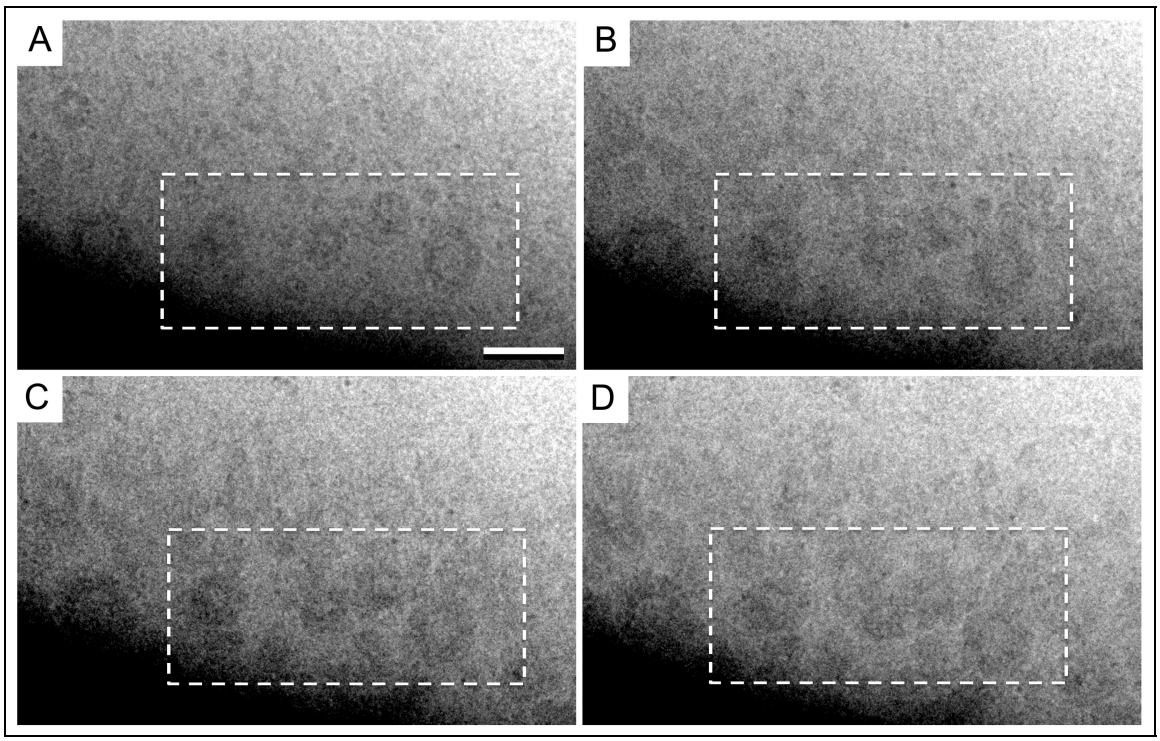
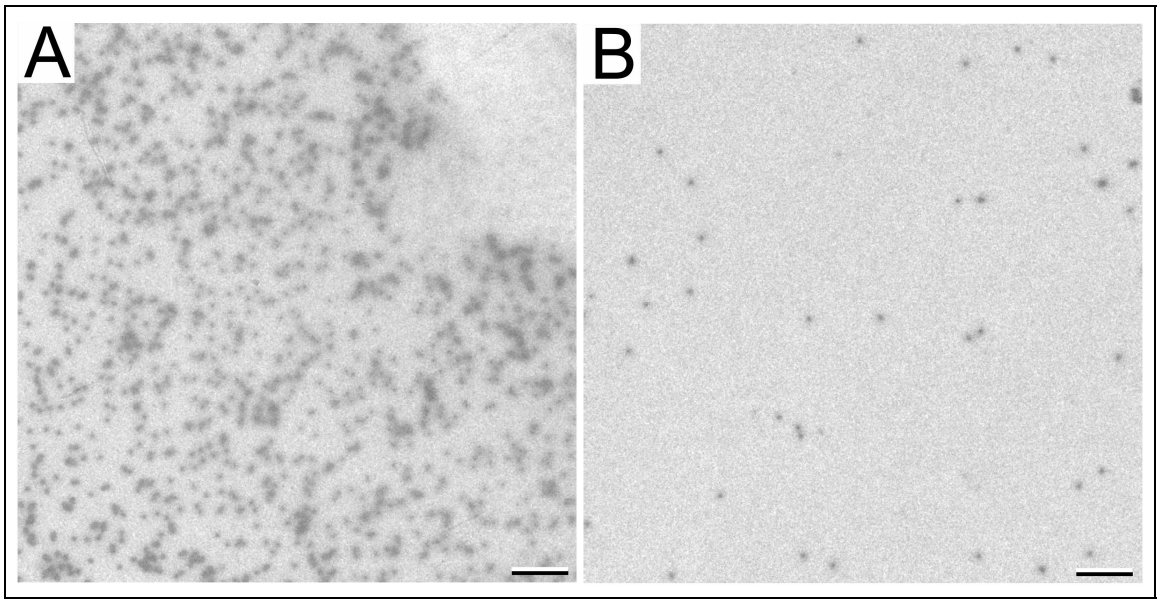
Supplementary Materials

Supplementary Figure 1. Beam damage to liposomes in solution. (**A**) Image of a liposome formulation after a 1-second exposure at a dose of 0.5 electrons / A^2. Subsequent 1-second exposures of the same region (**B – D**) indicate blurring of the liposomal features, which may also appear weakened due to the presence of sucrose in the commercial formulation. Scale bar is 150 nm.



Supplementary Figure 2. Comparison of tethered and non-tethered DLPs in liquid. (**A**) Low magnification view of DLPs in liquid show a greater number of particles recruited to antibody labeled SiN membranes in comparison to (**B**) glow-discharged microchips lacking tethering components. Scale bar is 1 µm



Movie 1. Dynamic behavior of magnetic nanoparticles in liquid. We examined microwells containing liquid and nanoparticles at low magnification then focused in on a selected microwell for a closer view. Small nanoparticle clusters (< 100 nm) can freely diffuse in solution while larger clusters (≥ 150 nm) remain relatively fixed. Smaller diffusing cluster tend to associate with the larger clusters over time, possibly by van der Waals attraction enhanced by the presence of iron oxide in the clusters.

Movie 2. Micelles in solution lack long-range diffusion. An image sequence of micelles in solution show little to no diffusion in the X- and Y-directions although the micelles, which vary in size from 100 – 150 nm, may freely diffuse in the Z-direction and out of the focal plane.

Movie 3. Structural details of DLPs in solution. A representative image of transcribing DLPs in solution was used to calculate 3D reconstructions (blue and yellow) of the active particles. Sections through the reconstructions reveal ordered density within the capsid cores at varying levels of transcriptional activity.