



BBI
Brain and Behavior Initiative

Special BBI Seminar

Brain networks for engagement, vision, choice, and action



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Matteo Carandini received a Laurea in Mathematics from the Università di Roma (1990) and a PhD in Neural Science from New York University (1996). After postdoctoral fellowships at Northwestern University and New York University, he established a laboratory at the Swiss Federal Institute of Technology in Zurich (1998). He then moved the laboratory to the Smith-Kettlewell Eye Research Institute in San Francisco (2002) and finally to UCL (2007). His work aims to understand how the brain processes sensory signals, and integrates them with internal signals to guide decision and action. The goal is to understand these processes at the level of large populations of individual neurons.

Behavior arises from neuronal activity, but it is not known whether the active neurons are concentrated in a few brain regions or distributed across many regions. We trained mice to report decisions about visual stimuli, and used high-density probes to record from >30,000 neurons across 42 brain regions. Task engagement could be predicted by a characteristic pattern of activity in a set of brain regions. During engagement, visual signals starting in the visual pathway invaded a wide set of brain regions. A majority of neurons in nearly all brain regions responded at the time of action. However, neurons encoding choice prior to action were rare and inhabited only a few regions of forebrain and midbrain. These results reveal computations performed by neuronal populations distributed across the brain, and define distinct brain-wide networks supporting engagement, vision, choice, and action.

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