ART. XXIII.—*On the amount of Time necessary for Vision*; by
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IN the celebrated experiment of Wheatstone on the duration of the discharge of a Leyden jar, the conclusion was drawn that distinct vision is possible in less than one millionth of a second. The incorrectness of the data on which this conclusion rested was afterward pointed out in an admirable investigation by Feddersen, who remarks on this point: "One cannot hereafter assume, in optical and physiological experiments, that the discharge of a Leyden jar is an instantaneous act; but at the same time, by the determination of the greatest suitable resistance, it will be possible to limit the discharge to its least possible duration."* The smallest measured duration obtained by Feddersen was one-millionth of a second.

In an article in the present number of this Journal I show how, by the use of a much smaller electrical surface, I obtained and measured sparks the duration of whose main constituent was only forty billionths of a second. With their light, distinct vision is possible; thus, for example, the letters on a printed page are plainly to be seen; also, if a polariscope be used, the cross and rings around the axes of crystals can be observed with all their peculiarities, and errors in the azimuth of the analyzing prism noticed. There seems also to be evidence that this minute interval of time is sufficient for the production of various subjective optical phenomena: for example, for the recognition of Loewe's rings (using cobalt glass); also the radiating structure of the crystalline lens can be detected when the light is suitably presented to the eye.

* Pogg. Annalen, Band cxiii, p. 453.

Hence it is plain that forty billionths of a second is quite sufficient for the production on the retina of a strong and distinct impression; and as the obliteration of the micrometric lines in the experiment referred to, could only take place from the circumstance that the retina retains and combines a whole series of impressions, whose *joint duration* is forty billionths of a second, it follows that a much smaller interval of time will suffice for vision. If we limit the number of views of the lines presented to the eye in a single case to ten, it would result that four billionths of a second is sufficient for human vision, though the probability is that a far shorter time would answer as well, or nearly as well. All of which is not so wonderful, if we accept the doctrines of the Undulatory Theory of light; for according to it, in four billionths of a second, nearly two and a half millions of the mean undulations of light reach and act on the eye.

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