

intervals of the particles (see chap. x. and hereafter, chap. xiii.), are only limitations of what was indefinite in the earlier form of the hypothesis. And so far as the properties of visible radiant light are concerned, I do not think it at all too much to say, as M. Schwerd has said, that "the undulation theory accounts for the phenomena as completely as the theory of gravitation does for the facts of the solar system."

This we might say, even if some facts were not yet fully explained; for there were till very lately, if there are not still, such unexplained facts with regard to the theory of gravitation, presented to us by the solar system. With regard to the undulatory theory, these exceptions are, I think, disappearing quite as rapidly and as completely as in the case of gravitation. It is to be observed that no presumption against the theory can with any show of reason be collected from the cases in which classes of phenomena remain unexplained, the theory having never been applied to them by any mathematician capable of tracing its results correctly. The history of the theory of gravitation may show us abundantly how necessary it is to bear in mind this caution; and the results of the undulatory theory cannot be traced without great mathematical skill and great labor, any more than those of gravitation.

This remark applies to such cases as that of the *transverse fringes of grooved surfaces*. The general phenomena of these cases are perfectly explained by the theory. But there is an interruption in the light in an oblique direction, which has not yet been explained; but looking at what has been done in other cases, it is impossible to doubt that this phenomenon depends upon the results of certain integrations, and would be explained if these were rightly performed.

The phenomena of *crystallized surfaces*, and especially their effects upon the plane of polarization, were examined by Sir D. Brewster, and laws of the phenomena made out by him with his usual skill and sagacity. For a time these were unexplained by the theory. But recently Mr. Mac Cullagh has traced the consequences of the theory in this case,<sup>21</sup> and obtained a law which represents with much exactness, Sir D. Brewster's observation.

The phenomena which Sir D. Brewster, in 1837, called a *new property of light*, (certain appearances of the spectrum when the pupil of the eye is half covered with a thin glass or crystal,) have been explained by Mr. Airy in the *Phil. Trans.* for 1840.

Mr. Airy's explanation of the phenomena termed by Sir D. Brew-

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<sup>21</sup> Prof. Lloyd's *Report, Brit. Assoc.* 1834, p. 374.