

# **From Neuronal Circuit Reconstructions to Principles of Brain Design**

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How does electrical activity in neuronal circuits give rise to intelligent behavior? We believe that this question is impossible to answer without a comprehensive description of the connectivity in neuronal networks. Such a description may be a wiring diagram, which catalogs all neurons and synaptic connections between them. In collaboration with several laboratories, we are reconstructing vertebrate and invertebrate wiring diagrams from electrophysiological, light, and electron microscopical data. To gain insight into brain function from the wiring diagrams, we formulate engineering principles of brain design and test them experimentally. By focusing initially on explaining the function of simpler organisms, we are assembling a theoretical framework and accumulating experience necessary to understand more complex systems, such as the mammalian neocortex.