UNIVERSITÉ DE GENÈVE

PRESS RELEASE

Geneva | 3 September 2025

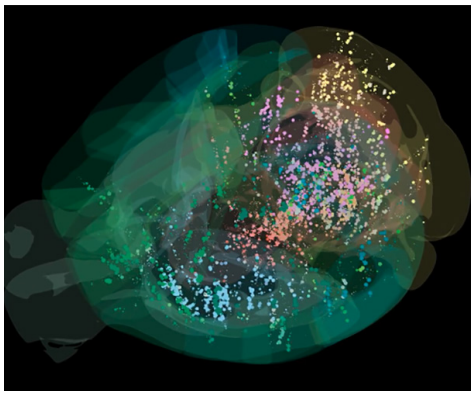
WARNING: embargoed until 3 September 2025, 15:00 GMT

The complete brain map of our decision-making process

An international consortium including neuroscientists from UNIGE has published a complete map of the mouse brain activation during decision-making.

What happens in the brain when we make a decision? A large consortium of neuroscientists affiliated to the International Brain Laboratory (IBL), co-led by a team from the University of Geneva (UNIGE), unveils the first complete map of brain activity during this complex process in mice. With unprecedented single-cell resolution, this brain map challenges the traditional hierarchical view of information processing in the brain. It demonstrates that the brain is able to coordinate multiple regions to simultaneously process different external stimuli, but also to make predictions based on previous experiences in order to make decisions. These findings are the subject of two articles published in *Nature*.

Officially launched in 2017, the IBL has introduced a new model of collaboration in neuroscience that pools a standardised set of tools and information management between several laboratories, thus ensuring data reproducibility. "Thanks to this large-scale collaboration, 21 laboratories worked together on the same experimental model to record and analyse the individual activity of more than 650,000 neurons in 279 areas of the brain, representing 95% of the mouse's brain volume," explains Alexandre Pouget, full professor in the Department of Basic Neuroscience at UNIGE Faculty of Medicine and co-founder of the IBL.



© Dan Birman. IBL

Neuronal firing rates across the brain during an average trial of the decision-making task, conducted as part of the IBL study.

Pictures

A brain lit up like a Christmas tree

The scientists used Neuropixels, a special type of electrode, to simultaneously record neural activity and measure brain activity in mice performing a decision-making task. Placed in front of a screen, the mice had to move a small wheel to the left or right, towards a light that appeared sporadically, in order to receive a reward. But sometimes the light was so dim that the animal had to guess which way to turn the wheel. "The mouse then uses the frequency at which the light previously appeared on the left or right to make assumptions, which allows us to study how prediction based on previous experience influences perception and decision-making," says Alexandre Pouget. "And we found that when it is making a decision, the entire brain lights up like a Christmas tree! These experiments have resulted in an extremely detailed map of the brain during decision-making, from its very beginning to the moment the reward is obtained."

Two major discoveries

The research teams made two major discoveries. First, decision-making signals are distributed throughout the brain. They are not localised in specific regions, contrary to the commonly accepted model

of a hierarchical decision tree. “There is constant communication between different areas of the brain throughout the decision-making process,” explains Alexandre Pouget.

Furthermore, prior expectations, i.e. what we think is likely to happen based on previous experiences, are encoded throughout the brain, not just in the areas responsible for cognition. The parts of the brain responsible for processing sensory information or controlling actions also play a central role in the brain’s ability to anticipate and therefore guide behavioural responses. These findings are important for understanding certain neuropsychiatric disorders such as schizophrenia and autism, where the management of anticipation and reward appears to be dysfunctional.

“Traditionally, neuroscience has looked at brain regions in isolation. Recording the whole brain means we now have an opportunity to understand how all the pieces fit together,” says Kenneth Harris, Professor of Quantitative Neuroscience at UCL and one of the core members of the IBL.

Working towards open science

One of the principles governing the IBL is a commitment to democratising and accelerating science, as well as improving data reproducibility. The brain map published here is available to teams around the world, who are already using it for a wide range of research. In addition, all data from these studies, along with detailed specifications of the tools and protocols used for data collection, are openly available to the scientific community. More details can be found on the IBL website in the sections: Data, Tools, Protocols.

This research was supported by grants from Wellcome (209558 and 216324), the Simons Foundation, the National Institutes of Health (NIH U19NS123716O1), the National Science Foundation (NSF 1707398), the Gatsby Charitable Foundation (GAT3708), as well as the Max Planck Society and the Humboldt Foundation.

contact

Alexandre Pouget
Full Professor
Department of Basic Neuroscience
Faculty of Medicine
UNIGE
+41 22 379 46 99
Alexandre.Pouget@unige.ch

DOI: 10.1038/s41586-025-09235-0

DOI: 10.1038/s41586-025-09226-1

UNIVERSITÉ DE GENÈVE
Communication Department
24 rue du Général-Dufour
CH-1211 Geneva 4

Tel. +41 22 379 77 17

media@unige.ch
www.unige.ch