

THE HABIT CHANGE: INQUIRIES INTO THE PAST, CONJECTURES FOR THE FUTURE

Boris Z. Kantor
Russian Mineralogical Society,
boris_kantor@mail.ru

One and a half of centuries ago, M.A. Tolstopyatov (1869), Russian mineralogist, noted that “*the different parts of a crystal should be identical; however, they are not always so... As an organized body, a crystal must modify its organization at different stages of its development under changing conditions, and this involves various complications*”

The time scale of these changes is extremely small by human standards. A mineral that we look at, or hold in our hands is normally considered the nature’s end product. Its natural history can be reconstructed but its future development, if it had remained in its natural environment, is hidden from us. However, often a potential evolution is already implied in the present form of the mineral. Having detected this tendency, we can imagine approximately the mineral’s future outlook.

The pyrite crystal shown on Photo 1 is a very instructive example, and we shall use it to discover the start up and direction of exterior shape alter-

Photo 1. **Pyrite**, 1.8 cm wide.
Berezovskoe Deposit, Urals, Russia.
Photo: B.Z. Kantor.

Fig. 1. Crystal faces, rapidly and slow growing.

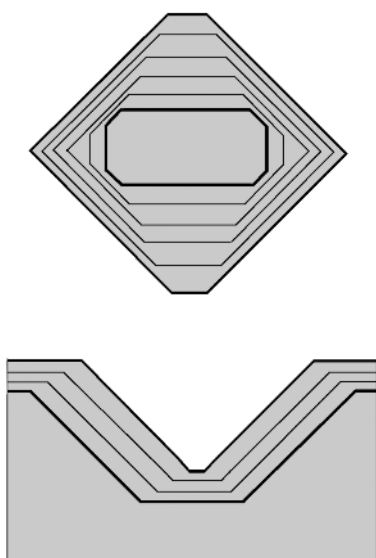


Photo 2. **Quartz**, Japan law twin, 3.5 cm wide.
Pelona Mine, Peru.
Specimen and photo: B.Z. Kantor.

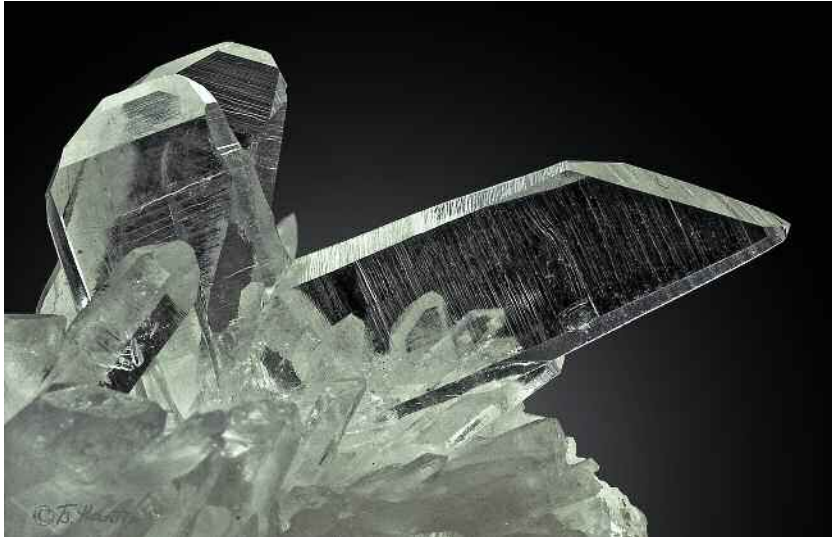
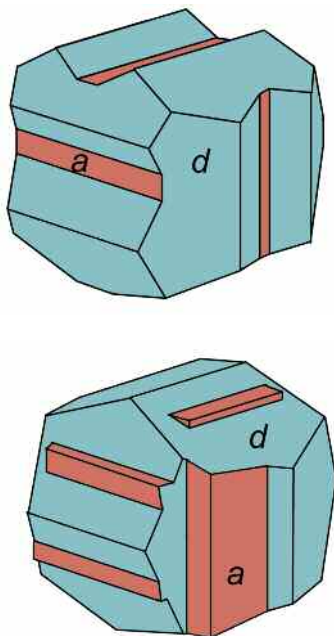


Fig. 2. Cube combined with pyritohedron: two ways of habit change (see Photo 1).



ations. Such alterations are generally named crystal habit changes where habit means the general crystal shape feature: equant, prismatic, lamellar, acicular etc., or, sometimes, the dominating crystal form.

It should be recalled that the *crystal face growth* implies this face's movement in the direction normal to its plane. In the process of crystal growth, *the rapidly growing faces are diminishing in their sizes* while the slow growing ones are expanding as the crystal grows (Fig. 1, up). This is true if reentrant angles are absent. If the crystal has reentrant angles, things may reverse: a slow growing face may diminish in its size being tapered by the rapidly growing adjoining ones (Fig.1, below). Besides, a reentrant angle is a trap for the particles of crystallizing substance; therefore here the crystallization process is more rapid than on the rest of the crystal surface. This fact explains, in particular, the flattened shape of galena spinel twins as well as some quartz Japan twins (Photo 2). All things being equal, reentrant angles are overgrown very rapidly.

But let us return to our example (Photo 1). There are only two forms on our crystal, cube and pyritohedron, the latter evidently dominating at the moment. It is clear from the crystal shape that the pyritohedron has overcome the cube in the process of the crystal development by capturing more and more of the crystal surface. At the same time, the cube growth was slowing down or ceased at all. Let us also notice the small younger crystals overgrown on the main crystal. They appeared when the crystal was approaching its present size and, therefore, witnessed the latest growth stage and participated in it. These small crystals lack the cube faces at all, hence the whole aggregate was only generating pyritohedron faces at that time.