**Atomic and Laser Physics Seminar**

**Monday, 25 February**

**11.30**

**Audrey Wood Seminar Room**

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**Department of Physics**

***X-ray diffraction at the National Ignition Facility***

The National Ignition Facility is the largest and most powerful laser system ever built. In addition to inertial confinement fusion and other areas of research, the NIF has the capability to compress matter to extremely high pressures (Gbar) creating novel states of matter that are otherwise unattainable. Theory and experimental evidence suggest that materials at these pressures can display complex and surprising behaviour, in a regime directly relevant to exo-planet interiors.

These high pressures are achievable at the NIF due to the high energy and precision pulse-shaping capability required by the ignition campaign. Using a carefully designed pulse shape, a target material can be quasi-isentropically compressed to reach states away from the shock Hugoniot. This in itself is far from trivial but also creates a very challenging environment for diagnosing the final state of the sample material and the fundamental physics involved in the rapid compression. Nanosecond X-ray diffraction is one such diagnostic which has been applied in this field over several decades.

Our group is part of a collaboration aiming to achieve X-ray diffraction from materials at 10s of MBar at the NIF. I will discuss the context of this campaign, some of the challenges involved, the proposed strategies, and their development.