In this Memoir of Fresnel's, he takes very nearly the same course as Young had done; considering the interference of the direct light with that reflected at the edge, as the cause of the external fringes; and he observes, that in this reflection it is necessary to suppose half an undulation lost: but a few years later, he considered the propagation of undulations in a more true and general manner, and obtained the solution of this difficulty of the half-undulation. His more complete Memoir on *Diffraction* was delivered to the Institute of France, July 29, 1818; and had the prize awarded it in 1819:[5] but by the delays which at that period occurred in the publication of the *Parisian Academical Transactions*, it was not published[6] till 1826, when the theory was no longer generally doubtful or unknown in the scientific world. In this Memoir, Fresnel observes, that we must consider the effect of *every portion* of a wave of light upon a distant point, and must, on this principle, find the illumination produced by any number of such waves together. Hence, in general, the process of integration is requisite; and though the integrals which here offer themselves are of a new and difficult kind, he succeeded in making the calculation for the cases in which he experimented. His *Table of the Correspondences of Theory and Observation*,[7] is very remarkable for the closeness of the agreement; the errors being generally less than one hundredth of the whole, in the distances of the black bands. He justly adds, "A more striking agreement could not be expected between experiment and theory. If we compare the smallness of the differences with the extent of the breadths measured; and if we remark the great variations which a and b (the distance of the object from the luminous point and from the screen) have received in the different observations, we shall find it difficult not to regard the integral which has led us to these results as the faithful expression of the law of the phenomena."

A mathematical theory, applied, with this success, to a variety of cases of very different kinds, could not now fail to take strong hold of the attention of mathematicians; and accordingly, from this time, the undulatory doctrine of diffraction has been generally assented to, and the mathematical difficulties which it involves, have been duly studied and struggled with.

Among the remarkable applications of the undulatory doctrine to diffraction, we may notice those of Joseph Fraunhofer, a mathemati-

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[5] *Ann. Chim.* May, 1819. [6] *Mém. Inst.* for 1821–2. [7] *Mém. Inst.* p. 420–424.