RECOGNITION OF THE WORK OF BORIS Z. KANTOR

John Rakovan,
New Mexico Bureau of Geology and Mineral Resources,
New Mexico Institute of Mining and Technology, Socorro, NM, USA

As noted throughout this issue one of the main areas of mineralogical research that Boris Kantor contributed to was mineral ontogeny (*e.g.* Kantor, 2003). This term, developed by Grigor'ev and others in the 1950s (*e.g.* Grigor'ev, 1961; 1975), refers to the study of individual crystals (*e.g.* their morphologic characteristics) and how crystals combine as aggregates. Kantor continued to publish works in this area for many years. In 2018 the theme of the Tucson Gem and Mineral Society (TGMS) Show was *Crystals and Crystal Forms*. Kantor gave a talk that year in the TGMS-Mineralogical Society of America-Friends of Mineralogy symposium on his work in mineral ontogeny. Because he was not able to be there in person he presented remotely from his home in Russia; something that has become commonplace today but was rare at that time.

Aspects of ontogeny such as crystal splitting are topics that have not been common in the western literature. Below is a beautiful example of crystal splitting in quartz. Kantor published many papers describing morphologic characteristics of split and aggregate crystals which are now being cited more frequently in the western scientific literature. This is because of recent interest in the ability to synthetically grow crystals and crystal aggregates with complex morphologies for potential materials applications, and to better understand crystal growth during biomineralization (*e.g.* Cölfen and Antonietti 2005; Farfan *et al.,* 2021). The manufacture of nano crystalline materials with specific morphologies including clusters such as split crystals is a hot topic of research. Although Kantor's work was mostly descriptive he did present hypotheses on the possible mechanism of formation of split crystals and other aspects of mineral ontogeny. With the advent of new analytical techniques with molecular and atomic scale resolution modern scientific studies are elucidating the pathways to the formation of the beautiful aggregate morphologies that Kantor has described in his many papers.

The cause and growth mechanism of split crystals in nature is poorly understood (Grigor'ev, 1961; Ul'yanova *et al.*, 1984). Recent studies of the morphologies of synthetic nanocrystals has shown that splitting can result from several different causes. These include the incorporation of molecular-scale impurities that cause offsets in the crystal structure (Pilapong *et al.*, 2010); poor orientation fidelity during crystal growth by self-assembly of nanoparticles (Tang and Alivisatos, 2006; Suzuki *et al.*, 2015; Arumugam *et al.,* 2017); and systematic defect production during rapid crystal growth at high degrees of solution supersaturation (Cha *et al.*, 2013).

A doubly terminated split **quartz** crystal (a.k.a. *bow* tie morphology) on a spray of **hedenbergite** crystals. 8 cm across. Second District of the Huanggang Mine, Inner Mongolia, China. John Rakovan specimen and photo.

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