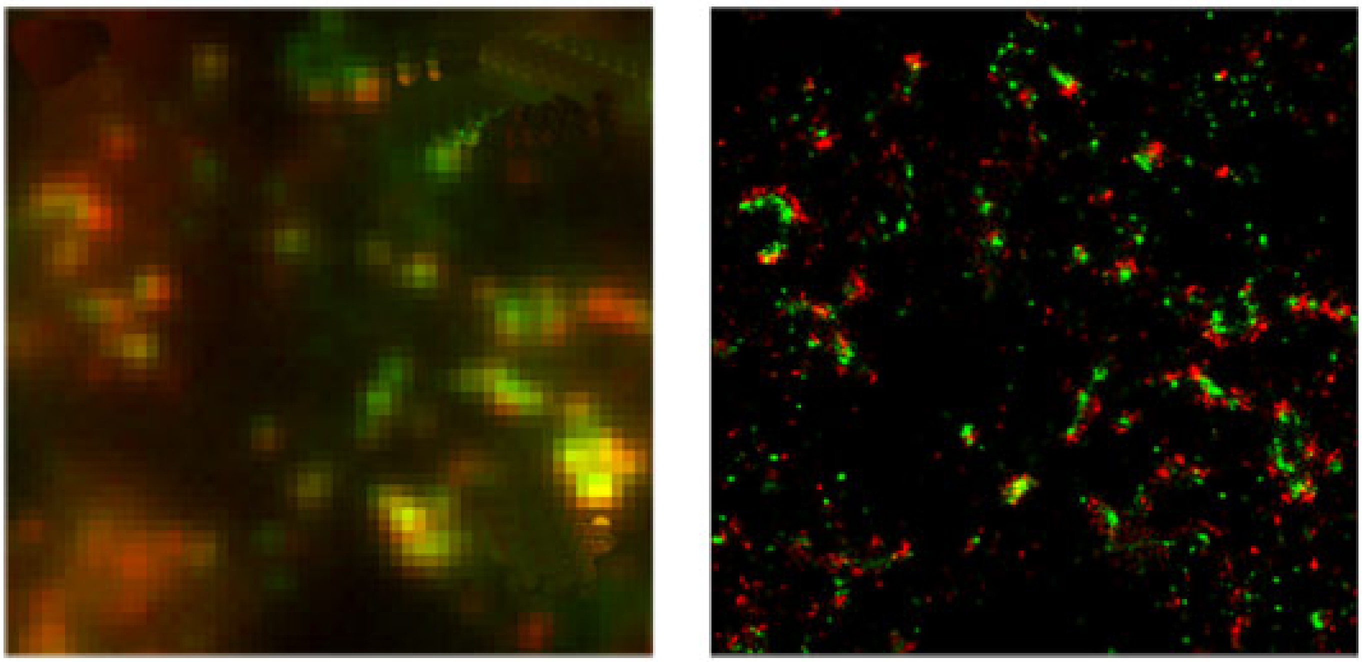
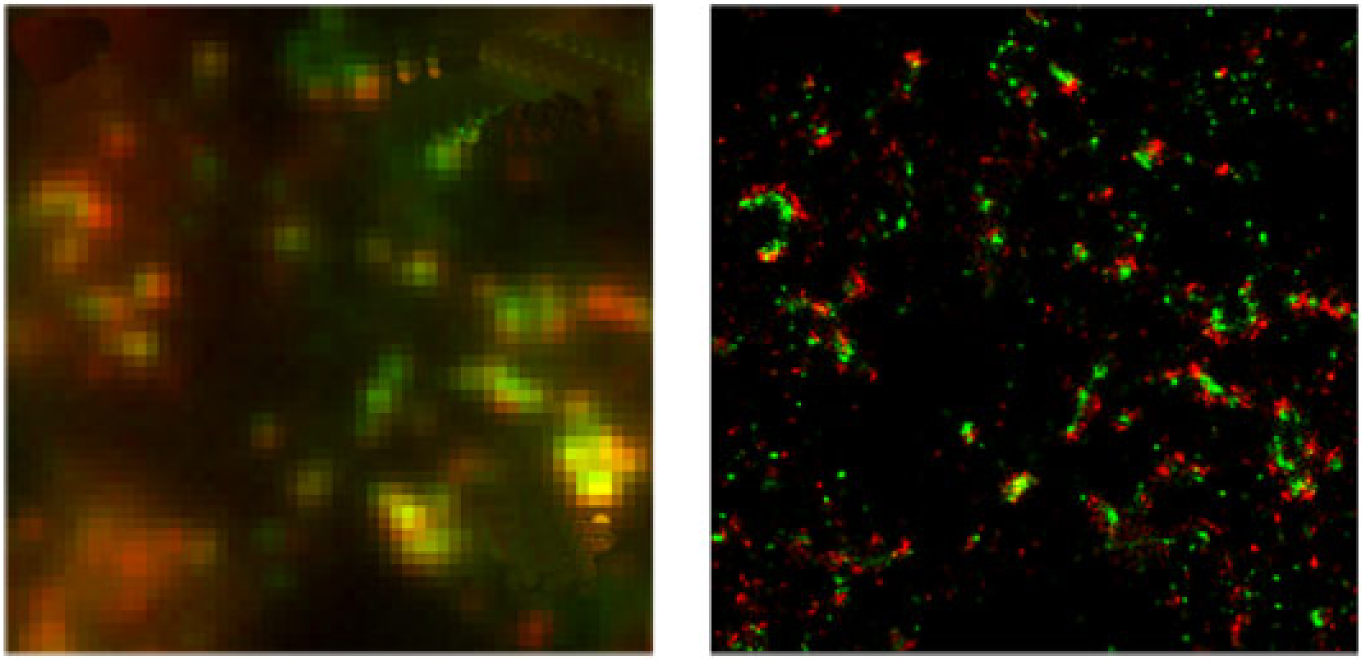
TOOLBOX

New technique creates map of synapses

BY **JESSICA WRIGHT**

9 MARCH 2011





High definition: A new method called STORM resolves the relative orientation of tagged molecules (right). Traditional light microscopy (left) cannot distinguish molecules in close proximity.

High definition: A new method called STORM resolves the relative orientation of tagged molecules (right). Traditional light microscopy (left) cannot distinguish molecules in close proximity.

A new technique can **pinpoint the precise location of individual proteins** at a synapse — the junction between neurons — at high resolution in brain tissue, according to a study published 9 December in *Neuron*.

Synapses are complex junctions that regulate the exchange of information from one neuron to the next, a process that transmits signals across the brain. Several studies published in the past few years have linked proteins that **function at the synapse to autism**.

Synaptic proteins can be divided into two groups: pre-synaptic, located at the transmitting side of a synapse, and post-synaptic, which are on the receiving neurons. Using a technique called stochastic optical reconstruction microscopy, or STORM, researchers are able to resolve the relative orientation of both these groups of proteins.

Using traditional light microscopy, researchers can visualize proteins at the synapse fused to fluorescent molecules, which are activated by specific wavelengths of light. This technique lights up all tagged molecules simultaneously, however, which results in large points of fluorescence that are difficult to resolve.

By contrast, STORM activates one small group of tagged molecules at a time and then deactivates it before photographing the rest. This creates a series of images of individual molecules, which can be assembled into one three-dimensional reconstruction.

By tagging different types of molecules with various fluorescent probes, the researchers resolved the relative orientation of ten different pre- and post-synaptic proteins, including the post-synaptic proteins SHANK1 and **PSD-95**, which have been linked to autism and Williams syndrome. The researchers see differences in the composition and distribution of these proteins between different synapses and across brain regions.