

One experiment

Via a Web-based portal built by his lab team — www.mouse.brainarchitecture.org — CSHL Professor Partha Mitra takes us on a journey to the final frontier of human biology, the brain. His team is fast closing in on their goal of providing the first whole-brain circuit map of the mouse. The rationale: to generate a reference wiring diagram to identify circuit alterations in neurological disorders, and to understand brain evolution by comparing wiring diagrams across species.

Using four neural tracers injected sequentially at 250 brain locations in mice of identical age and sex, the team enables us to follow branching projections from myriad neurons over the full volume of brainspace. Each injection can be thought of as one experiment. This image takes us on one partial journey of many thousands as the full circuit is compiled, mouse by mouse, each brain imaged robotically in 500 cross-sections, each section 1/50 mm wide.

This journey begins with injections of red- and green-labeled tracers at different depths in the left motor cortex. The injection appears on the right, as we look into the brain from the perspective of the mouse's nose. Fibers project from the motor cortex in two main bundles. To our left, axons shoot across the corpus callosum to the opposite hemisphere, presumably to help coordinate activity of the two sides. To our right and down, fibers project into the striatum on their way to connection with the thalamus, brain stem and spinal cord. [follow their path in HT iPad app] The human analogs of these fibers are thought to control our hands — neurons on the left side controlling the right hand. It boggles the mind to consider the myriad functions that will be traceable once the full-brain circuit map is completed. Then too we will have a basis for a wholly novel perspective on brain structure and dysfunction in autism, schizophrenia and other major disorders.

Peter Tarr

