# Readings in Neuroinformatics

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Chr Von der Malsburg. Self-organization of orientation sensitive cells in the striate cortex. *Kybernetik*, 14(2):85–100, 1973.

**Abstract**

Studying vision, we can think of our eyes as continuously "filming", with the retina capturing a map of light dots and passing it along through the thalamus onto the primary visual cortex. Here, the arriving image gets decomposed by neurons sensitive to just one specific spatial concept such as orientation. These neurons are grouped together roughly as cylindrical clusters aligned vertically to the cortical surface, forming a new map of "functional columns", with a slight change of orientation selectivity between one column to the next. With these findings well established, it remains to find a simple explanation for the purpose of this manner of organization as well as a plausible mechanism for its determination. Here we propose a model to meet the given conditions. True to the anatomical facts, it is designed as interconnected cells with states expressed as non-linear functions of weighted sums that in turn represent the signals transmitted within the cellular network. Its capacity for learning is tested by iteratively entering model stimulus parameters into the equations, showing that it successfully implements the mechanism sought for, determining the cortical orientation preference clusters. Our work shows that core functional features of sensual processing in the cortex can be mathematically described allowing valid predictions.

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