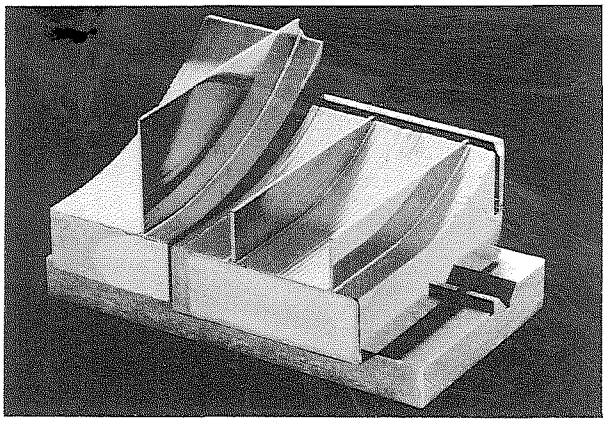

Figure : Two crystal X-ray interferometer, crystal parts cut from different silicon materials.

11.6–4 X-RAY DIFFRACTION IN A FINITE CRYSTAL WITH A LINEAR LATTICE PERIOD VARIATION. By A.V.Kolpakov and V.I.Punegov, Department of Physics, Moscow State University, Moscow, USSR.

In (⁎) (Chukhovskii F.N. et al. Acta Cryst., 1978, A34, 610) a dynamical theory of X-ray diffraction in a semi-infinite crystal with a constant deformation gradient has been presented. A kinematical theory for thin crystals with a linear onedimentional lattice constant variation has been developed in (⁎⁎) (Kolpakov A.V. et al. Kristallografija, 1977, 22, 473). The present report discusses a dynamical diffraction in a crystal of finite thickness with a linear change in the interplanar spacing. For this case the amplitude of Bragg reflection R (the notations see in (⁎)) is:

$$R(z=0)=\frac{\pi \kappa^{g} P e^{-i\frac{\pi}{4}}}{|\gamma^{g}|\lambda(4B)^{\frac{1}{2}}}\,\frac{D_{-\nu-1}(-x_1)D_{-\nu-1}(x_0)-D_{-\nu-1}(x_1)D_{-\nu-1}(-x_0)}{D_{-\nu-1}(-x_1)D_{-\nu}(x_0)+D_{-\nu-1}(x_1)D_{-\nu}(-x_0)}$$

where D_j – Weber`s function of the j-th order

The results for a thin or semi-infinit crystal follow from this general solution. We interpret the results by analogy with Fresnel construction (⁎⁎). In particular, it is shown, that the diffraction in finite and semi-infinite crystal with linear lattice period variation to be similar to Fresnel diffraction at the slit and screen edge, respectively. The intensity maxima of the one-sided oscillation profile of the reflection curve for a semi-infinite crystal correspond to the Bragg conditions for odd Fresnel layers in the crystal. For the practical purposes we have been developed a good convergent approximation.

11.6–3 FRAUNHOFER DIFFRACTION OF DYNAMICALLY DIFFRACTED BEAMS IN DISTORTED CRYSTALS. By C. Malgrange, Laboratoire de Minéralogie-Cristallographie, Université Pierre et Marie Curie, Paris, France and J. Gronkowski, University of Experimental Physics, Varsaw, Poland.

Diffraction by a slit is a well-solved problem in classical optics where homogeneous media are considered. An incident plane-wave of wavelength λ going through a slit of width e, gives, over a distance of the order λ^2/e,a beam of constant width e, slightly perturbed by Fresnel diffraction. At larger distances, the beam diverges with a Fraunhofer angular half width equal to λ/e.
It has been shown (A.Authier, C.Malgrange, C.R. Acad.Sc. Paris, (1966), 262, 429) that for an X-ray plane wave at Bragg incidence on a perfect crystal, the same phenomena occur but with a magnification of the order of Λ/λ (Λ means the extinction distance) resulting from the angular magnification in the crystal. Consequently, the distance at which the beam diverges is then of the order of e^2/Λ.
The aim of this work is to show how diffraction acts on the propagation of an X-Ray beam at Bragg incidence in a slightly distorted crystal. Computer experiments have been performed using Takagi's equations in the Bragg case and for a constant strain gradient. The results obtained for various values of the departure from exact Bragg incidence, the strain gradient and the slit width can be interpreted by extending to distorted media the following argument working in media of constant refraction index : Fraunhofer diffraction occurs at distances from the slit at least equal to the distance at which the Fraunhofer image is wider than the width of the slit.

11.7–1 DIFFRACTION OF THERMALLY SCATTERED X-RAYS IN CRYSTALS. By Y. Kashiwase and Y. Kainuma, College of General Education, Nagoya University, Chikusa-ku, Nagoya 464, Japan.

The aim of this paper is to review our recent experimental studies on the diffraction pattern formed by the thermal diffuse scattering (TDS) reflected secondarily by the net planes in a crystal which has been predicted theoretically by one of the present authors (Kainuma,J. phys. Soc.(1961)16,228). The patterns were observed in the Bragg arrangement by the present authors on the Laue photograph of a urea nitrate crystal (Kashiwase,Kainuma and Minoura, J.Phys.Soc. Jpn.(1981)50,2793) and pyrolytic graphite crystals (Kashiwase,Kainuma and Minoura, Jpn.J. Appl.Phys. (1982)21,L34. Acta Cryst.(1982)A38, 390). The patterns consisted of a defect line across the 002 diffuse spot and an excess line across the diffuse background around the incident beam spot. On the other hand, an excess line in place of defect line was found across the 200 diffuse spot on Laue photograph of a calcite crystal in the Bragg arrangement (Kashiwase and Kainuma, J.Phys.Soc.Jpn. (1982) 51,2379). Strong excess lines were also observed across the 111 diffuse spot in the Bragg arrangement and across the 220 diffuse spot in the Laue arrangement on Laue a photograph of a germanium crystal (Kashiwase and Kainuma, delivered at the Meeting of the Phys.Soc.Jpn. held at Yokohama National University (1982) to be published). The crystals given above are classified into two groups. The former crystals are relatively imperfect. TDS related to the defect line is very strong owing to their