

### **Real versus Virtual aids in Teaching Crystallography**

Mariusz Jaskolski, Elzbieta Bartoszak-Adamska, *Department of Crystallography, Faculty of Chemistry, A. Mickiewicz University, Poznan, Poland.* E-mail: mariuszj@amu.edu.pl

Crystallography is a special discipline, impossible without models. Our macroscopic models of the microscopic world are only crude approximations of the atomic reality. Those artificial "reflections" of the real world can be expressed using material "substance" or as virtual reality. The explosive development of computer graphics tools has provided a tremendous boost to both structural research and teaching. Without the use of computers it would be impossible to teach about the expanding frontiers of biocrystallography. In addition to being the scenes and tools for displaying and manipulating molecular models, computers are also invaluable in modernizing the teaching/learning process, facilitating distance education, individual learning pace, exchange of teaching aids, etc. Despite the possibilities offered by computer tools, many educators believe that the use of traditional "real" models is essential. Classroom experience shows that some aspects of space and symmetry, almost intuitively obvious with solid models, are complicated or inconvenient when handled on the computer screen. At the introductory level, where simple models and hand-waving can be very appealing, there is no need to strive to recreate three dimensions in the computer. There is also a psychological aspect of using solid objects as material models, even if not perfect, seem to have some physical properties that make them closer to the real world than the idealized computer representation. Besides, computer models can only display what had been foreseen by the programmer, while the use of pliers, plasticine, glue, and imagination can lead to almost unlimited creativity.

**Keywords: computer graphics, models, teaching aids**