

Hercules 2020 – Session B (Biomolecular Structure and Dynamics): Fibre Diffraction

Craig Boote, PhD

Senior Lecturer, Structural Biophysics Group, School of Optometry and Vision Sciences, Cardiff University, UK.

Abstract:

Diffraction has made numerous important contributions to our current knowledge of the molecular structure and supramolecular arrangement of fibrous tissues. In addition, many large molecules, such as biological and synthetic polymers, cannot be crystallised for classical crystallography experiments, but can alternatively be drawn into semi-crystalline fibres and investigated via fibre diffraction. This lecture will introduce the basic concepts behind fibre diffraction, and give a number of examples of how the application of x-ray and neutron fibre diffraction using synchrotron sources has solved a number of important biological questions. The lecture assumes prior knowledge from Introductory Methods lecture "Fourier Transforms" (available on-line).

Lecture plan:

Part1: Introduction to Fibre Diffraction

- i. The nature and production of x-rays and their interaction with matter
- ii. The nature and production of neutrons and their interaction with matter
- iii. X-ray/Neutron fibre diffraction theory

Part2: Applications of synchrotron fibre diffraction

- i. X-ray fibre diffraction of the dog-fish egg case (importance of the Ewald sphere)
- ii. Small- and wide-angle x-ray fibre diffraction of the human cornea
- iii. Wide-angle neutron fibre diffraction of DNA-water interactions.