**Three Year Review- Yamni Mohan**

**Introduction**

In the quest for finding the mechanism through which the cortex processes information, two distinct levels have been studied. The first being the neuronal level and the second the cortical architecture level. Of all the features that have been studied, orientation tuning of the primary visual cortical neurons has been the most prominent. V1 neurons show sharp orientation tuning and neurons that respond to the same orientation are organised in columns. So far, there is no unifying theory that explains both orientation tuning and the cortical architecture. In my thesis I aim to evaluate a mechanism that offers an explanation for both feature selectivity and the underlying cortical architecture.

**Part one: Sub cortical orientation biases**

**Chapter one: Orientation biases in the tree shrew superior colliculus.**

In this chapter, I recorded from neurons in the tree shrew Superior Colliculus. Studies have shown that

**Chapter two: Radial orientation bias in the inputs to V1 in macaques.**

**Part two: Insight into orientation tuning from the tree shrew primary visual cortex**

**Chapter three: Receptive field properties neurons in the tree shrew primary visual cortex**

**Chapter four: Role on inhibition in generating sharp orientation tuning in the tree shrew primary visual cortex.**

**Chapter five: Evaluating the shrew V1 neurons as a patch by patch fourier processor.**

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| Determine if the tree shrew SC neurons are orientation tuned. Determine if there is relationship between the orientation and spatial frequency tuning of tree shrew SC neurons. Compare the responses of SC neurons to that observed in the retina and LGN of both tree shrews and other species | If the sharp orientation tuning in V1 is derived from biases in the retina, then it should be evident in areas of the thalamus other then the LGN which receive direct retinal input. |
| Determine if there is a preponderance of cardinal orientations in optical imaging maps of the cortex. | If the sharp orientation tuning in V1 is derived from orientation biases in the retina, then any anisotropies seen in the retina will be reflected in the inputs to the cortex. These anisotropies will also form the building blocks of cortical architecture. |
| Compare and contrast the orientation tuning, spatial frequency tuning, modulation ratios and polarity of neurons with previously published tree shrew as well as cats and macaque results. | The receptive field transformation that occurs from LGN to Area 17 in layer 4 happens from layer 4 to layer 2/3 in the tree shrews, as it happens in the macaques. |
| Elucidate mechanism of orientation selectivity in the primary visual cortex of tree shrews. | Orientation tuning in shrew layer 2/3 can be explained by non-specific inhibition of the |