

### 3D Technology Charts Ongoing Neural Activity of Brain Disorders

Researchers of the Massachusetts Institute of Technology and the University of Vienna have created an imaging system that can create 3D models of ongoing brain activity of living animals.

This is the first time scientists have been able to generate 3D video of an entire brain at a millisecond timescale. It could help researchers discover how neurons and neuronal networks process sensory information and generate behaviour, according to the report published by *Nature Methods* last Sunday.

Another possible application for the new brain-mapping technology is helping neuroscientists learn more about the biological basis of brain disorders such as Parkinson's disease and Alzheimer's. This can be achieved by using the new imaging technology to chart the exact cells and networks affected.

The team used the technique to monitor the activity of every single neuron of the worm *Caenorhabditis elegans* at once. They also created images based on the entire brain of a zebrafish larvae. This gives biologists and neuroscientists a more complete view of neural activity than previously thought possible.

Ed Boyden, associate professor of biological engineering and brain and cognitive science at MIT emphasized the importance of the new technology. "If you want to understand how information is being integrated from sensation all the way to action, you have to see the entire brain".

The brain-mapping is based on prior research of engineered fluorescent proteins that can be used to visualize the electrical impulses in the brain. Until now, however, no imaging technology has been available that could oversee the entire brain at speeds high enough to catch these electrical impulses in action.

Traditional 3D neural imaging has been known as a slow, time-consuming process where each examined point in the brain is scanned and rendered individually.

This new method is instead based on light-field imaging, which creates 3D images by measuring the angles of incoming rays of light. According to *Nature Methods*, the MIT and Austrian researchers modified and applied a light-field microscope to monitor neural activity for the first time for this very purpose.

With such a microscope, it uses a multitude of lenses to split the light emitted by an object into several light dots used to determine exact three-dimensional depth.

This allows extremely high-speed high-detail 3D imaging as opposed to traditional technology such as Magnetic Resonance Imaging (MRI) or ultrasound.