Magnetic Induction Mapping of Nanostructured Materials

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Direct measurements of the magnetic properties of closely-spaced crystals that are below 100 nm in size are notoriously difficult to make at nanometre spatial resolution using any technique. I will present recent results obtained using electron holography that show images of three-dimensional magnetic vortex states in chains of 50-nm-diameter FeNi nanocrystals, and chiral magnetic states in self-assembled rings of 20-nm-diameter Co nanocrystals. I will show how the fraction of magnetically active moments in a single 4-nm-diameter Co nanowire can be measured, and I will discuss the competing factors that control the magnetic stability of naturally occurring fine-grained minerals over geological timescales.