

The development of binocular vision

Host School/Institute: Discipline of Biomedical Science, School of Medical Sciences

Project Code: SMS3

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Description of Project:

Most of us can combine the information from our two eyes to obtain a richer view of the world than would be the case with only one eye. While it is easy to take binocular vision for granted, there are many unanswered questions about how it operates.

Many neurons in primary visual cortex can be stimulated through either eye. These *binocular* cells have one receptive field for left eye stimuli and another receptive field for right eye stimuli. Response properties such as preferred orientation and preferred motion direction differ little between the two receptive fields. This is a remarkable property, given that the two monocular pathways develop, by and large, independently.

How does this binocular congruence come about? The proposed project will explore this question computationally. A mathematical model for signal processing in each of the monocular pathways will be developed. The monocular pathways will be connected to each cortical cell by making two assumptions: that one monocular connection is made before the other, and that a Hebbian process (“cells that fire together wire together”) determines the pattern of connections for the later pathway.

The student undertaking this project should be mathematically competent. Further, a working knowledge of the software package Matlab will provide a flying start.

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