

Viewing the brain's nanostructure

To understand how the brain's structure affects various functions, you need a detailed map of the neurons and their connections. Viren Jain of Google Research, Jeff Lichtman of Harvard University, and colleagues made such a map by using volume electron microscopy and advanced computational techniques. The approach's rapid imaging and automation capabilities made it possible to reconstruct a 1 mm^3 volume of tissue from a human brain's outer layer. The sample had been surgically removed from a patient so that neurologists could reach an underlying region that is a source of epileptic seizures. The volume's nanoscale resolution is fine enough to make visible individual cellular elements and synapses—the communication sites between neurons—and the encompassed area is large enough to include neural circuits made of tens of thousands of neurons and millions of synapses.

This image shows thousands of neurons whose cell bodies are shaped loosely like pyramids. The neurons range in length from $10\text{ }\mu\text{m}$ (blue) to $30\text{ }\mu\text{m}$ (red). Neurons receive electric signals via dendrites—the thick branches extending from the neurons—and send signals using axons, the longer, thinner fibers between the cells. Researchers suspect that autism, schizophrenia, and other developmental disorders may alter the structure of neural circuits. More analyses of the data may be forthcoming: The researchers have made the 1.4 petabytes of reconstruction data publicly available online. (A. Shapson-Coe et al., *Science* **384**, eadk4858, 2024; image made by Daniel Berger, courtesy of Google Research and the Lichtman Lab at Harvard University.)

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