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# Mimicking magnetite biomineralization using peptide displaying scaffolds

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Magnetotactic bacteria are a model organism for magnetite biomineralization and represent a growing research area due to the wide range of applications for the magnetic nanoparticles they can produce. An organelle unique to these bacteria, called the magnetosome, produces a single crystal of magnetite enveloped inside a lipid membrane. A host of specialized proteins are involved in the production and regulation of the magnetosomes, they are capable of synthesizing high quality, uniform, magnetic nanoparticles under ambient conditions. Several key proteins have been identified from these bacteria which display activity in synthetic magnetite precipitation reactions where they improve both the homogeneity and morphology of the crystals. However, these proteins are transmembrane proteins which mean they are difficult to produce and characterize. Our research aims to unlock the mechanisms, at the molecular level, through which these proteins control biomineralization. We do this by studying the hydrophilic loops linking their transmembrane helices using both free peptides and constrained stem loop coiled coil scaffolds. This approach generates novel biomimetic reagents for precision nanoparticle synthesis, and overcomes the solubility issues of the full membrane protein. Recently, the use of artificial protein scaffolds has become an area of intense interest. The use of these small, robust, monomeric proteins has become a viable alternative to the much more complex and expensive antibodies. In addition to the coiled coil scaffold, we also utilized a magnetite interacting Adhiron (MIA) scaffold. In the presence of an active loop sequence they are capable of controlling the nucleation and growth phases of magnetic nanoparticle crystallization. The structural limit to conformational changes ensures binding is both sequence and structurally dependent, superior to an unstructured peptide. The scaffolds may also be used for the attachment of dyes, antibodies and drug molecules to magnetic nanoparticles-making these assemblies possible alternatives to antibody-drug conjugate systems.

## Biography

Lori A Somner is a final year PhD candidate at the University of Sheffield, Chemistry Department, based in the UK (2014-2018). This is also where she was also awarded her Master's degree in Chemistry (MChem, 2010-2014). She has expertise in chemistry and chemical biology, specifically nanotechnology and biomedical applications.

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