PRÉSERVER
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DOCUMENTATION ET MODE D'EMPLOI DE LA CHAMBRE DE DIFFRACTION DE RAYONS X SEARLE

FICHE N° 4012

Période de fabrication : 1975-1999
Fabricant : Elliot Marconi Avionics Ltd
Domaines : Chimie
Sous-domaines : Chimie organique, Cristallographie
Organisme : Université de Rennes
Ville : Rennes
Modèle : XRAY SAS Camera
Matériaux : Papier

Description

La chambre de diffraction de rayons X pour faibles angles XRAY SAS Camera a été diffusée par la firme Elliot-Marconi Avionics. Avec cet appareil, une nombreuse documentation en anglais et un mode d'emploi détaillé étaient fournis et permettait d'effectuer son montage, les réglages, la maintenance. De nombreuses expériences étaient décrites et quelques films photographiques ont aussi été retrouvés ainsi que le mode d'emploi réalisé pour cet instrument par la société Baird et Tadlock.

Utilisation

La chambre diffraction de rayons XRAY SAS Camera, diffusée par la firme Elliot -Marconi Avionics, permettait de faire de nombreuses expériences grâce à ses trois dispositifs expérimentaux différents : torroïd d'Elliot, double miroirs de Franck, optique de Huxley-Holmes. Elle servait en particulier à déterminer des structure de matériaux cristallins ou peu cristallins tels que polymères et molécules biologiques.

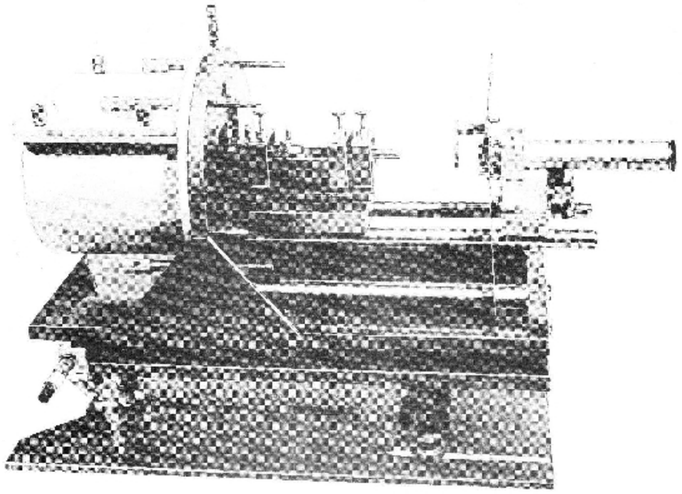

PLATE 8

The camera with toroid optics in position for alignment in the X-ray beam. The radiation shield would normally be placed between the microscope and the vertical support plate during alignment.

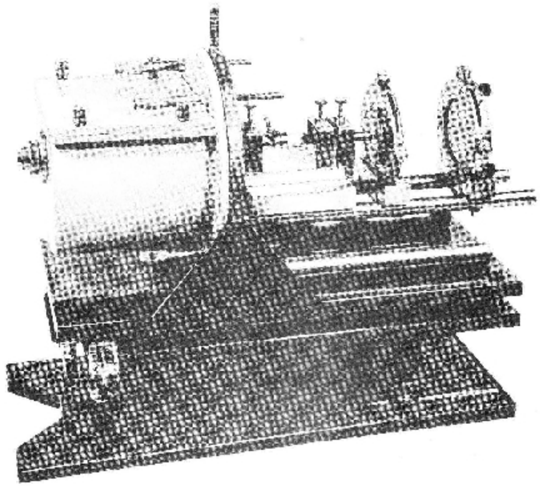

PLATE 9

View of the camera showing positions of 9" vee, specimen holder and backstop/film holder on the optical bench.

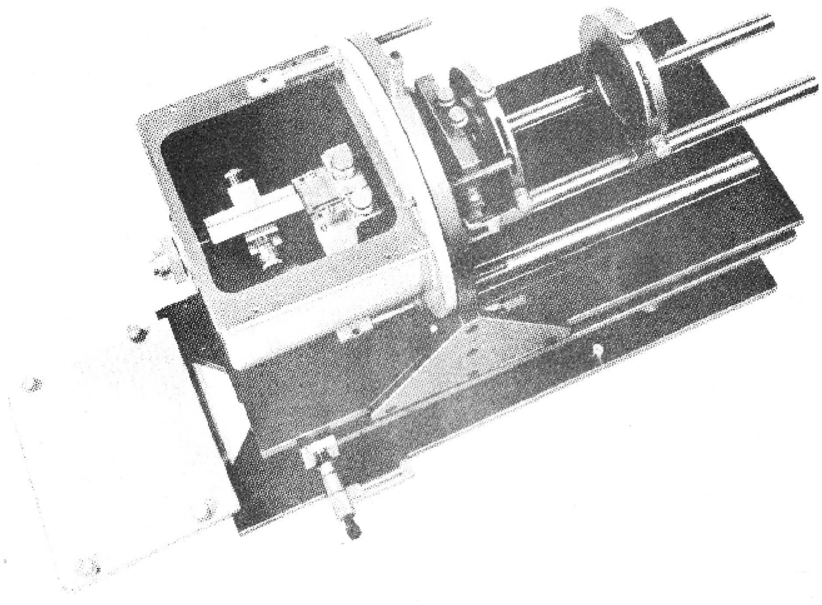

PLATE 7

View of camera with Franks mirrors, guard slits, specimen holder and combined backstop/film holder in position on the optical bench (N.3. the vertical mirror has its focussing adjustment to the right in this photograph contrary to the recommendation in the text).

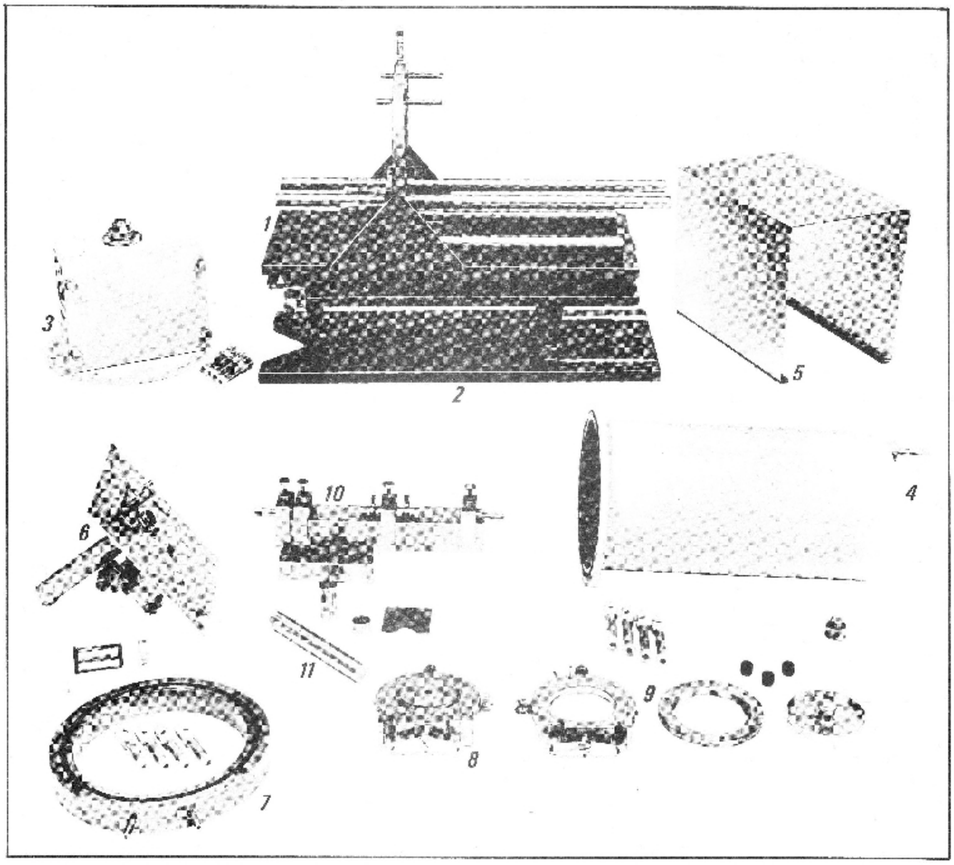

PLATE 4

A breakdown of the X-ray camera as supplied with **Elliott toroidal** mirror optics.

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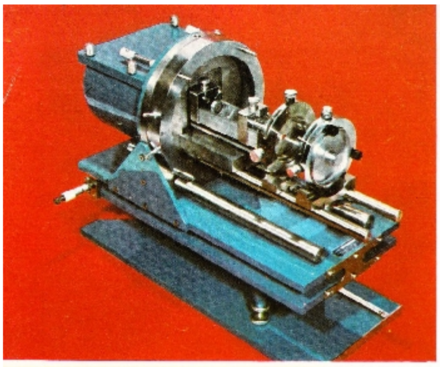
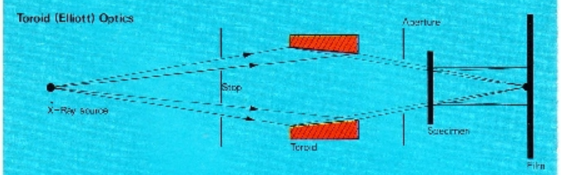
1. Camera Stand
2. Base plate
3. Front vacuum chamber
4. Rear vacuum chamber
5. Radiation shield
6. Microscope assembly
7. Services collar (if ordered)
8. Specimen holder
9. Combined backstop/film holder unit
10. 9" vee with toroid holder, apertures and stops
11. 100 micron optical alignment aperture

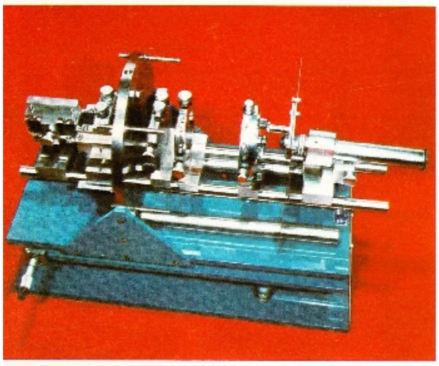
OPERATING MANUAL

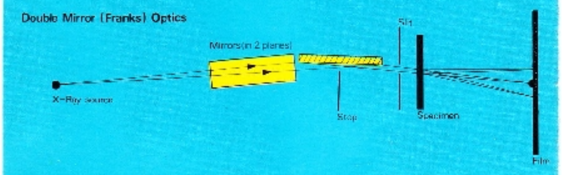
SEARLE X-RAY DIFFRACTION CAMERA

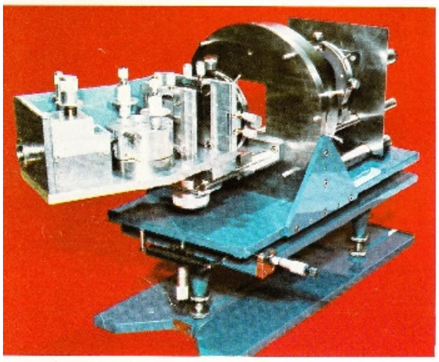
BAIRD & TATLOCK
BLACKHORSE LANE WALTHAMSTOW LONDON E17
TELEPHONE 01-527 2603

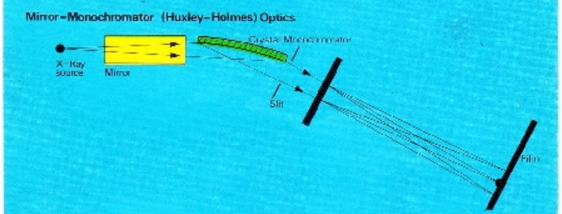












EXPERIMENTAL ARRANGEMENTS FOR X-RAY FOCUSSING CAMERAS

Marconi Avionics Limited
Elstree Way, Borehamwood
Herts. WD6 1RX England

A member of GEC Marconi Electronics Ltd.

Telephone: 01-953 2030
Telegrams: Elliotauto Borehamwood
Telex: 22777 (Ellauto Borhmwd)

MARCONI AVIONICS

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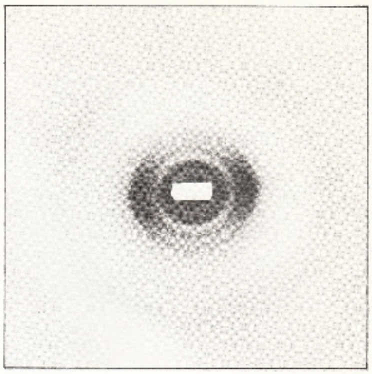
Toroid Optics

The toroid optics consists of a gold-coated cylindrical tube whose section is a circular arc, which reflects X-rays at glancing incidence with an interfocal distance of 43 cm, supplied with sets of apertures and direct beam stops for various specimen to film distances.

Because of its high aperture this focussing system requires short exposure times but inherent instrumental scattering limits the "lattice" repeat distances detectable to less that 250 Å.

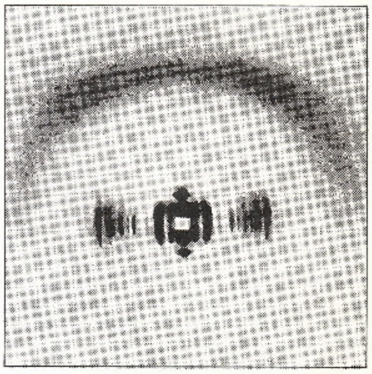


Small-angle diffraction pattern of nucleohistone fibre, obtained with Toroid optics.

Franks Optics

The Franks optics consists of a pair of glass focussing mirrors, in the horizontal and vertical planes, curved to a variable radius in four point bending mechanisms. The direct beam is occluded, and instrumental scatter is limited by horizontal and vertical guard slits. The maximum specimen-to-film distance is variable with the curvature of the mirrors.

"Lattice" repeat distances up to 700 – 800 Å can be detected with this focussing system, although with much longer exposure times than with the toroid optics.

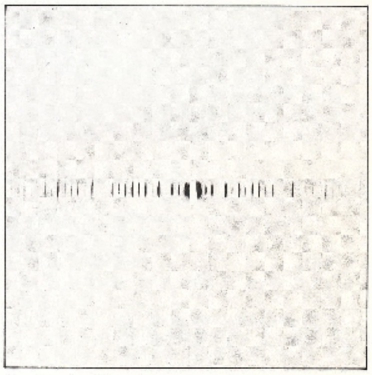


Small-angle diffraction pattern of a bacterial cell membrane, obtained with Franks optics.

Huxley-Holmes Optics

The Huxley-Holmes optics consists of a quartz crystal monochromator in a four-point bending mechanism which provides focussing in the horizontal plane, with a curved mirror focussing in the vertical plane, together with apertures to limit instrumental scatter. Quartz crystals of different orientation may be selected and the curvature of the crystal and the mirror are adjustable, so that the maximum specimen-to-film distance is variable.

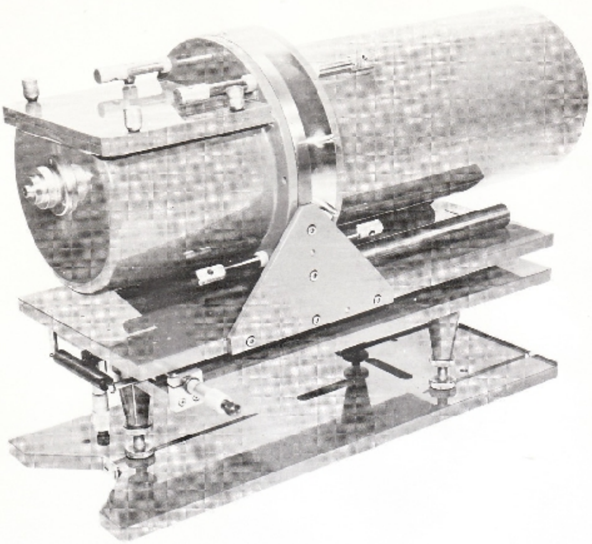
The use of a crystal focussing system allows "lattice" repeat distances of over 1000 Å to be detected in the horizontal plane.



Small-angle diffraction pattern of collagen, obtained with Huxley Holmes optics.

Photographs by courtesy of J.F. Pardon, D. Hukins, and A.E. Blaurock.

X-Ray Diffraction Cameras Incorporating Elliott Toroid, double Franks mirror and Huxley-Holmes mirror monochromator optical systems



These cameras were developed by G. D. Searle Ltd from original work carried out by Prof. Wilkins and Dr. Elliott at Kings College London, by Dr. Franks at Birkbeck College, London and N.P.L., and by Dr. Huxley and Dr. Holmes at the M.R.C. Molecular Biology Laboratory, Cambridge.

Polymers and biological materials, although generally of poor crystallinity, commonly exhibit a certain degree of long-range ordering of the macromolecular units, which may be associated with "lattice" repeat distances measured in hundreds of Å units. This is manifested in the scattering of X-rays through small angles, and the scattering patterns obtained can provide crucial evidence of the structural nature of polymeric materials, both natural and synthetic.

The most effective means of forming these patterns is by using focussing cameras, which combine high angular definition of the X-ray reflections with high intensity. The Searle range of cameras have been successfully applied to a wide variety of polymers and biopolymers such as polythene, nucleoproteins, lipoproteins, polypeptides, polysaccharides, cell membranes, muscle fibres, collagen, nerve fibres, cornea and retina.

The Searle Camera consists of a basic camera stand, to which can be added one of three alternative optical focussing systems, (i) Toroid, (ii) Franks, or (iii) Huxley-Holmes, to form a complete instrument.

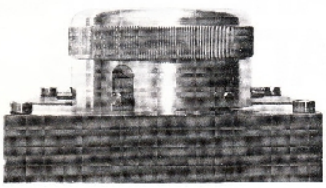
Camera Stand

The camera stand rests on a base plate and can be aligned horizontally and vertically with respect to the source of X-rays. Two evacuable chambers enclose the entire instrument allowing the environment of the optics and the specimen to be controlled. The camera is supplied with an adjustable specimen holder and backstop, and a microscope for aligning them relative to the direct beam. The cassette holds circular photographic films of 3" diameter.

Accessories to the camera include an ancillary services collar for providing electrical or gas supplies to the specimen, and a circular film cutter.

Circular Film Cutter

The film cutter is designed to cut 3" diameter circular films for the cassette provided with the camera.



SEARLE SMALL ANGLE SCATTERING CAMERA

MARCONI
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