A cryogenic super-resolution microscope for B24

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Beamline 24's transmission x-ray microscope (TXM) can provide very high resolution, three-dimensional, structural information from a wide range of samples. If we can relate this structural data to complementary chemical or functional information, then TXM becomes a much more powerful tool. Applied to biology, fluorescence microscopy is a well established method for determining the distribution of moieties with specific chemistry (through labelling with fluorescent conjugates), or function (via the expression of fluorescent proteins), but the resolution of even diffraction-limited conventional microscopy is an order of magnitude poorer than that achieved with TXM.

A limitation of transmission x-ray microscopy is that samples must be frozen and, as yet, there no commercially available light microscope that allows us to apply super-resolution techniques under cryogenic sample conditions. For this reason, we are building a custom super-resolution fluorescence system to be used in conjunction with B24's TXM. We present an overview of this system, and of the techniques and capabilities it will offer.

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