QUARTZ: CHRYSANTHEMUM, CATERPILLAR, *etc.*

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This is the last paper by Boris Z. Kantor, which he handled over to the Mineralogical Almanac a week before he passed away. We publish this paper without any usual editorial changes, as it has been originally written by the author.

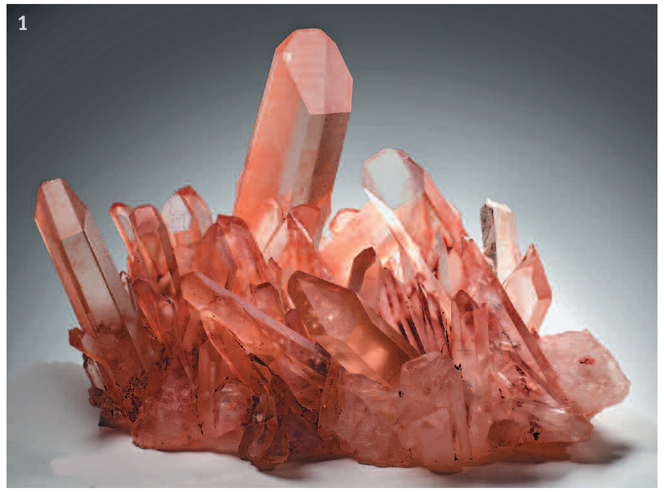
Crystallized minerals are wonderful gifts of Nature. Crystals are especially attractive when perched on their mother rock, usually called "matrix," but also "substrate," or simply "rock."

Their arrangements are variable. Elongated crystals are usually attached to the matrix by one end of the crystal while other is free and terminated with faces. Such crystals are typical of the so-called radiating zeolites like natrolite, scolecite, etc. as well as quartz, tourmaline, apatite, calcite and a lot of other mineral species. The best way to observe, investigate and explain crystal aggregates on matrix is to use quartz specimens as they are a very wide spread and, thus, accessible mineral, which is also endowed with a rich and diverse morphology.

The most beautiful specimens of quartz are surely the polycrystalline clusters on matrix named "druses" in the Russian literature (*Figs.* 1 and 2). *Druse* is a widely used word within the Russian mineralogical community, and every mineralogist and hobbyist knows very well what it means. However, you will not find a strict definition in a mineralogy or crystallography textbook: both confine themselves to some visual and approximate notions. The only published definition was made some 160 years ago by an author who was not a mineralogist at all but a philologist. In his "*Explanatory Dictionary of the Great Living Russian Language*" Vladimir I. Dahl defined "*druse*" as "*some cuttings (crystals) thickly grown on a single stone; a huddle of cuttings, a brush*," where "*huddle*" is "*a pile of something loose or thrown as a crumbly heap*".

1. **Quartz** with **hematite** coating. 11.5 cm wide. China.

2. **Quartz**, crystals on the pyrite crystals. 8.5 wide. Casapalca Mine, Peru.



Specimens, photo and other illustration: Boris Z. Kantor if other is not specified.

The Dahl's definition demonstrates the fact that the idea of a druse was not new. Scientifically, this definition is irreproachable: it defined all the typical features of druses as mineral aggregates. First, it is the whole of the intergrown ("thickly grown") mineral individuals ("cuttings") and that they have both grown on a common base ("a single stone"), and randomly and independently from one another at that ("thrown as a crumbly heap"). Seemingly, one has only to reword all this in the contemporary language of mineralogy, something like this: a druse is a mineral aggregate consisting of individuals (crystals) grown on a common substrate (matrix) from nuclei scattered on it in random orientations and in the absence of any orienting effect upon one another.

But no: the mineralogists are obviously avoiding a scientific definition of "druse" and confine themselves to the generally known visual ideas. As for Western Europe and the USA, they do without the idea itself. The word "druse" exists there but means something different, what we name "drusy cavity" with tiny crystals of the same species on its walls (Glossary of Geology, 2011).

However, to avoid any confusion, we only use the term "druse" in this article in its above meaning according to Dahl's definition.

But why there is no strict contemporary definition? We will understand the cause when we relate to the processes of a druse's origin and evolution, which is an interesting case of inanimate matter self-organization (Kantor, 2011).

A mineral aggregate referred to as "druse" exists from the moment when the crystals arranged randomly and independently on their matrix begin to contact and intergrow. However, this is, at the same time, the beginning of its degeneration because the intergrowth changes from a chaotic growth to ordered one. The process is of a sort of rivalry. The crystals disposed askew to the matrix cease their growth one after another making room for those growing normal to the matrix. Finally, a relatively few participants remain in this collective "race." They are oriented parallel one another and, thus, do not prevent one another from growing (*Fig.* 3). In this way a druse evolves into a *columnar structure* (*Fig.* 4).

3. Model of geometrical selection (Grigoryev, 1965).

4. Smokey **quartz**, 12 cm wide. Donghai, Jiangsu Prov. China.