13. X–1 THE PRODUCTION OF NEUTRONS BY SPALLATION SOURCES. By C. G. Windsor, Materials Physics Division, AERE, Harwell, Oxon OX11 ORA, UK.

At the present time we are in a time of strong expansion in neutron sources using accelerator based pulsed proton spallation. The progress over the last few years and the probable growth over the next few years will be reviewed. The sources with very short proton pulses offer performance (counts per given resolution) essentially independent of neutron energy over the epithermal range. The present fruits of this will be reviewed for diffraction and inelastic scattering. Speculations will be given on how these may be extended over the next few years. The longer proton pulse sources offer very high peak thermal fluxes and are well suited to the production of cold neutrons, which have a long intrinsic moderation time. The performance of experiments suited to these sources will be compared with these on shorter pulsed sources and on reactors.

13. X–2 HIGH-RESOLUTION POWDER DIFFRACTION AT PULSED NEUTRON SOURCES. By James D. Jorgensen, Argonne National Laboratory, Argonne, IL 60439, USA.

The recent development of accelerator-based pulsed neutron sources has made possible the design and operation of time-of-flight powder diffractometers which achieve high resolution and count rates. Since no chopper is used, the sample can view a large source area. Thus, long source-to-sample flight paths can be used to obtain high resolution. The pulse repetition rate is typically low enough to avoid frame overlap. Count rates are maximized by combining detectors into time-focussed groups. In the most recent diffractometers, time focussing is accomplished by in-line microcomputers rather than geometrical methods and can be done at any scattering angle. Rietveld structural refinement of data from these instruments requires a precise description of the incident neutron flux versus wavelength and of the peak shape. The peaks are non-Gaussian and asymmetric, with the width being roughly proportional to wavelength. However, suitable analytical functions which adequately model the peak shape and its wavelength dependence have been developed and Rietveld refinement of pulsed-source, time-of-flight data is now routinely done. When used at a pulsed neutron source, the time-of-flight method allows a large range of reciprocal space to be viewed simultaneously. The resolution at a given scattering angle is nominally constant. Since complete data can be obtained at a single scattering angle, the time-of-flight method also offers advantages for diffraction in restricted environments.

This work has been supported by the U. S. Department of Energy, Division of Materials Research under contracts DE-AC02-76ER01198 and W-31-109-ENG-38.

13. X–3 THE APPLICATION OF SPALLATION NEUTRON SOURCES FOR INELASTIC SCATTERING. By B. Alefeld, Kernforschungsanlage Jülich, Germany.

The most important characteristic feature of a Spallation Neutron Source is the possibility of time dependent neutron production. The time dependent structure of the neutron flux leads to a direct advantage for the time-of-flight methods. This has been demonstrated impressively at the existing Spallation sources at Argonne (USA), Los Alamos (USA) and KEK (Japan) where results have been obtained, which could not or only hardly be obtained at the existing High Flux Reactors where the time averaged flux is much higher. It will be shown, that also other important spectroscopic techniques which are successfully used on steady state sources like Triple Axis Spectroscopy, Back-Scattering, Small Angle Scattering and Spin Echo-Spectroscopy gain by the time dependent neutron flux of a Spallation Neutron Source (compared to a steady state source with the same average flux). The time dependent neutron flux of a Spallation Source probably wil cause a revival of promising spectroscopic methods like the correlation spectroscopy and certainly is a strong stimulation for developing new experimental methods, leading to a better neutron economy for scattering experiments than is possible on coutinous neutron sources. A new type of a time of flight instrument is described, in which phase space transformation is combined with time focusing leading at least theoretically to pulse intensities which are much higher than at existing time of flight instruments.

13. 1–1 A NEW LINEAR POSITION-SENSITIVE SCINTILLATION DETECTOR FOR NEUTRONS. By W. Schäfer, E. Jansen and G. Will, Mineralogisches Institut, Außenstelle in KFA Jülich, Universität Bonn, Bonn, W.-Germany.

The technique of the linear scintillation position-sensitive detector (PSD) is based on the principle of the gamma-ray Anger camera modified by new electronical processing and stabilisation methods to the requirements for application in neutron powder diffractometry (Schelten, J., Kurz, R., Naday, I. and Schäfer, W., Nucl. Instrum. Methods (1983) 205, 319; Naday, I. and Schäfer, W., (1983) Proc. of the Workshop on Position-Sensitive-Detection of Thermal Neutrons, Grenoble, 1982 (Academic Press, London) in the press. The scintillator material is ^{6}Li-enriched glass of 1 mm thickness with a detection probability for 1.3 A neutrons of about 75%. One PSD unit has a sensitive length of 682 mm using 24 photomultiplier tubes of 1 1/8" diameter each. The spatial resolution of the PSD expressed by the width of the response function is 2.5 mm (FWHM). The integral linearity is better $\pm$ 0.1 mm. The pulses of one PSD unit are registered in 1024 channels. The channel to channel variation along the PSD is $\pm$ 1.5% according to a primary calibration by an homogeneous illumination with neutrons. The gamma-sensitivity of the ^{6}Li-glass scintillator is minimized by electronical pulse height discrimination to lower 10^{-4}.

Two identical PSD units (one is shown in the figure) are installed on the powder diffractometer KATINKA in the research reactor DIDO in the KFA Jülich. It is possible, to vary the distance PSD-sample continuously between 115 and 190 cm corresponding to 2θ-ranges of about 33° and 20° resp. for each unit, thus varying the angular resolution of the PSD from 0.12° to 0.07° resp. The angular separation between the two units is also