o.m11.o1 **Teaching Crystallography to Reluctant Physicists.** A.M. Glazer, *Clarendon Laboratory, Parks Rd., Oxford OX1 3PU, United Kingdom*
Keywords: teaching crystallography.

Typical undergraduate physics syllabuses in the United Kingdom normally contain at least one course on what is these days termed "Condensed Matter Physics". Within this boundary the field of Crystallography usually occupies only a small introductory niche, before students go on to learn what they perceive to be the more interesting subjects of semiconductors, magnetism and superconductivity. The result of this is that only the most basic elements of Crystallography are taught, being largely limited to cubic systems and the most elementary concepts of symmetry and diffraction data collection. Yet, despite this simplicity of approach, experience shows that Oxford examination questions in this area tend to be poorly done, whereas more complex physics is well appreciated. In this talk, these problems will be briefly discussed and a sample of a computer-aided basic Crystallography lecture course especially designed to suit physicists attending the Oxford Condensed Matter Physics course will be demonstrated.

o.m11.o2 **Electron Crystallography – Teaching and Imagination**. U. Kolb, *Institut für Physikalische Chemie, Johannes Gutenberg-Universität, Welderweg 11, 55099 Mainz, Germany, http://www.uni-mainz.de/~kolb*.
Keywords: teaching crystallography.

To enter the world of electron crystallography it is important to understand the connection between an image and its diffraction pattern. With an optical system (633nm He-Neon laser and three lenses) it is possible to produce both from an object on a negative slide onto a screen [1]. The switch-over between an image and its Fourier transformation can be performed by removing one lens of the system. In this manner one can step from 1D- to 2D- and furthermore to disordered lattices while explaining the meaning of reciprocal space.

The main parts of a Transmission Electron Microscope (TEM) can be compared directly with such an optical system. One can also switch between real and reciprocal space, with just a change in dimensions. The effects of lenses and apertures on the limit of resolution should be discussed here [2].

In comparison to x-ray diffraction the smaller wavelength (bigger Ewald sphere) allows us an approx. planar cut through reciprocal space. Tilting the crystal around special axes leads to several of these diffraction patterns (zones). Now it is possible to find cell parameters and space group of the crystal [3]. Apart from a mathematical approach to explain e.g. extinctions, it is very important to build up a skill in reading reciprocal space directly. This may be supported by simulation programs for diffraction patterns [4].

In order to analyse electron diffraction data properly, it is necessary to emphasize some differences between x-ray and electron diffraction.

1. Dynamical scattering due to a high interaction ratio of electrons with matter causes changes in intensity of reflections and the appearance of forbidden reflections.
2. Thin crystals, needed for TEM investigations, show "rod-like" reflection shapes.
3. Biased tilt geometry causes a missing cone in reciprocal space.

To discuss these effects, based on the understanding gained before, it is good to skip to a more mathematical explanation by using e.g. blochwaves [4].

[1] G. Koppelmann, PhuD 4, 314 (1981).
[2] Transmission Electron Microscopy, D.B. Williams and C.B. Carter, Plenum Press 1996.
[3] I.G. Voigt-Martin and U. Kolb, International School of Crystallography, 26th course: Electroncrystallography, Erice, 1997.
[4] Cerius2, Molecular Simulations, Oxford.