Personal Reminiscences

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As an alumnus of the then famous Polytechnic Institute of St. Petersburg (Leningrad) I enjoyed the personal influence of the best Russian professors of the first 15 years of this century, among them Prof. A. Joffé. During the years of the Revolution I happened to live in a small provincial town without industry, and once was head of a 'Sovnarhoze'.

Then I became an ordinary analytical chemist in a Leningrad factory. The well-known geochemist and mineralogist A. E. Fersman selected me to become one of the chief contributors for his magazine *Priroda* ('Nature'). I was for him a person who could write something about anything in all fields of pure Science. These were the times of V. M. Goldschmidt's mighty intrusion into the mineral sciences with ionic radii, coordination numbers, etc. Nobody in Russia was able to get beyond the very elements of Goldschmidt's geochemistry and crystal chemistry, and so Fersman decided that here was a job for me. The first result was a translation of Hassel's *Crystal Chemistry*; the Russian version was twice the size of the original and contained ten times as many figures. After that, I compiled *Fundamental Ideas of Geochemistry* with translations of papers of authors such as Bragg, Schiebold, Machatschki, W. H. Taylor (felspars). I became an authority for explaining to the geologists the inner mechanism of their minerals.

After some adventures in mineral technology, I entered quite by chance a new Laboratory (some years later it became an Institute) of Crystallography, created by Shubnikov, and here I was soon made Head of the X-ray Department, without my having an adequate knowledge of, or practice in X-rays (by the principle of 'better you than anyone not belonging to our clan'). I was then 45. The competition with the old-timers in X-rays was at the time not too hard, because it was the era of Patterson syntheses, of new Fourier methods (Beevers and Lipson strips), etc., and it was an easy matter to get ahead of the classical X-ray people of Glocker's type. In Russia most of these were metal physicists and convinced that crystallography is just a small part of metal physics.

Also quite accidentally I became Professor of Crystallography and

X-ray Analysis in the Faculty of Physics of the Gorki University. *Docendo discebam* and acquired the knowledge which I was still lacking, being primarily a chemist and mineralogist.

In my teaching I adopted a method of introducing space groups which was generally accepted in Russia and is partly presented in my booklet on *Space Groups*. We believe that our students should play with space groups in a similar manner as they play, a year earlier, with wooden models of crystal shapes which are traditional in crystallographic collections. For introducing the students to the more complicated structures, a theory of closest packing was developed and explained in a book which is well known in Russia. About 15 of my original figures may now, after 12 years, be seen in Azaroff's *Introduction to Solid State Physics*, two of them adorning the inner and outer covers of the volume. Gorki, where I am spending no more than 50–60 days a year, has become for me the source of my best pupils. They readily come to me with the quite realistic hope of being advanced to Moscow; in contrast to geologists, they usually have a good training in general physics and mathematics. Their diploma theses all contain contributions connected with my name, mainly in the field of space-group theory of different dimension and kinds: ordinary, black-white, and colour groups. Their Ph. D. theses deal with new direct methods of solving crystal structures: inequalities, statistical approach, superposition methods, and contain many original ideas immediately applied to the analyses of new structures.

As a mineralogist (my colleagues from Geology made me a member of the Academy) I always chose as thesis subjects for my students significant silicate structures. When the number of solved structures exceeded twenty, I tried to invent a system covering all of them, and this is the 'Second Chapter of the Crystal Chemistry of Silicates' which I am at present preaching to the world. Most of these silicates are the Zr, Ti, Nb, Ta, Be, and Li silicates which are so important for the mineral technology; others are calcium hydrosilicates which are no less important for the cement industry. Both parts have been shown to be governed by the same set of crystal-chemical laws. Only this year I was exceedingly happy and felt myself rewarded by the discovery by one of my pupils (she is a mineralogist) that there exists a dimorphous silicate which forms two types hitherto regarded as exclusive in one and the same substance: epididymite, $NaBeSi_3O_8H$, is a chain silicate, while eudidymite, having the same formula, is a layer or net silicate (Phyllosilicate).