

Understanding the brain as a whole

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Neuroscience has revealed a great deal about different brain regions and their neurons and circuits, but has not yet explained how the brain operates as a whole to drive cognition and behavior. To do so, we must measure – and make sense of – the joint activity of vast neuronal populations distributed across brain regions.

Historically, the main obstacle has been technical: recording methods could either resolve the activity of individual neurons or monitor multiple brain regions.

We can now overcome this difficulty with technologies that record from thousands of cells simultaneously across brain regions. These include the Neuropixels probes announced at this year's Society for Neuroscience meeting, and others that will emerge from efforts such as the BRAIN initiative.

The remaining obstacle is cultural, and lies in our parochial ways. Laboratories that study behavior do so using different tasks, recording from different neurons, in different brain regions, in different animals, in different species. Such disparate observations can neither be pooled nor compared.

One solution is to get multiple laboratories to focus on a set of standardized tasks – in highly controlled conditions such as virtual reality – and focus on the mouse, with its arsenal of genetic tools and databases. Such standardization would make it fruitful to pool and share the resulting data.

The brain may be too complicated for any one laboratory. By coordinating our efforts, we have a stronger chance of revealing how a myriad of neurons across the brain work together to drive cognition and behavior.