

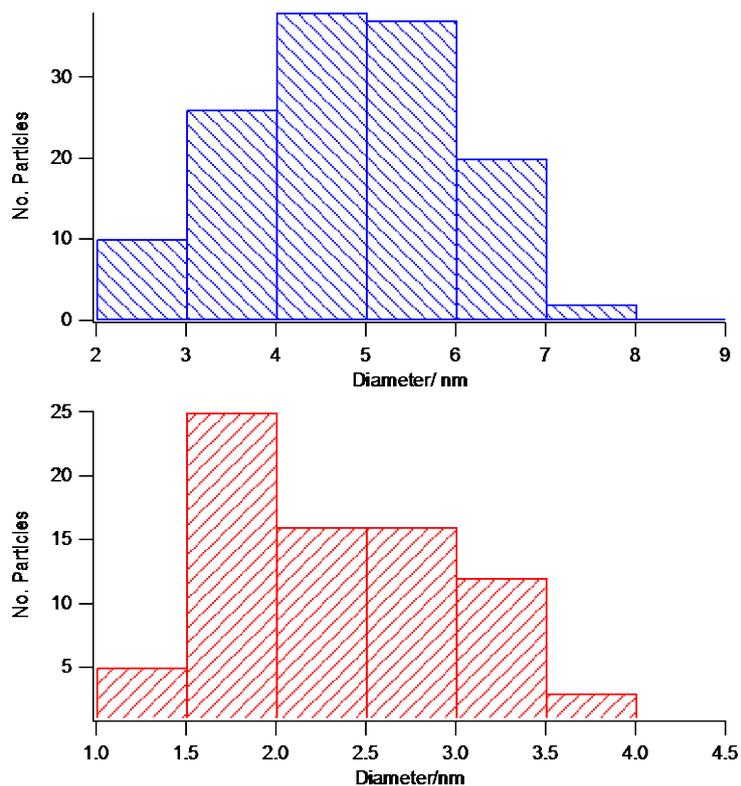
## Supporting Information

### Interactions of Nanoparticles with Purple Membrane Films

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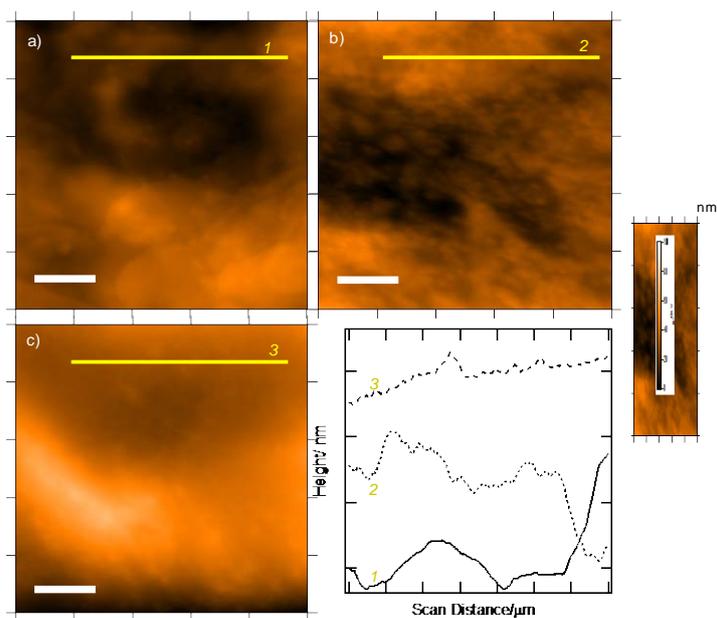
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**Fig. S1** NP size distribution histograms for a) citrate stabilised gold NPs and, b) carboxy-methyl dextran coated magnetite NPs.

The NP size distribution histograms in Fig. S1 were produced from the image analysis utilising Gwyddion v2.24. The core size for up to 140 NPs was measured and transformed into a histogram in IgorPro®.



**Fig. S2** AFM images of PM films showing line profiles, with the size of all scale bars 200 nm. a) Control PM sample showing overlapping PM patches, b)  $[\text{PM}4.1\text{Fe}_3\text{O}_4\text{CS}]$ , c)  $[\text{PM}0.2\text{AuCS}]$ , and d) corresponding line profiles of the AFM images.

For  $\text{Fe}_3\text{O}_4\text{CS}$  samples,  $\text{Fe}_3\text{O}_4\text{NPs}$  were also present on the surface of the PM film (cf. Fig. 7(c)) although the surface coverage was smaller than the *FP* sample. It is likely that, as the  $\text{Fe}_3\text{O}_4\text{NPs}$  were excluded from the inter-lamellar spacing during PM self-assembly, they became more concentrated towards the edge of the PM patches and on the surface of the film. Similar surface coverage by AuNPs atop the PM films by both *FP* and *CS* methods was evident from Fig. 7(c) and S2 (c). It should be noted that the spherical features are aggregated NPs, which was a feasible outcome subsequent to evaporation of the dispersing aqueous medium.