The BRAIN Initiative

The goal of the BRAIN Initiative is no less than a full understanding of the global network activity of the brain. Achieving this goal requires development of the capability of monitoring real-time activity in the brain in a comprehensive way with high temporal and spatial resolution, a project that cannot succeed without integrating neuroscience with engineering and the physical sciences.

It has become increasingly clear that high-level cognitive activities are carried out through the activities of broad networks of neurons. Current technologies give us only a sketch of these networks and a cumulative picture of the associated activity. The feasibility of a major effort in technology development is based on recent advances in the molecular probes and in the design and fabrication of nano-scale devices, as well as in the rapidly advancing field of RF device miniaturization. Exploration of new modalities for outside-the-cranium recording are also being explored.

The overall strategy is to organize and support research teams and projects aimed at developing novel technologies for detecting neuronal activity, for reporting it out of deep brain tissue, and for processing and analyzing the resulting data. Improvements in the ability to monitor activity in real-time and at a fine, neuronal level of resolution will likely be achieved in a stepwise manner, and small brains in experimental animals the first to become accessible. Subsequent steps will involve theory formulation and verification through simulations and further experiment.

Terrence Sejnowski is a pioneer in computational neuroscience and his goal is to understand the principles that link brain to behavior. His laboratory uses both experimental and modeling techniques to study the biophysical properties of synapses and neurons and the population dynamics of large networks of neurons. He has published over 500 scientific papers and 14 books, including The Computational Brain. He received his PhD in Physics from Princeton and is currently an Investigator with the Howard Hughes Medical Institute, a Distinguished Professor at the University of California at San Diego and holds the Francis Crick Chair at The Salk Institute. Sejnowski is the President of the Neural Information Processing Systems (NIPS) Foundation, the premier conference on machine learning and neural computation. He is a member of the National Academy of Sciences, the National Academy of Medicine and the National Academy of Engineering. He was instrumental in shaping the BRAIN Initiative that was announced by the White House in 2013 and served on the Working Group of the Advisory Committee to the Director of NIH for the BRAIN Initiative.