New imaging method lets scientists 'see' cell molecules more clearly

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Scientists have always wanted to take a closer look at biological systems and materials. From the magnifying glass to the electron microscope, they have developed ever-increasingly sophisticated imaging devices.

Now, Niels de Jonge, Ph.D., and colleagues at Vanderbilt University and Oak Ridge National Laboratory (ORNL), add a new tool to the biology-watcher's box. In the online early edition of the *Proceedings of the National Academy of Sciences*, they describe a technique for imaging whole cells in liquid with a scanning transmission electron microscope (STEM).

"Electron microscopy is the most important tool for imaging objects at the nano-scale - the size of molecules and objects in cells," said de Jonge, who is an assistant professor of Molecular Biology & Biophysics at Vanderbilt and a staff scientist at ORNL. But electron microscopy requires a high vacuum, which has prevented imaging of samples in liquid, such as biological cells.

The new technique - liquid STEM - uses a micro-fluidic device with electron transparent windows to enable the imaging of cells in liquid. In the PNAS article, the investigators demonstrate imaging of individual molecules in a cell, with significantly improved resolution (the fineness of detail in the image) and speed compared to existing imaging methods.

"Liquid STEM has the potential to become a versatile tool for imaging cellular processes on the nanometer scale," de Jonge said. "It will

potentially be of great relevance for the development of molecular probes and for the understanding of the interaction of viruses with cells."

The technique will also become a resource for energy science, as researchers use it to visualize processes that occur at liquid: solid interfaces, for example in lithium ion batteries, fuel cells, or catalytic reactions.

"Our key innovation with respect to other techniques for imaging in liquid is the combination of a large volume that will accommodate whole cells, a resolution of a few nanometers, and fast imaging of a few seconds per image," de Jonge said.

Source: Vanderbilt University