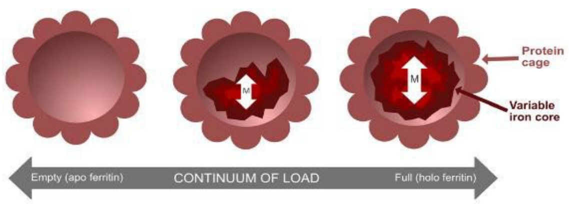
QUBIC

The Australian Research Council Centre of Excellence in Quantum Biotechnology

Quantifying Iron Loading of Ferritin Using Mass Photometry: A New Blood Iron Assay?

Institution	The University of Queensland
Project details	Iron is a highly important cofactor in the human body, required by a wide range of enzymes for essential metabolic processes. Most of the iron used by the body comes from the recycling of red blood cells. Red blood cells store iron in the protein ferritin. The most common clinical diagnostic test is to measure the concentration of blood serum ferritin, although this is an indirect test as ferritin's iron loading (fullness) can vary between individuals. There is clinical interest in new assays that can more accurately determine blood iron content. iSCAT in a mass photometry configuration works by illuminating a glass coverslip with a laser. The light scatters off molecules near the coverslip and reflects off the coverslip. The interference between these two beams is measured and can be converted to a mass (more massive molecules scatter more light).



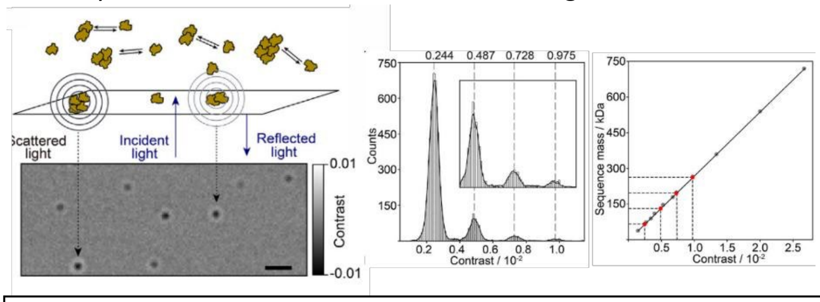
The variable iron filling of the ferritin protein in blood serum. Reproduced from [1]

Lab work to be undertaken

Utilize interference scattering microscopy (iSCAT) for mass photometry of various ferritin solutions to determine their mass distributions.

Open question

Is the (mass) sensitivity of mass photometry sufficient to measure clinically relevant differences in the iron loading of Ferritin?



Mass photometry operates by detecting the interference between the light scattered off the protein and that reflected off the coverslip (left). The scattering contrast (centre) is often simply related to the particle mass cases (right). Reproduced from [2].

Aims and Outcomes

- Demonstrate the capability of mass photometry to measure

	the mass of iron-filled and empty ferritin. • Quantify the mass photometer's mass sensitivity. • Determine if/how mass photometry could be used as a useful clinical blood iron assay. • Develop experimental skills: basic optics and microscopy, sample preparation, programming, data analysis. • Develop experience in interdisciplinary science. 1: *ES Grant et al. Clin Chem Lab Med (2021)* 10.1515/cclm-2020-1095 2: *R Asor et al. Curr Opin Chem Biol (2022)* 10.1016/j.cbpa.2022.102132
Who can apply	Preferred student background is someone with basic data analysis/signal processing experience, and some familiarity with basic optics: scattering, microscopy and interference.
Contatct / Project supervisors	Dr. Sam Scholten - s.scholten@uq.edu.au (UQ Quantum Optics Lab)