Crystallographers in the 18th century had no means of looking inside crystals, but they managed to form a picture of their internal structure on the basis of their external geometry.

Classifying by shape?

In 1669 Steno suggested that the hexagonal form of quartz crystals was preserved during growth through the accumulation of parallel layers deposited by an outside liquid. The theory was taken up by Guglielmini who suggested that crystals were found in four basic shapes (hexagonal prisms, cubes, rhombohedrons and octahedrons).

Constancy of angle

Romé de l'Isle was inspired by Linnaeus's biological naming system and proposed using the shape of the crystal as a means of classification. To make clay models of crystals he asked Carangeot to measure the angles between the faces: they were found to be identical for the same type of crystal.

Brick by brick...

The shape of a crystal is therefore not a matter of chance; it is an inherent characteristic of a particular solid chemical compound. From his observations of scraps of broken calcite, Haüy developed a model, in which crystals result from the stacking of small bricks together, bricks which he called "integrant molecules".

Explaining the faces

Haüy also noted that the faces of the crystals resulted from simple intercepts, i.e. the law of simple rational indices. He introduced a law of symmetry proposing that a crystal diminishes equally from the faces, edges and vertices of the primitive solid.

Romé de l'Isle and Haüy's investigations gave rise to the new science of "crystallography", one of the oldest of the "physical" sciences, together with astronomy, mechanics and optics.