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## **Workshop**

### **A STRONG COLLABORATION BETWEEN PHYSICIANS AND MATHEMATICIANS THROUGH THE XIXTH CENTURY: DOUBLE REFRACTION THEORY**

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Mathematics and Physics may address the same topics though they employ different methods, experiments on one hand, analysis or geometry on the other. Nevertheless, those two disciplines stimulate one another which usually generate progress.

In order to illustrate this fact, we propose to draw some examples from Augustin Fresnel's wave theory of light, elaborated in 1819.

In 1830, famous mathematician Augustin-Louis Cauchy forecasted elliptical polarization by crystals (phase jump) trying to transcript analytically Fresnel's principles. This phenomenon had not been considered earlier. It was checked by Physicist Jules Jamin, about twenty years later.

Also, in 1832, some mathematical calculations led William Rowan Hamilton to discover conical refraction. A year later, Humphrey Lloyd observed this phenomenon.

However, we shall present an even more surprising interaction between the two sciences, which emerged from crystallography. A whole community of researchers has been animated by the problem of determining the properties of wave surfaces, since the directions of light through crystals can be deduced by Huygens' geometrical construction. Mathematicians invented new tools which led to now famous theorems.

History of Sciences shows the importance to teach physics and mathematics coherently rather than as two separated independent fields. Also researchers from each discipline would take advantage in adapting their language when communicating their discoveries.

Abstracts from Christian Huygens' Treatise on Light 1690, Augustin Fresnel's Memoir on double refraction 1821, William Rowan Hamilton's Memoir on Systems of Rays 1830, Archibald Smith's short paper on Wave Surfaces, will be read and commented.