Centenary of Augustin Fresnel (1788–1827)[*]

H. A. Lorentz
Paris, 27 October 1927

Translated and annotated by Gavin R. Putland,[†]
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I am glad of the opportunity to say a few words at this great and beautiful ceremony[1]—to pronounce a few words in honor of AUGUSTIN FRESNEL, the great physicist, the founder of modern optics. I'm sure that I am about to express the sentiments of all my colleagues, of all foreign physicists, of those who are present here, as of those who in all the nations of the world reflect with us today on AUGUSTIN FRESNEL.

Whatever nationality and whatever age we may be, we all honor him as one of the great masters of science, as one of those to whom it has been given to enter deeper and further than others into the secrets of nature, as one of those in whom inventive and creative genius has shone with the most lively brilliance.

Not only do we think today of the great works of FRESNEL, of the remarkable results that he obtained, and of all the contribution which he brought to our science and whose influence has been felt in all of physics; but we think also of the circumstances in which he worked, of the perseverance, of the devotion with which he consecrated himself to the pursuit of the truth, and which allowed him to surmount the difficulties that came to him from his health so delicate and frail.

I hardly know a more moving story than that of his years of continuous work—there were but six or seven—and of the two years that followed, during which his health hardly permitted him to continue his researches, and finally of his premature death.

I have been asked, and it is a great honor for me, to deliver to the French Physical Society these addresses, which have come from many countries and in which you will find the expression of universal sentiments of recognition and admiration.

For my part, I can say that FRESNEL was one of the masters to whom I owe the most, and I still remember that when, more than half a century ago, my resources permitted me to buy a book on physics a little more extended than the ordinary textbooks, I procured for myself the edition by ÉMILE VERDET of the *Complete Works* of AUGUSTIN FRESNEL.[2] When I had read the *Introduction* by VERDET, my admiration and my respect were mixed with love and affection; and what were not the enjoyments that I had, when I could read FRESNEL himself and study his beautiful works, admirable by their simplicity!

FRESNEL hardly had a laboratory; indeed often he had no laboratory at all to perform his experiments. You know how, after NAPOLÉON's return from the island of Elba, Fresnel had been interned in the small town of Mathieu because he had wanted to resist the Emperor. It was there that, with the sole aid of the blacksmith[3], he constructed the micrometer with which he was able to determine the positions of

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[*] "Allocution de M. H.-A. Lorentz, au nom des délégations étrangères" ("Speech by Monsieur H. A. Lorentz, on behalf of the foreign delegations"), *Revue d'optique*, vol. 6 (1927), pp. 514–16, reprinted as "Centenaire D'Augustin Fresnel (1788–1827)" in H. A. Lorentz (ed. P. Zeeman & A. D. Fokker), *Collected Papers*, vol. 9, The Hague: Nijhoff, 1939, pp. 340–42.

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[‡] Earlier statements about my knowledge of French were true when they were made.

[1] The 'ceremony' began at 8:30pm in the Grand Amphitheatre of the Sorbonne, Paris. Meanwhile in Brussels, the sessions of the fifth Solvay conference for that afternoon and the following morning were left free, so that participants could attend the opening of the Fresnel celebrations. [Source: G. Bacciagaluppi and A. Valentini, *Quantum Theory at the Crossroads: Reconsidering the 1927 Solvay Conference*, Cambridge University Press, 2009, pp. 17–18.]

[2] A. Fresnel (ed. H. de Sénarmont, E. Verdet, & L. Fresnel), *Oeuvres complètes d'Augustin Fresnel* (3 volumes), Paris: Imprimerie Impériale, 1866, 1868, 1870.

[3] French: *forgeron*. Verdet, in his introduction to Fresnel's *Oeuvres complètes* (vol. 1, p. xxxi), says *serrurier* (locksmith), which is followed by most secondary sources in English.

the fringes in the phenomena of diffraction, thus preparing for his great theory of these phenomena. Moreover, his mathematical resources were as modest as his instruments of observation. Fresnel was not a highly trained mathematician, and I do not know what could have happened if he'd had to take an examination in higher mathematics in front of M. Emile Picard. But he could provide everything he lacked by his ingenuity and his intuition.

M. Picard has already spoken of the determination of the wave surface in biaxial crystals, and of the theory of double refraction, which may not be found to be perfectly rigorous,[4] but which remains always a great masterpiece. Then there are the formulae, known to all physicists, for the intensity of reflected and refracted light, and the interpretation, by a veritable stroke of genius, of the imaginary values that appear in these formulae in the case of total reflection. Nor let us forget the celebrated "Fresnel coefficient" which allows us to say in what measure the light waves are dragged by moving matter, and which has become one of the supports[5] of the theory of relativity.[6]

Henri Poincaré once said that theories are transient like the waves of the sea, following each other the ones like the others. The comparison is not entirely fair, because the waves leave no trace, whereas many good theories remain. Many indeed remain of the theories of Fresnel. They are immortal, although there have been great changes, and although in recent years we have even seen this return to the notions of the corpuscular theory to which M. Picard has alluded.

It is with precisely these new concepts, and the form that they have taken in the mechanics of quanta, that we now occupy ourselves in Brussels at the meeting of the "Physics Conference". We find ourselves facing some very difficult and sometimes mysterious questions. So I could not help saying to Mme Curie this morning: Fresnel would have understood nothing. That was thoughtless and I must correct myself. Certainly, if Fresnel could have attended our discussions, they would have frightened him at first, and he would perhaps have said to himself: "Is it good that this has come of my physics?" But soon he would have entered into our ideas, and would have extracted that which is essential and fundamental, and I am sure that, with his genius and his gift of penetration, he would have been, for us, a master and a guide.

The "Solvay Physics Conference" in Brussels has suspended its work for a day, to be able to take part, as we do wholeheartedly, in the tribute that we render tonight to the memory of Augustin Fresnel, and we most sincerely thank the French Physical Society for giving us the opportunity to join it.

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[4] Fresnel's derivation of the equation of the wave surface was improved upon by later commentators, but the equation itself (for non-chiral crystals) was correct.

[5] French: *bases*.

[6] The velocity of light in a moving medium as given by Fresnel's drag coefficient is a first-order approximation to the relativistic velocity composition. It is one of three first-order relativity effects, the other two being the Doppler effect and stellar aberration; but it is the only one that necessarily involves a relativistic velocity other than c itself.