

## TOOLBOX

# Brain atlas maps gene expression in three dimensions

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Researchers have charted patterns of gene expression in a three-dimensional (3D) representation of the human brain. The results, published 20 September in *Nature*, show that different brain regions have distinct molecular and functional roles<sup>1</sup>.

The map, called the **Allen Human Brain Atlas**, is based on two postmortem brains, one from a 24-year-old man and the other from a 39-year-old man, neither of whom had any signs of a neurological illness. The project aims to integrate information from **as many as ten brains**.

To create the map, the researchers first established a structure for the whole brain using magnetic resonance structural imaging. They then sliced the postmortem brains into thin sections and stained them with dyes and antibodies to identify populations of neurons and other brain cells.

The researchers isolated 900 discrete regions from these slices and cataloged the genetic messages that code for proteins in each slice.

Integrated into one picture, the data provide a 3D map of gene expression in the entire brain. Overall, the researchers found, gene expression varies significantly across the brain, with certain genes expressed only in discrete brain regions.

For example, genes related to dopamine signaling, which is involved in pleasure and reward, are expressed in a small subset of brain regions, including the striatum and the hypothalamus.

The researchers also looked at the expression of 740 genes that code for proteins in the **postsynaptic density** (PSD) — a neuronal region implicated in autism that receives signals across neuronal junctions, or **synapses**. About 30 percent of PSD genes are expressed only in a subset of brain regions, suggesting that variation in synaptic gene expression may underlie differences in brain regions.

Glia, support cells in the brain, express a number of PSD genes. Studies in the past few years

have shown that glia may play a more significant role in brain signaling than was previously believed.

## **References:**

1: Hawrylycz M.J. *et al. Nature* **489**, 391-399 (2012) [PubMed](#)