From the discovery of quasicrystals to anti-counterfeit applications, or how science gets renewed and serves society.

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For two centuries, crystallography was one of the best established and less-questioned pillars of solid-state science. This state of grace lasted until the discovery of quasicrystals in the beginning of the 80s [1]. Since then, the notions of symmetry in ordered solids, of electrical conductivity in metals, of thermodynamic stability in alloys, etc. had to be revisited in depth in order to develop a new physical chemistry that could account for this new state of condensed matter.
Indeed, the discovery of the quasicrystalline state in a metallic alloy earned its author a Nobel Prize in Chemistry. It was extended later on to other types of materials, such as polymers or thin films of oxides. More significantly even, it was found in nature, either in meteorites or in places where drastic shocks occurred at high temperature (nuclear test, lightning). The talk will briefly narrate this adventure, starting from elementary notions of translational symmetry in crystals, then explaining what is a quasicrystals and what are its main properties, and finishing with additive manufacturing of anti-fake devices that can be used to protect valuable objects such as pieces of art [2,3]. This work, that took place in Nancy, benefits from the contributions of the author who was the first to envisage some usefulness for quasicrystals [4,5].

1] Metallic phase with long-range orientational order and no translation symmetry (1984), Shechtman D. et al., Phys. Rev. Lett. 53–20:1951–1954.

[2] Method of authenticating an object with X-ray diffraction (2021), S. Kenzari and V. Fournée, European Patent EP 3652526B1.

[3] https://www.signaturesam.com/

[4] Useful Quasicrystals (2005), J.M. Dubois, World Scientific, Singapore.

[5] Potential and marketed applications of quasicrystalline alloys at room temperature or above (2023), J.M. Dubois, Rendiconti Lincei. Scienze Fisiche e Naturali. https://doi.org/10.1007/s12210-023-01170-4.