CSD structures created specifically to illustrate key chemical concepts, and a number of teaching modules that make use of this subset in a teaching environment. All of this material is freely available from the CCDC website, and the subset can be freely viewed and interrogated using WebCSD, an internet application for searching and displaying CSD information content. Examples of more extensive educational applications that utilise the complete CSD System will also be reviewed.
The educational value of visualising real 3D structures, and of handling real experimental results, will be stressed throughout.

Keywords: Teaching, Cambridge Structural Database, WebCSD

MS46-T05

Teaching Protein Crystallography using Interactive Whiteboard Technology. Ehmke Pohl, *Department of Chemistry, School of Biological and Biomedical Sciences, Biophysical Sciences Institute, Durham University.*
E-mail: Ehmke.pohl@durham.ac.uk

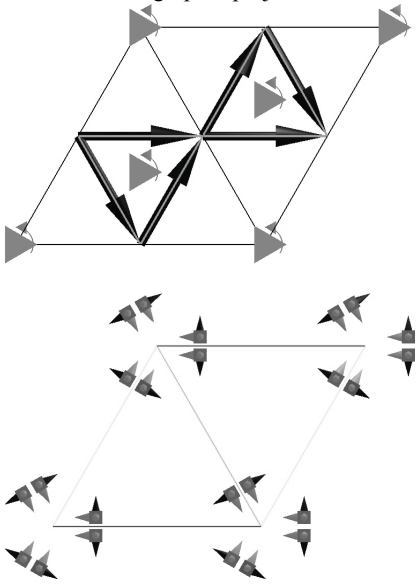
Today's modern pedagogical concepts all recognize that learning experience and outcome is optimal when teaching is an active process with frequent interactions between teacher and students. It is widely accepted that understanding of the subject is best achieved through discovery, collaboration and dialogue.
Interactive whiteboards (IWB) allow the use of various electronic devices to draw on projections based for example on Powerpoint presentations. Teacher and students can directly annotate figures, drag-and-drop text and illustrations from one application to another and save all actions in electronic form. This material can then be evaluated and corrected before being distributed to all students. Furthermore, IWBs offer the advantage that the mouse control can be replaced by hand movements, which allows students to interact intuitively with the material displayed. Direct engagement is clearly motivating for all students but it also encourages lecturers to adopt innovative teaching methods and hence go beyond the safety of their regular powerpoint presentations.
IWB technology has been adopted for the protein crystallography course, which is one module in the newly established MSc in Biomathematics postgraduate program led by the Mathematics Department at Durham University. The PX course covers a wide range of topics from basic structural biology concept to mathematical crystallography and protein structure determination. Here, we will present general ideas and specific examples how IWB are utilized to enhance student's learning experience and outcome.

Keywords: interactive whiteboard, crystallography, structural biology

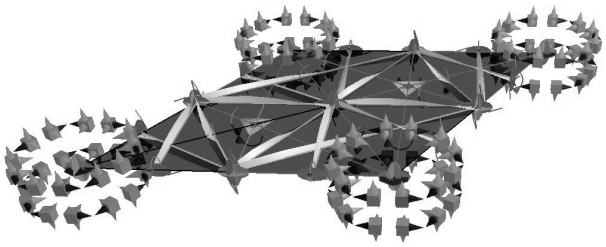
MS46-T06

Interactive 3D Visualization of Plane Groups and Layer Groups Using the SGV. Eckhard Hitzer[a], Christian Perwass[b]. [a]*Applied Physics, University of Fukui, Japan.* [b]*Raytrix GmbH, Kiel, Germany.*
E-mail: hitzer@mech.u-fukui.ac.jp

In this presentation we will show how the Space Group Visualizer (www.spacegroup.info) interactively visualizes two-dimensional (2D) plane groups [1], and layer groups [2]. We demonstrate how to successfully display the 17 plane 2D space groups in the interactive crystal symmetry software Space Group Visualizer (SGV). The SGV is based on a new type of powerful geometric algebra visualization platform CLUCalc.
The principle is to select in the SGV a three-dimensional super space group and by orthogonal projection produce a view of the desired *plane 2D space group*. The choice of 3D super space group is conveniently summarized in a lookup table. The direction of view for the orthographic projection needs to be adapted only for displaying the plane 2D space groups Nos. 3, 4 and 5. In all other cases space group selection followed by orthographic projection immediately displays one cell of the desired plane 2D space group, see e.g. the plane space group *p31m* in the Figure.



The full symmetry selection, interactivity and animation features for 3D space groups offered by the SGV software become thus also available for plane 2D space groups. A special feature is, that by canceling the orthographic pro-jection every plane 2D space group is seen to be a *subgroup* of a corresponding 3D super space group.
The visualization of *all* 80 *layer groups* relies on the SGV features of view reduction to 3D cells with 2D translations. It will be explained how to visualize layer groups, together with concrete examples. See e.g. *p6mmm* in the Figure below.



[1] Hahn, T. (ed.), *Int. Tables for Crystallography, Vol. A*, 5th ed., Springer, 2005. [2] Kopsky, V., Litvin, D.B. (eds.), *Int. Tables for Crystallography, Vol. E*, 1st ed., Kluwer, 2002.

Keywords: interactive 3D visualization, plane groups, layer groups