Toward a more realistic picture of how molecules move within cells

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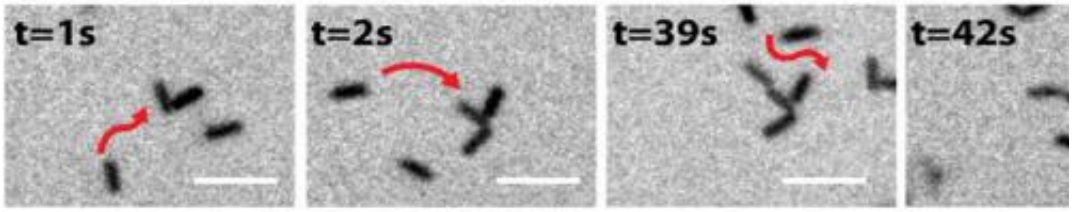

Using liquid phase TEM, Alivisatos et al. were able to track gold nanorods in real time. Credit: American Chemical Society

A candid photo can reveal much more about the mood of a party than a stiff, posed picture. The same might be true for molecules, according to researchers. In a report appearing in the journal *ACS Central Science*, they report use of a newly developed method that can take a candid snapshot of how molecules really move in vitro and in cells. This information could help resolve some controversial claims about how nanocrystals assemble.

Paul Alivisatos and colleagues note that microscopy is often limited by how samples are prepared. Currently, the most powerful microscopes require samples to be dried under a vacuum. That freezes molecules in one place, wherever they were when they were dried. But many materials behave very differently when they're in liquid, like when those molecules are in a living cell. Some molecules can move freely, whereas others have more limited mobility. Optical microscopy is a good way to

investigate such things at the microscale level, but until recently, it hasn't been ideal for smaller objects like nanoparticles.

The researchers used the newly developed technique of liquid-phase transmission electron microscopy to visualize and track gold nanorods—which could be used in cancer therapy— in real time. The nanorods assembled differently, depending on whether they were in liquid or dried. Rather than focus on the details in a given assembly, the team parsed large amounts of data to monitor the positions of each nanoparticle. That gave them a quantitative understanding of previously hidden factors involved in nanocrystal assembly. They say that such data could help researchers more fully understand how nanoparticles assemble, a process shrouded in controversy, and how molecules move within living cells.

More information: Interaction Potentials of Anisotropic Nanocrystals from the Trajectory Sampling of Particle Motion using in Situ Liquid Phase Transmission Electron Microscopy, *ACS Central Science*, 2015.

Provided by American Chemical Society

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