

# A theory of the primary visual cortex, its zero-parameter quantitative prediction, and its experimental tests

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A monkey's brain, a good model of human brain, devotes about half of its area to visual processing, and the primary visual cortex, also called V1, is the largest brain area devoted to vision. There has been a great amount of experimental data on the neurobiology of V1, including those by Hubel and Wiesel who won Nobel prize in 1981. However, the role of V1 for the perceptual and cognitive function of vision was unclear for many years. I will introduce a recent theory of V1 proposing that V1 serves to guide visual attention using external visual inputs so that the brain can devote its resources to process a tiny fraction of visual inputs in the attentional spotlight. This theory can be described by a simple equation, which combined with physiology of V1 can easily derive another simple equation relating several measurable quantities about visual behavior without free parameters. This prediction is experimentally confirmed. In addition, surprising insights about our brain are revealed by an “impossible” qualitative prediction of this theory, and its experimental confirmation.