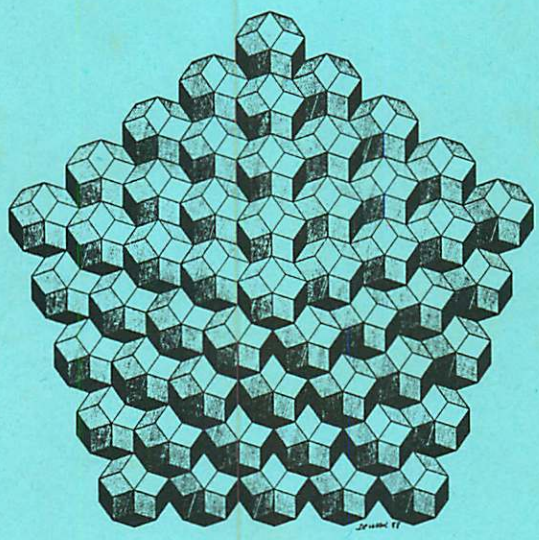
Symmetry of STRUCTURE

an interdisciplinary Symposium

Abstracts

I.



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DYNAMIC MODELS OF QUASISYMMETRICAL CRYSTALS
(Exhibition)

Classic mineralogical notions about the idealized forms of crystals are exchaneged by homologic ones. Homologic mineralogy is based not on 32 classes of symmetry but on 215 classes of homology (I) from which 32 classes of abstract (ideal) crystals are grown as private cases. Apart from symmetrical in quasisymmetrical crystals the axes of homology and conjugated with them elements are not the lines but Fedorov's primas (2). That is why not to mix quasisymmetric bodies with symmetric ones they are called prima-bodies: prima-tetrahedron, prima-octahedron, prima-cube , prima - rhombohedron etc (3).

Of unique importance is homogeneously deformed prima-tetrahedron quanting into four prima-subtetrahedrons and one prima-octahedron. From the prima-tetrahedron all possible variety of quasisymmetric crystal forms are produced (4). Crystals of minerals always, at least a little are not symmetric and they should be considered quasisymmetrical (homological) forms i.e. prima-bodies. The most precise description of quasisymmetric crystal formation (Earth minerals) is obtained on the base of homologic approaches. Prima-bodies as distinct from monolithic ideal crystals have strictly arranged overatomic block structure which defines real properties of crystals.

Connected with this in homological mineralogy under systematic approach they use not a two-stage scheme description (crystal - atomic structure) but a three-stage one (crystal - overatomic block structure , atomic structure). In this method overatomic block structures are described according to the levels of Hierarchy (from large to small). While describing block structures of great

importance are compositions on the basis of golden cross-section and connected with it Fabonachi's numbers indicated by the row I,I, 2,3,5,8,I3,2I etc.(3,4,5). Blocks of different morphological types are inseparably linked with initial (starting) prima-tetrahedrons as they are deduced from them by the way of Fedorov's deformations proper (tension , compression, shears, twisting). From the mentioned above point of view the growth of each prima-tetrahedron (block) is described as its growing tension according to its corresponding axes of homology (vicinal growth). In this case the crystal growth is not superficial but a volumetrical process accompanied by plastic deformation of the whole volume and this brings about a corresponding distortion of its form. This means that growth deformations build up a real form of the crystal.

As the prima-bodies (forms of real crystals) are quasisymmetrical bodies with irrational (vicinal) facing , on the basis of packing such bodies it is impossible to fill in an endless space as it can be accomplished by packing, e.g. Platon's cube. That is why in every crystal (mineral) which attained a certain size big stresses arise as a result of lack of coincidence in prima-cubes (blocks). These stresses result in forming various defects (waviness,patchiness, twisting, blocking, cracking). As a result of this, as Denesh Nad stated, symmetry is linked with density (6). Model constructions made as well coincide with the point of view of M. Seneshal who says that"rational structures are particular samples of more common type" (7). In our case for example the structure of Platon is considered as a particular sample of prima tetrahedron structure which in comparison with Platon's tetrahedron is a more common form.

The procedure of describing the composition and characteristic features of the earth minerals in accordance with 215 classes of homology discovered by V.I. Mikheev requires the establishment of the stock of dynamic homologic crystal models able to describe homologie transformations connected with different deformatuins. On the basis of prima-tetrahedron the author has made more than 2000 homologic models of quasisymmetric crystals. In contrast to static models of 32 classes , the crystal models of 215 classes are dynamic : they can be subjected to homogeneous deformations of tension, shearing, compression and twisting.

Together with the models which are able to deform without breaking a group of models has been designed which is obtained by shearing an intitial model by its transformation (deformation) and by subsequent gluing, thus forming a new body. Among such models there is for example quasihexagonal prima-antiprism (more common analogue is the hexagonal antiprism of Archimed) transformed into prima-icosider which is more common analogue of Platon's icosider.

At the exhibition there are models on display which illustrate the common analogues of Platon's bodies: of prima-tetrahedron, prima-octahedron, prima-cube, prima-icosider, prima-pentagonal dodecahedron. The evolution of enumerated prima-body forms is investigated with the help of models in the process of their vicinal growth. After the example of diamond, quartz, silicon, gold, zircon, calcium and ather minerals here are demonstrated dynamic models strict geometrically describing (after E.S.Fedorov - crumbled) composition of quasisymmetric crystals produced with the help of golden cross section and Fabonachi numbers. On display there are models of crystals (minerals) of different morphological types including twins inosculated sperolytes, druses, splitted, thread-like, twisted, straight and turned out crystals as well as polygonally pipe-like

crystals. At a quite new level dynamic models permit to know the block (regularly quanting) composition of crystals. Such models can be used not only while interpreting the composition natural synthetic crystals and paracrystals but also while investigating and interpreting the composition of biological quasisymmetric crystals (fags in their namber). These modeles can be used in architecture, robot-engineering and in other spheres of knowledge, where are applicable such notions as tension, compression, shearing, twisting and other transformational combinations described on the basis of Fedorov's primas.

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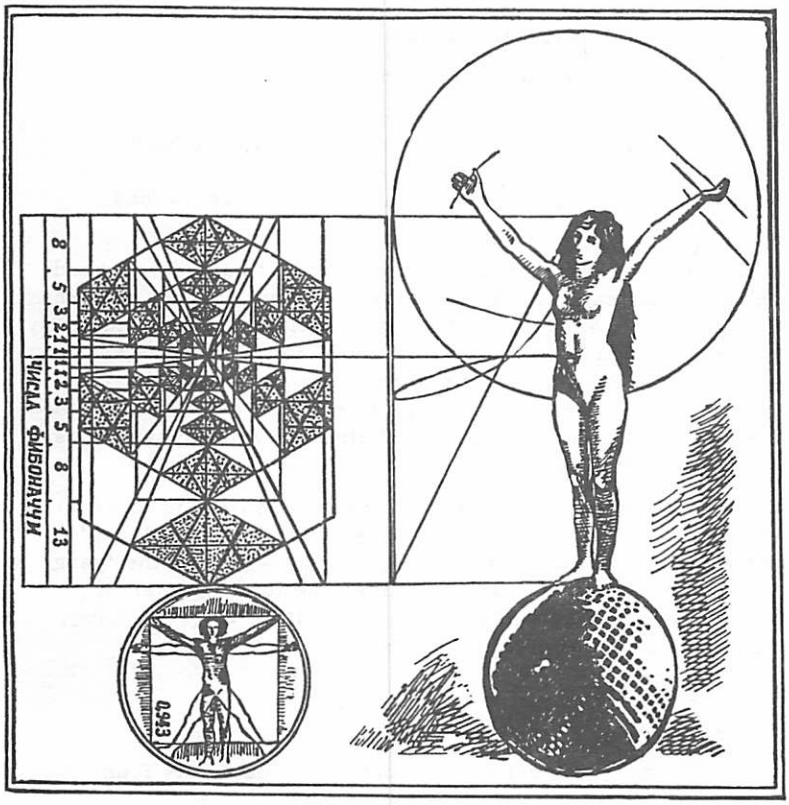

Рис.1 Золотое сечение является той общей платформой, на основе которой описываются объекты исследований гомологической минералогии и гомологической биоминералогии.

В правой части рисунка приведено построение, показывающее, что хорошо организованная фигура человека поясом делится в отношении золотого сечения (61,8% от пяток до пояса и 38,2% от пояса до верхней точки головы). Слева вверху показано золотое сечение природного скелетного кристалла кварца в плоскости 0001. Слева внизу - построение Леонардо да Винчи.