TOOLBOX

Sharp microscope captures growing embryos, changing brains

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Researchers have developed a new way to perform high-resolution microscopy in a moving, changing organism, they reported in November in *Nature Biotechnology*[1]. They used the method to follow the development of a live embryo and its brain.

To take a three-dimensional image that encapsulates an entire sample — whether a whole organism or a single cell — researchers use techniques such as confocal microscopy. These techniques take photographs of the sample in sections and combine them to capture the entire picture. However, this method can be slow and may damage the sample by exposing it to too much light, making it difficult to track changes over time.

To circumvent these hurdles, the researchers used two different objectives — the parts of a microscope that transmit and collect light. They placed the objectives on either side of the sample. One objective turns on fluorescence while the other detects it; they then switch roles, alternating back and forth.

Placing the objectives to the side allows researchers to illuminate each plane of the sample at once, using only a small amount of light. Alternating the objectives speeds up the process, which is otherwise too slow to capture a moving sample.

The method will allow researchers to track dynamic mechanisms, such as growth and migration of neurons in a developing brain — a process that **may be impaired in autism**.

In the new study, the researchers looked at movement in the cell's physical scaffold, called microtubules, within live cells.

They also used it to look at fluorescent molecules in the nuclei of developing worm embryos. Over

a span of 14 hours, the microscope recorded the rapidly dividing cells in the growing worm embryo. The researchers also lit up neurons in the developing worm brain, using the technique to watch new neurons grow and migrate to their final positions.

REFERENCES:

1. Wu Y. *et al. Nat. Biotechnol.* **31**, 1032-1038 (2013) **PubMed**