by experiment), and partly on misconceptions of the theory; and I believe there are none of them which would now be insisted on.

We may mention, also, another difficulty, which it was the habit of the opponents of the theory to urge as a reproach against it, long after it had been satisfactorily explained: I mean the *half-undulation* which Young and Fresnel had found it necessary, in some cases, to assume as gained or lost by one of the rays. Though they and their followers could not analyse the mechanism of reflection with sufficient exactness to trace out all the circumstances, it was not difficult to see, upon Fresnel's principles, that reflection from the interior and exterior surface of glass must be of opposite kinds, which might be expressed by supposing one of these rays to lose half an undulation. And thus there came into view a justification of the step which had originally been taken upon empirical grounds alone.

10. *Dispersion, on the Undulatory Theory.*—A difficulty of another kind occasioned a more serious and protracted embarrassment to the cultivators of this theory. This was the apparent impossibility of accounting, on the theory, for the prismatic dispersion of color. For it had been shown by Newton that the amount of refraction is different for every color; and the amount of refraction depends on the velocity with which light is propagated. Yet the theory suggested no reason why the velocity should be different for different colors: for, by mathematical calculation, vibrations of all degrees of rapidity (in which alone colors differ) are propagated with the same speed. Nor does analogy lead us to expect this variety. There is no such difference between quick and slow waves of air. The sounds of the deepest and the highest bells of a peal are heard at any distance in the same order. Here, therefore, the theory was at fault.

But this defect was far from being a fatal one. For though the theory did not explain, it did not contradict, dispersion. The suppositions on which the calculations had been conducted, and the analogy of sound, were obviously in no small degree precarious. The velocity of propagation might differ for different rates of undulation, in virtue of many causes which would not affect the general theoretical results.

Many such hypothetical causes were suggested by various eminent mathematicians, as solutions of this conspicuous difficulty. But without dwelling upon these conjectures, it may suffice to notice that hypothesis upon which the attention of mathematicians was soon concentrated. This was the *hypothesis of finite intervals* between the