NEWS

Bloated brains lay bare delicate branches of neurons

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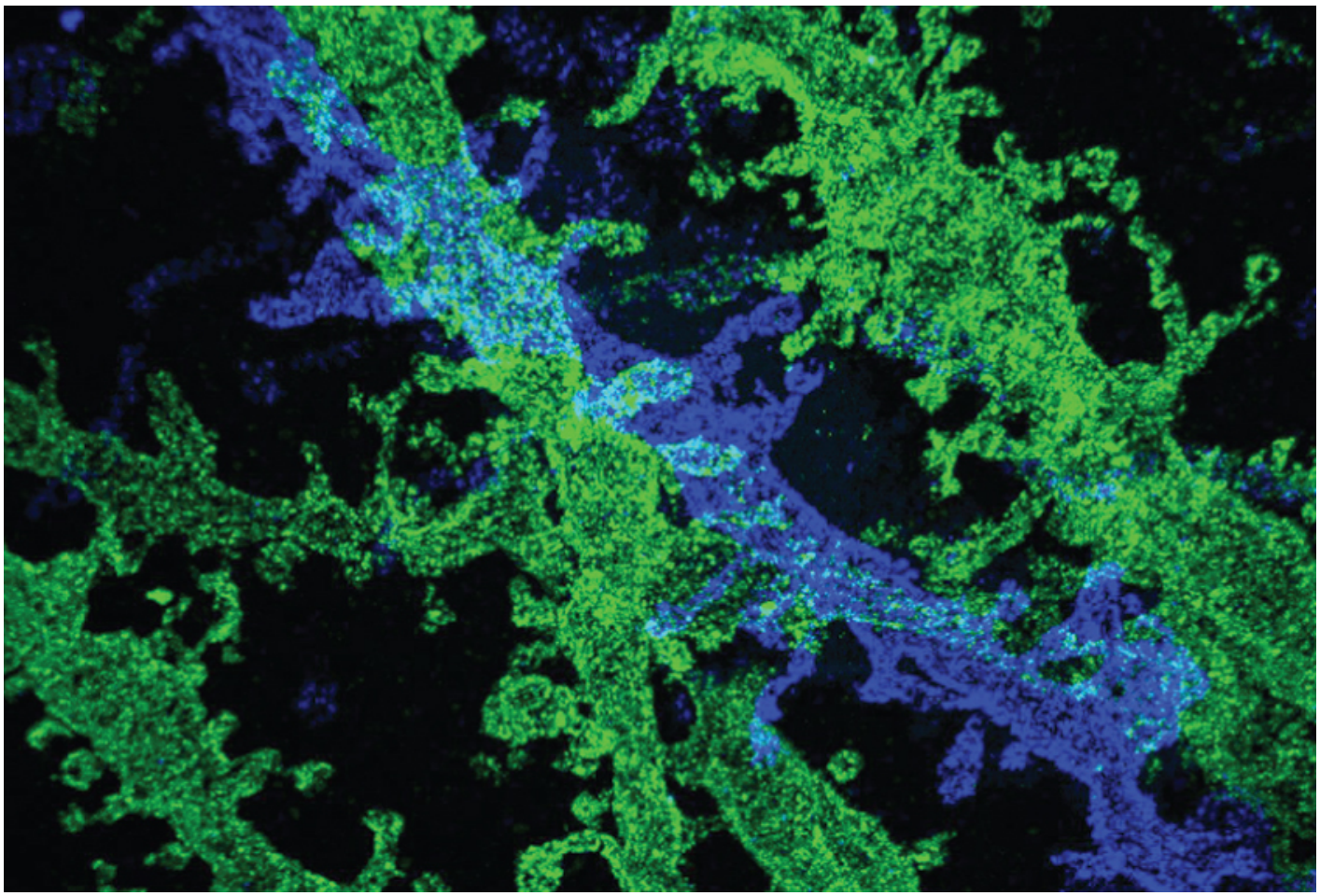


A technique that expands brain tissue to 20 times its original size lets researchers glimpse components of neurons at fine resolution. Researchers presented the unpublished method yesterday at the **2016 Society for Neuroscience annual meeting** in San Diego.

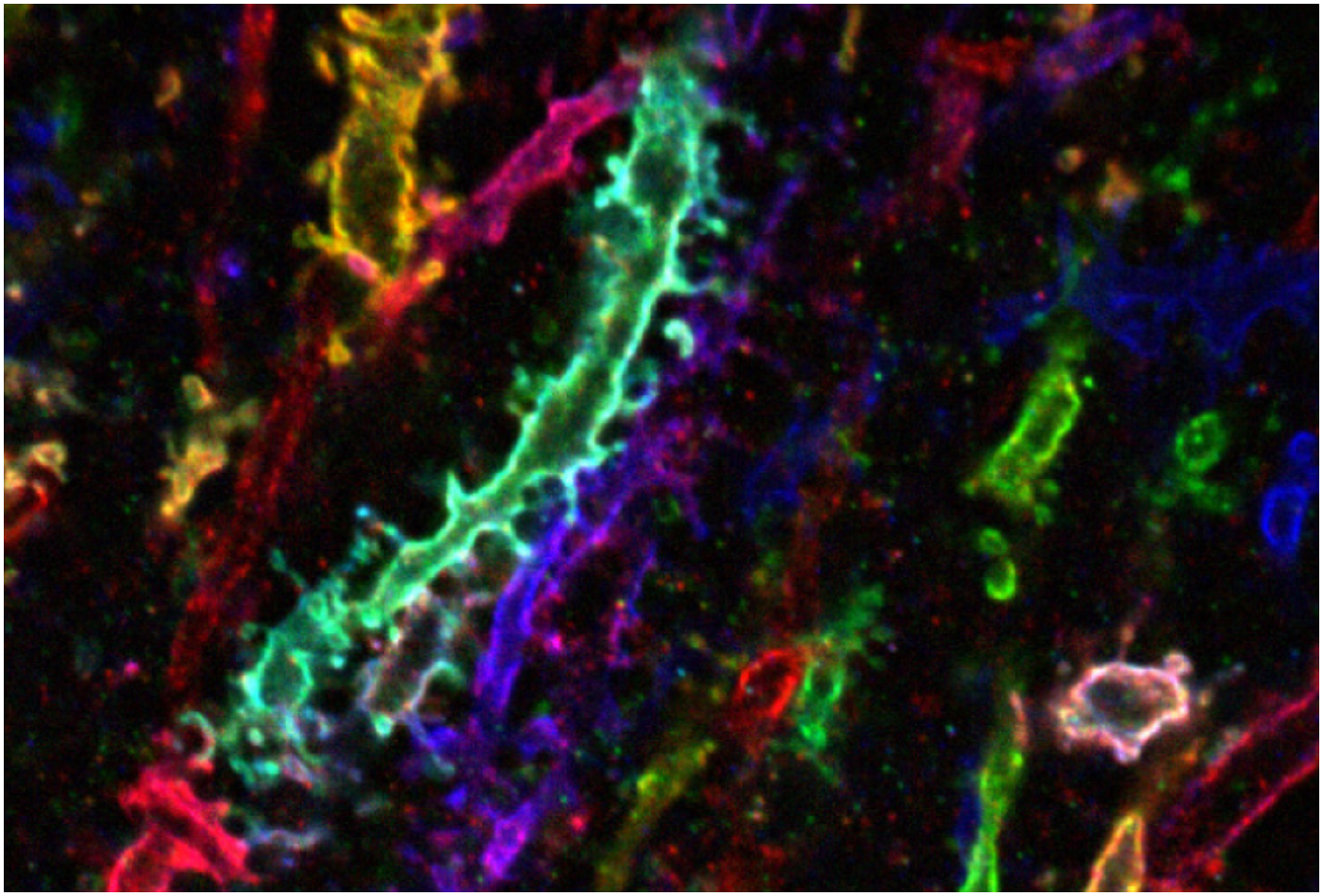
Traditional approaches for capturing detailed images of neurons require high-powered microscopes. But even the best microscope is limited by its lens.

To push the technique's limits, researchers have developed a method that expands brain tissue without disrupting its cellular makeup. The technique, called **expansion microscopy**, involves embedding the tissue inside the water-absorbing gel found in disposable diapers.

An early version of the tool could stretch tissue to 4.5 times its original size, revealing cellular structures at 70-nanometer resolution. Last year, the researchers used the technique to stretch tissue and label individual RNAs — the blueprints for protein production. They presented those results at last year's **Society for Neuroscience annual meeting**.

In the new work, the researchers tweaked the protocol to get 20-nanometer resolution. This allowed them to visualize neurons' signal-receiving branches, called **dendrites**, and slender projections, called axons, in exquisite detail.

"We can start to really resolve very fine features, like parts of dendritic spines and axons," says lead investigator **Ed Boyden**, professor of biological engineering and brain and cognitive sciences at the Massachusetts Institute of Technology in Cambridge, Massachusetts.



Colorful connections: A new technique yields high-resolution images of the signal-receiving branches of neurons.

Stretching limits:

Like traditional microscopy, the new technique requires the use of fluorescent labels to light up specific cellular structures. Right now, this process begins in unexpanded tissue. Boyden and his team are trying to modify the technique so that they can stain the tissue after expanding it. Once optimized, this method would allow them to zoom in on specific structures, such as **synapses**, the junctions between neurons.

“If you wanted to deconstruct the proteins at a synapse, you’d want to move the proteins far apart from each other and then label them,” Boyden says.

The researchers are also investigating ways to visualize pieces of expanded tissue in three

dimensions. This could allow them to observe brain circuits.

*For more reports from the 2016 Society for Neuroscience annual meeting, please **click here**.*

REFERENCES:

1. Chang J.B. *et al. Nat. Methods* Epub ahead of print (2017) **PubMed**