May 3, 2021

Nikolaj P. Dolbilin

Local Theory of Crystalline Structures

Mathematical model of crystalline structure is presented by a discrete point set in Euclidean space whose symmetry group is crystallographic, that is, a discrete group of Euclidean isometries with a compact fundamental domain. Since such highly ordered structures as crystals arise during crystallization from absolutely disordered substance (solution, melt, gas), the question of the reasons for the appearance of "long-range order", in particular, of a periodic crystalline lattice, is quite natural.

Physicists (R.Feynmann) explain the long-range order in a crystalline structure by repeatability of the same limited fragments : "if in matter, atoms are moving not very actively, they get stick together into configurations with energy as low as possible. If the atoms are located somewhere so that their positions correspond to the lowest energy, then in another place the same atoms will make the same arrangement. Therefore, in a solid, the arrangement of atoms is repeated over and over again." The densest packing of plane by equal circles is a very special example, where periodicity of the packing arises as result of applying a local rule, in this case, "each circle is surrounded by six equals". But not everything is so simple. For example, recently discovered quasicrystals (D.Shechtman) also have the recurrence of local fragments, although, as is known, they do not have a periodicity.

In the talk it will be said on the local theory of regular systems. One of the main goals of the theory is to describe local conditions under which a discrete point set has a crystallographic symmetry group. New interesting results on local groups in arbitrary Delone (Delaunay) sets will also be noted.

SCIENTIFIC SEMINAR
"DIFFERENTIAL GEOMETRY AND APPLICATIONS"

headed by Academician of RAS Anatoly T. Fomenko

The seminar takes place online in ZOOM on Mondays
from 4:45 p.m. to 6:20 p.m. (Moscow time)
The zoom-ref is provided only to registered persons
To be registered, ask any participant of our seminar to endorse you
Announcements of previous talks can be found on the seminar website
`http://dfgm.math.msu.su/chairsem.php`