Introduction

# Cellular architecture and signal propagation in neurons

## Building blocks of the brain

The brain consists of two fundamental cell populations, neurons and glial cells. Neurons communicate via electrical signals which ultimately allows the conscious and unconscious functions of the brain to occur. The glia on the other hand comprises a heterogenous group of cell types that play supportive roles such as speeding neural signals, ensuring neurons have the correct electrolyte and oxygen balance, regulation of immune responses and clearance of waste products. Neurons and glial cells work harmoniously to produce controlled electrical signalling in the brain.

The neuron is made of three distinct segments which have distinct roles to play in the transmission of electrical signals. Input to the neuron is provided at the dendrites along which the signals undergo various non-linear transformations. The signals summate at the axon hillock and if a threshold point is reached, the neuron will transmit an excitatory or inhibitory signal via its axon which synapses onto the dendrite or cell body of other neurons.

## Dendrites and signal propagation

# Modelling dendrites

## Cable Theory

## Limitations of Cable Theory

## Alternative models of dendrites

# Impermeant anions

# Aims and Objectives