light upon it as corresponded to the number of candles. And by doubling the number of the latter, without extending the line, no other effect was observed to take place beyond an

¹ Genesis i. 3.² Idem. i. 2.³ Deut. xxxiii. 16.⁴ Exod. xiii. 21.⁵ 2 Chron. ii. 6.⁶ Matth. ii. 9.⁷ Gospel of St. John i. 5.