s14.m40.o2 **Teaching about chirality in crystals and molecules**. H. D. Flack, *University of Geneva, Switzerland. E-mail: Howard.Flack@cryst.unige.ch*

Keywords: Chirality; Absolute Configuration; Absolute Structure

Why and what do we need to teach synthetic chemists about chirality in crystals? How should we set about it? The motivation behind the first question comes from the requirement of synthetic chemists to determine absolute configuration from single-crystal X-ray diffraction measurements. For the budding crystallographer or structure analyst the questions need to be set wider and to encompass the treatment and interpretation of crystals with a non-centrosymmetric structure. The goal sought after is for these people to be capable both of designing experiments appropriate to their requirements, and of interpreting and reporting the results that are obtained.

Although much of the scientific content of the material needing to be taught can be found in the author's publications [1,2,3,4,5], clearly this needs augmenting by striking illustrative examples. Furthermore it has been found essential to include material on the phase diagrams of enantiomeric mixtures and their crystallization. For the latter the monograph [6] is an invaluable source of reliable material.

During the talk a selection of the teaching materials that we keep under constant revision and modernisation will be presented.

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[6] Jacques, J., Collet, A. & Wilen, S. H. (1983, 1994), *Enantiomers, Racemates and Resolutions,* Reissue with corrections, Krieger, Malabar, FL.

s14.m40.o3 **Crystallography in Kindergarten [1]**. Bart Kahr, *Department of Chemistry, University of Washington, Box 351700, Seattle WA 98195-1700, USA. E-mail: kahr@chem.washington.edu*

Keywords: Froebel, Kindergarten, Education

Friederich Froebel, a nineteenth century educator trained as a crystallographer, invented Kindergarten. Froebel's background in crystallography infused every aspect of his conception of Kindergarten, especially the self-actuated learning devices or "gifts" that were the center pieces of his curriculum. Froebel kindergartens spread rapidly through Europe, the United States and Japan in the latter half of the nineteenth century. Crystal engineering was thus a primary occupation of millions of children in the first several kindergarten generations. The kindergarten-crystallography connection was first established by Jeanne Rubin [2], a professor of music, and was later expounded on by Norman Brosterman [2], an architect. However, the importance of crystallography in the early childhood education is virtually unknown among crystallographers. Here, we review the remarkable life of Froebel, his crystallographic worldview, and his influential invention. We further discuss how Froebel kindergartens influenced modern art and speculate on how they influenced the course of modern science, especially X-ray crystallography.

[1] B. Kahr, Cryst. *Growth Des.* **2004**, *4*, 3-9.
[2] Rubin, J. S. Intimate Triangle: Architecture of Crystals, *Frank Lloyd Wright and the Froebel Kindergarten*, Polycrystal Book Service, Huntsville, Alabama, 2003. http://www.polycbs.com/flier.jpg
[3] Brosterman, N. *Inventing Kindergarten*, Harry N. Abrams, New York, 2002.