In these fields, we witness a tremendous development: modern neutron optics allow us to ap-ply polarisation analysis in a routine manner in neutron scattering experiments. Full vectorial polarisation analysis can be combined with spectroscopy to separate the magnetic- from the structural scattering, obtain vectorial information on magnetisation-fluctuations and chirality. High energy and resonant X-ray scattering in the hard and soft X-ray range at third generation synchrotron radiation sources provide complementary information on the electronic structure, on element and band specific spin polarisation, and on charge and orbital order directly re-lated to magnetism.
We will illustrate the potential of these novel methods on several examples ranging from magnetic nanoparticles, molecular magnets, thin film systems to highly correlated electron systems such as multiferroics, the family of the novel iron pnictide superconductors and oxide multilayers.

Keywords: magnetism; polarization analysis; neutron & synchrotron X-ray scattering

KN-9

93 Years After Debye & Scherrer: Powder Diffraction in the 21st Century. Robert Dinnebier. *Max-Planck-Institute for solid State Research, Stuttgart, Germany.*
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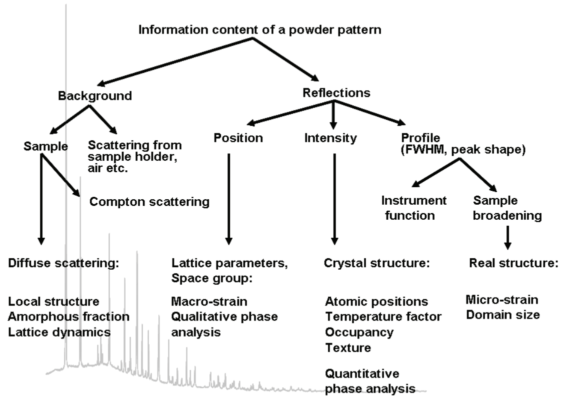
Although, the powder method was developed as early as 1916 by Debye and Scherrer [1], for more than 50 years its use was almost exclusively limited to qualitative and semi-quantitative phase analysis and macroscopic stress measurements. The main reason for this can be found in what is known as the principal problem of powder diffraction: accidental and systematic peak overlap caused by a projection of the three dimensional reciprocal space on to the one dimensional 2θ axis, leading to a strongly reduced information content compared to a single crystal data set. However, despite the loss of angular information, often sufficient information resides in the 1D dataset to reconstruct the 3D structure. Indeed, quantitative analysis of the pattern using modern computers and software yields the wealth of additional information about the sample structure that is illustrated in the figure below [2]. Modern instrumentation and sources are yielding data of unprecedented quality and modern analysis methods continue to increase our ability to harvest useful information from the data. The powder diffraction technique has never contributed to materials research in more diverse and important ways than now as we approach its centenary.
The information content of a powder pattern is huge, but much effort is needed to reveal the often hidden information. In the last decade, many new ideas have been successfully applied to powder diffraction, like the method of maximum entropy (MEM), fundamental parameters, global optimization in direct space, physical description of anisotropic peak broadening, parametric refinement, kinetics, distortion mode amplitudes, to name just a few.
It is the intention of this talk to discuss some hot topics in powder diffraction in theory and practice.



[1] Debye, P. , Scherrer, P. "Interferenzen an regellos orientierten Teilchen im Röntgenlicht," Phys. Z. 17 **1916** 277-282. [2] Dinnebier, R. E. (Editor), Billinge, S. J. L. (Editor) "Powder Diffraction: Theory and Practice", Publisher: Royal Society of Chemistry; 1st edition **2008** 574 pages .

Keywords: powder diffraction; Debye-Scherrer

KN-10

When Flavins get the Blues. Ilme Schlichting. *Max Planck Institute for Med. Research, Heidelberg, Germany.*
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Light is an important environmental variable and most organisms have evolved photoreceptors to respond to it. Photoreceptors are nano-switches that perceive the light signal by a chromophore containing sensing domain and transmit it via a structural change to an associated effector domain that subsequently gets (in)activated. Although a great deal of biochemical and spectroscopic data is known about these important relay systems, none is understood on a molecular level. This is not only frustrating from a basic science point of view but also hampers their redesign for cell biological or neurobiological applications.
Many blue-light photo-sensors rely on the light-sensitivity of the flavin cofactors, examples include the LOV- and BLUF-domains and cryptochromes/photolyases. Recent results on these different systems will be presented, sketching out the theme and variations in the paths from photon absorption to biological effects. Emphasis will be put on a blue-light activated phosphodiesterase involved in turnover of the bacterial second messenger cyclic-di-GMP. The light activation mechanism of the BLUF-photoreceptor and the catalytic mechanism of the phosphodiesterase will be presented.

Keywords: photoreceptor; mechanism; signaling; conformational changes

KN-11

Crystallography of Complex Thermoelectrics. Sven Lidin. *Department of Inorganic Chemistry Stockholm University, Stockholm, Sweden.*
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