CRYSTALLOGRAPHY

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Research interests include different aspects of crystallography of inorganic objects: crystal structure prediction, calculations of the structure and properties of the minerals at extreme and ambient conditions, phase transitions of carbonates, microstructure of the real crystals, X-ray and electron crystallography, the search of new materials.

Course Outline

1. **The Crystal Lattice:** a basic introduction to the representation of the crystal atomic structure as a three-dimensionally periodic object. The concept of crystal lattice will be introduced, as well as its visual illustration on the 2D and 3D periodic objects will be shown.

2. **Symmetry Elements of Crystalline Polyhedrons:** introduction to the basics of symmetry description of macrocrystalline objects. Students will learn how the symmetry of an object is described and what symmetry elements are necessary for this description. Also, the students will gain experience identifying symmetry elements on idealized paper and wooden crystal models.

3. **32 Point Groups of Symmetry:** an investigation of what combinations of symmetry elements can be present in crystals and how these combinations are classified. The connection between the symmetry of the crystals and the shape of the unit cell of the crystal lattice will be shown. The theoretical knowledge will be supported with extensive practice on the identification of symmetry point groups on the models of the crystals. This will provide the knowledge necessary for further successful participation in the Mineralogy and Petrography courses.

4. **Forms of Crystalline Polyhedrons:** combinations of symmetry elements produce crystal forms. Here, with knowledge on point symmetry, we will determine what crystalline forms are typical for each point group. This is crucial knowledge for field identification of minerals.

5. **Miller Indices:** the orientation of each plane relative to the crystallographic axis is characterized with the Miller indices. Students will learn the orientation of crystallographic axes in each crystal system and their difference from the physical or abstract geometrical axes. In practical classes, students will gain experience identifying Miller indices by stereographic projections.

6. **Real Crystals:** the final and most interesting part of the course. In this section, we will bring together all the knowledge obtained in the previous sections. Using samples of real crystals of rock-forming minerals, we will determine the symmetry, the crystal forms, and the Miller indices and will draw the stereographic projection.