

# Master Matière Condensée et Nanophysique

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**Laboratory:** Institut de Physique et Chimie des Matériaux de Strasbourg (IPCMS)

**Team:** Electron microscopy

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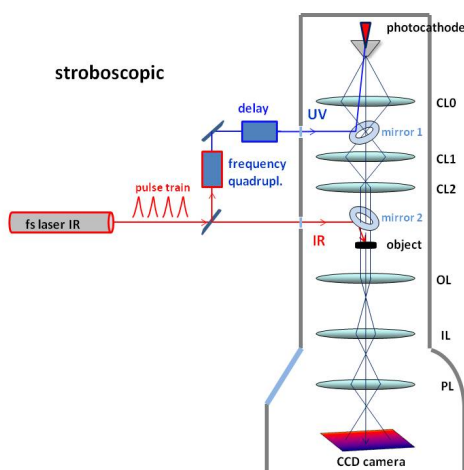
## Ultrafast Electron Microscopy

The subject of this internship is transmission electron microscopy at high temporal resolution. A new type of electron microscope with laser-optical periphery is used to create ultrashort electron pulses that serve as probes to study the dynamic behaviour of nanomaterials at the nano- to picosecond time scale. Short laser pulses induce transformations of the object, followed after an adjustable time by intense electron pulses that are used as probes to obtain an image, diffraction pattern, or electron energy-loss spectrum. This instrumentation allows us to study structural and electronic transformations of selected nanoobjects at very short time scales.

The internship will begin with work on conventional electron microscopes and the preparation of specimen materials. After a period of training, the candidate will contribute to the setup of laser-optical elements at the periphery of the electron microscope and carry out experiments on dedicated material systems whose behaviour at short time scales has to be studied.



*Ultrafast electron microscope*



*Principle of ultrafast electron microscopy*

### Literature:

A. Zewail, Four-dimensional electron microscopy, *Science* **328**, 187 (2010).

A. Zewail, La microscopie fait son cinéma, *Pour la Science* **399** (janvier 2011), p. 70.