AESTHETICS OF IMPERFECTION

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Once upon a time, it was a popular hobby for children to grow crystal from a solution of alum. The aim was to produce a large and "regular" crystal. However, it only kept its form at the beginning; and as it grew larger, it became covered, more and more, with steps and appendages, with no face having been left to exactly repeat another one.

But this is "*contrary to regulations*"! G.V. Wulff's Theorem (1901) affirms, indeed: The distances of crystal faces from its center are in proportion to the surface energy densities of these faces. As this density is the same for all the faces of each crystal form, these faces must be equidistant to the crystal center and, thus, identical and symmetrical; hence, the entire crystal must be symmetrical too.

However (unfortunately or not, who knows), Wulff's Theorem only refers to equilibrium crystals. Such crystals can be gotten by means of endlessly slow growth under permanent and symmetrical conditions. That is to say, practically never: an equilibrium crystal, perfect in the strict sense, is no more than a theoretical abstraction. Though, it can be approached, more or less; aiming for indeed, one should not rush when growing crystals. The worst is the condition of permanence. What is to be done with the instability of ambient temperature? How to create and support feeding symmetry? It is disturbed, really, by gravitation, convection flows, and even by the growing crystal itself.

When crystals are grown not at home but under industrial conditions, these problems have been solved, at the very least, due to exact observation of known rules created over decades by the best specialists' work. As for nature, there is no one there to care for crystal quality and, therefore, perfect (even conventionally) crystals of minerals are very rare. Hence high prices are asked for precious stones and commercially standard specimens of ordinary but technically important minerals like quartz and calcite.

The rarity, in nature, of perfect crystals becomes more understandable when the crystallization factors and circumstances have been discovered.

The Life Line

The object of crystallization is *the minimization of free energy* of the system where a crystal grows. The rate of this fundamental principle is determined

Photo 10. **Quartz**, length of the sheaf 11 cm. Dashkesan, Azerbaïdzhan

Photo 11. **Apophyllite**, 4 cm long. Jalgaon, India

Photo 12. **Stilbite**, 4.5 cm long. Poona, India