TOOLBOX

New atlas displays meticulous maps of brain connectivity

BY **JESSICA WRIGHT**

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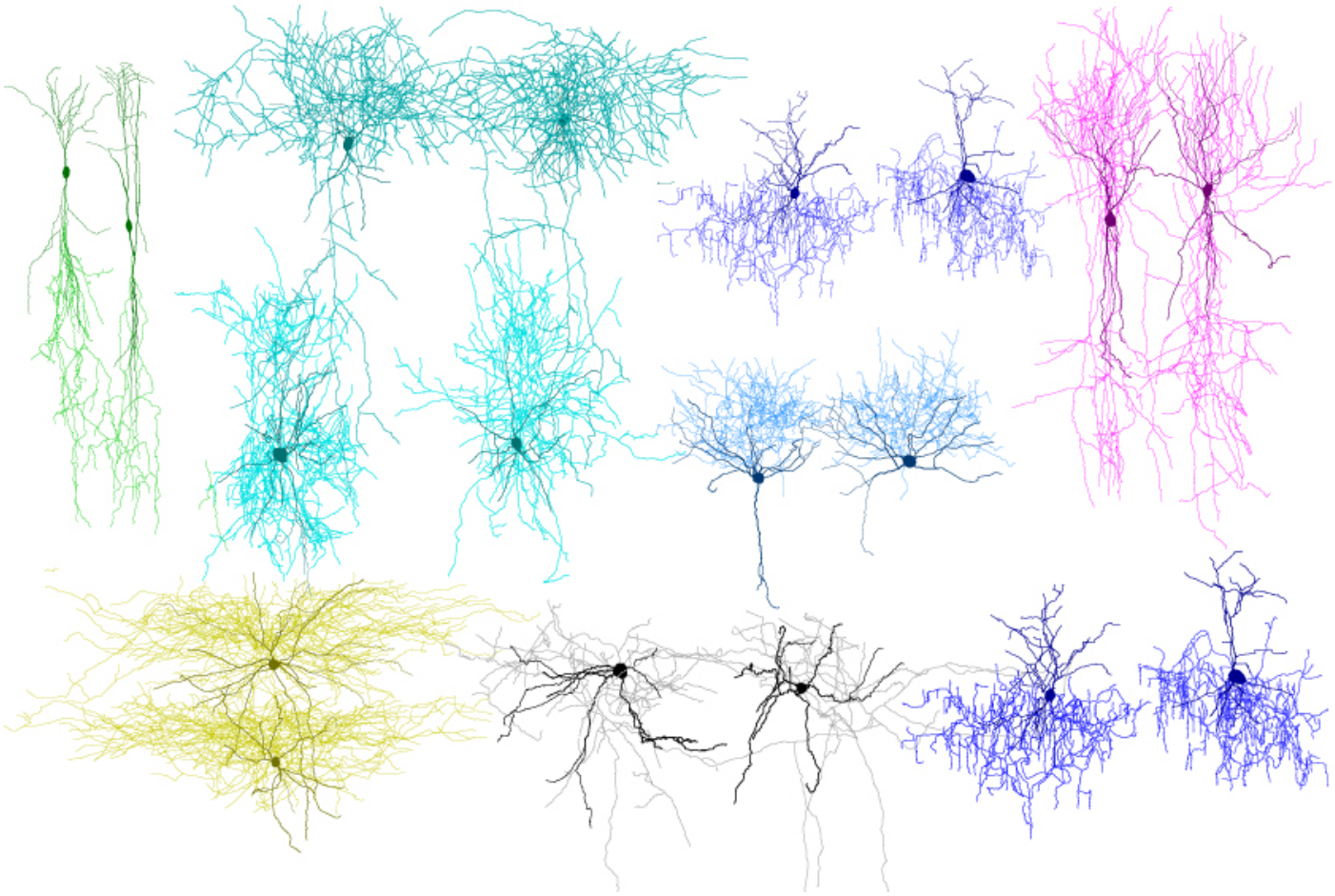

Researchers have documented the shape and electrical activity of more than 2,000 neurons in the mouse brain, and charted the connections between them[1].

The effort, described 27 November in *Science*, details 15 distinct types of connecting neurons, or interneurons, that inhibit brain activity. It also reveals that different types of interneurons connect to the cells around them in one of three ways.

The findings could aid in the ambitious task of mapping neuronal connections across the brain. It may also help reveal whether the 'rules' of connectivity are broken in mouse models of autism.

"Now we have a blueprint of what the normal brain should look like in the mouse," says lead researcher **Andreas Tolias**, associate professor of neuroscience at Baylor College of Medicine in Houston, Texas.

Some studies have hinted that people with autism have **an excess of neuronal connections** within certain brain areas but abnormally few links between areas. Many studies also point to **alterations in interneuron signaling** as an important signature of autism.

The new atlas may refine the understanding of these differences by helping researchers pinpoint potential irregularities in the characteristics of certain types of interneurons.

Altered shapes:

Tolias and his colleagues cut ultra-thin sections of the mouse primary visual cortex, a region at the rear surface of the brain, and recorded electrical activity from eight neurons at a time. In total, they measured the activity of 1,654 interneurons as well as 547 excitatory neurons called pyramidal cells, and mapped the roughly 11,000 connections between them. They then stained the brain slices so they could trace the shapes of the neurons under a microscope.

Information about each cell's shape and firing pattern defined the 15 interneuron types. These interneurons show one of three connection patterns: Some interneurons reach out to multiple types of neurons, whereas others interact exclusively with other interneurons or with nearby pyramidal cells.

The study could help researchers determine whether autism-linked mutations alter interneuron signaling. Some mouse models of autism may show abnormalities in the shape, activity or connection patterns of interneurons, Tolias says.

As a next step, the researchers plan to examine connectivity patterns in other mouse brain regions and in the brains of other species. The goal, Tolias says, is to understand the principles that dictate wiring of the brain and, ultimately, behavior.

REFERENCES:

1. Jiang X. *et al. Science* **350**, aac9462 (2015) **PubMed**