Oral Contributions

[MS41] Crystallographic teaching and education

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[MS41-01] Using the crystallography history as a tool for crystallography and science education

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Crystallography: a universal science with a pedagogical history. Crystallography and crystals are research method and tools used in investigations covering a vast range of topics. On one side, crystallography underpins most technological developments in our modern society and, on the other side, origins of crystallography start from humanity's interaction and interrogation with crystals from prehistoric times to the present day. We can use these two characteristics to focus interest on crystallography of large publics, young pupils and students and show them the importance of the scientific approach.

Crystals provoke wonder, become symbols, inspire study. Already in prehistoric times, faceted stones provoked wonder and admiration; from Antiquity onwards, they became subjects of philosophical and scientific enquiry. Their colours, transparency, multiple geometries, apparent inalterability inspired mysticism, fascination and questions.

Crystallography: the birth and triumph of a science. In the 16th century, natural philosophers start to discuss origins of crystals. In the 18th century, with no techniques yet available for probing deep into a crystal, scientists began to deduce their internal structure from observations of their external geometry. It was the birth to a new science. Together with astronomy, mechanics and optics, crystallography is one of the oldest of the physical sciences.

In the mid 19th century, still without any proper tool for seeing a crystal's structure, the concepts of periodicity and molecular order gave the explanation of their shape and symmetry. The 1895 discovery of the mysterious "X-Rays" inspired the work of Laue and the Braggs, father and son, who used crystals in order to understand these new rays. In return, their "diffraction" experiments showed how crystals were indeed made of regular arrays of atoms, finally making it possible to "journey" into the heart of a crystal.

Crystallography: a tool for research and applications. By allowing structure determination, crystallography provided evidence that architecture of materials is one key for their physical properties, as it is in the carbon family which gives us graphite, fullerenes, carbon nanotubes and graphene. Crystallography and crystals are at the heart of metallurgy and of microelectronics. From the beginning of the 20th century, the birth of crystal chemistry enabled chemists to "grow" and use crystals, to "visualize" their structure, and thus to invent new materials. This method has spread through the sciences of pharmacy and biology, where fundamental research leads to synthesis of new pharmaceuticals.

Crystals are an everyday object, found everywhere. Crystals are all around; from solid state lasers to "LEDs" for traffic signals or Christmas decorations... But the discoveries of the 20th century have dispelled the mysteries concerning their atomic structure and physical properties, giving them "a place at the heart of modern civilization". Crystallography is now used in investigations that cover an immense

range, from the composition of our planet Earth to the microscopic structures of materials and the molecules of life.
This presentation is result from issues emerging during the built of the "Voyage dans le Crystal" exhibition (*). We thank the numerous crystallographers which have contributed to this joint work.
* http://iycr2014.org/resource-materials/voyage-dans-le-cristal

Keywords: Crystallography, history, education