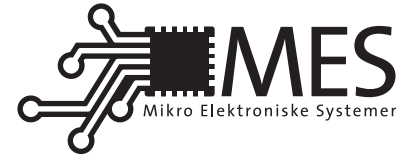




UNIVERSITY  
OF OSLO



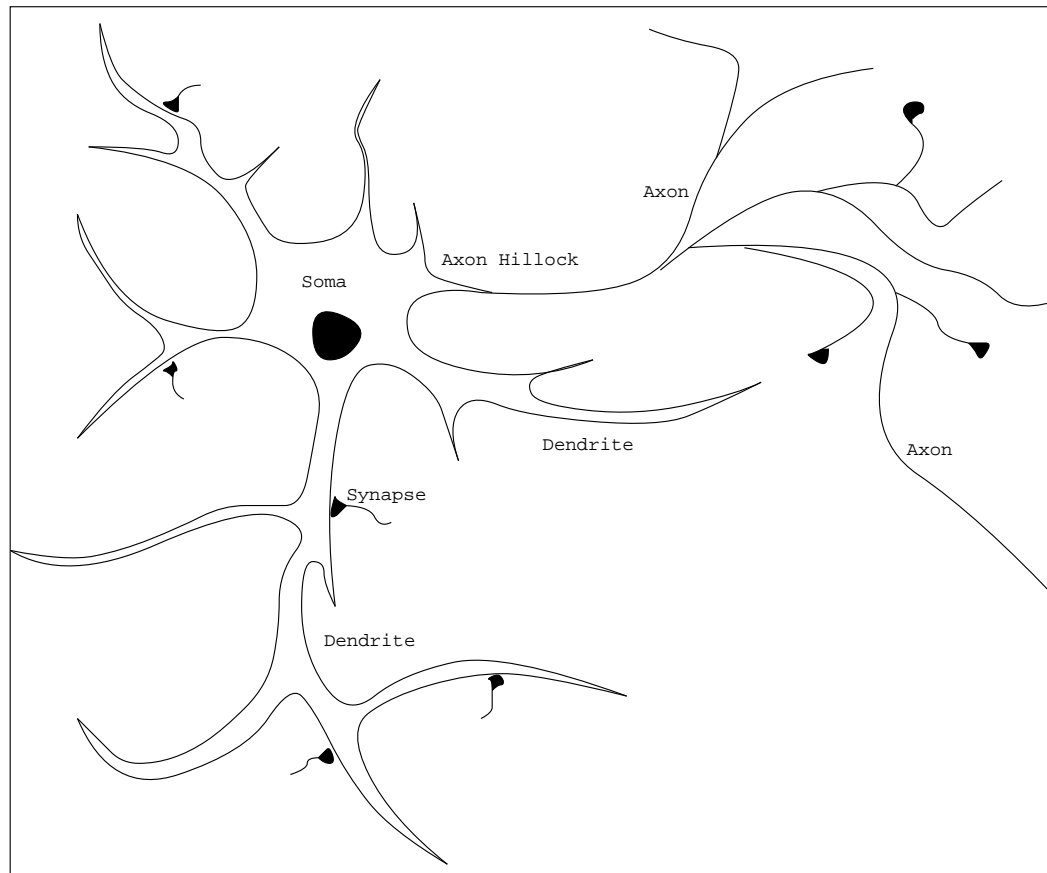
---

# Neuromorphic Electronics

## Neurons and Neuronal Models

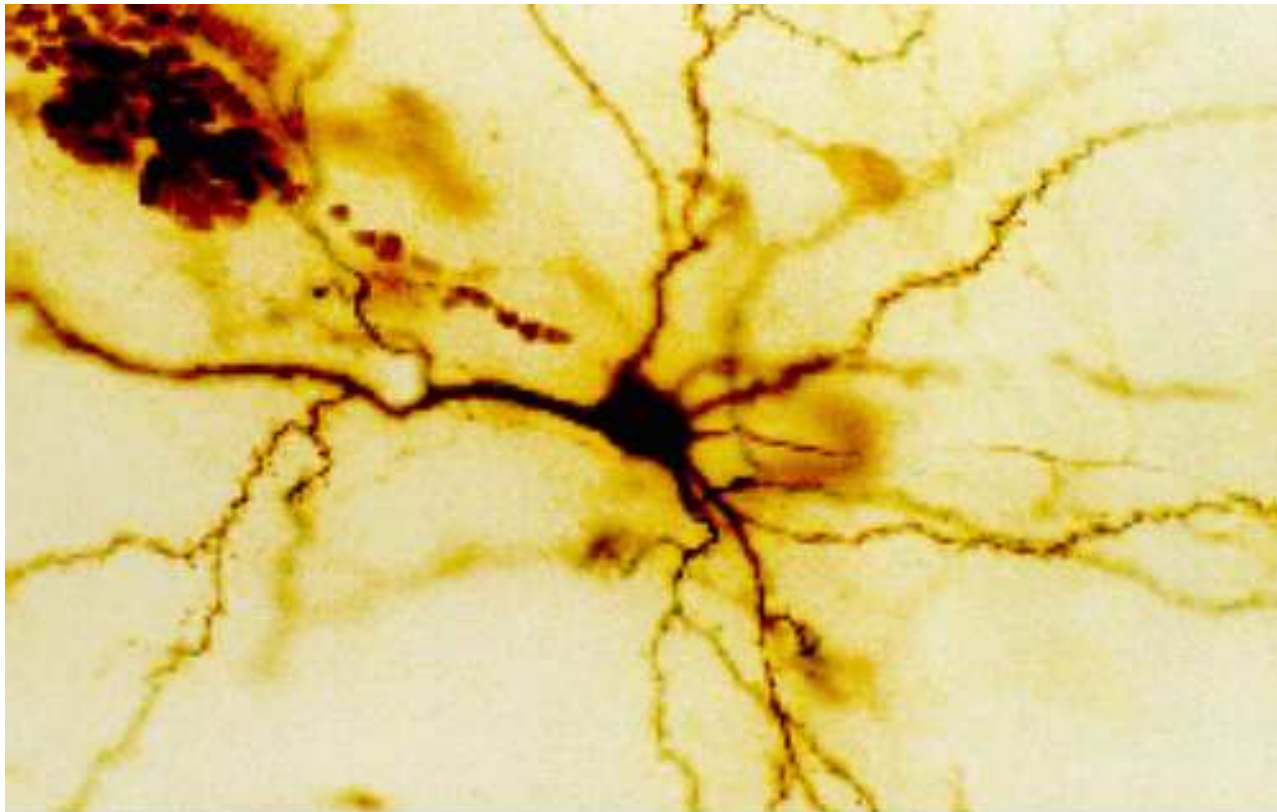


## Basic Anatomical Parts



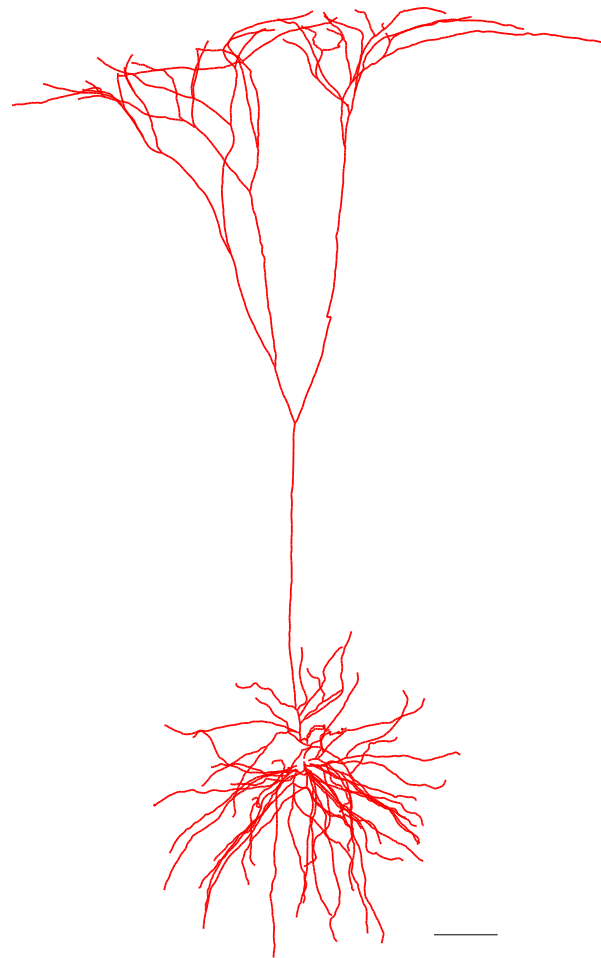


## Microscope Picture of a Stained Neuron





# 3D Reconstruction of Dendritic Tree





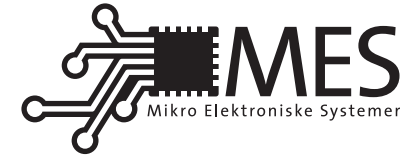
## Level of Detail in some Neuronal Models

electrical nodes	most simple, big networks implementable
perceptrons	mathematically simple, but complicated in aVLSI
integrate and fire neurons	mathematically complex, but simple in aVLSI
compartemental models	complex, simulation of big networks are very slow, aVLSI in real time

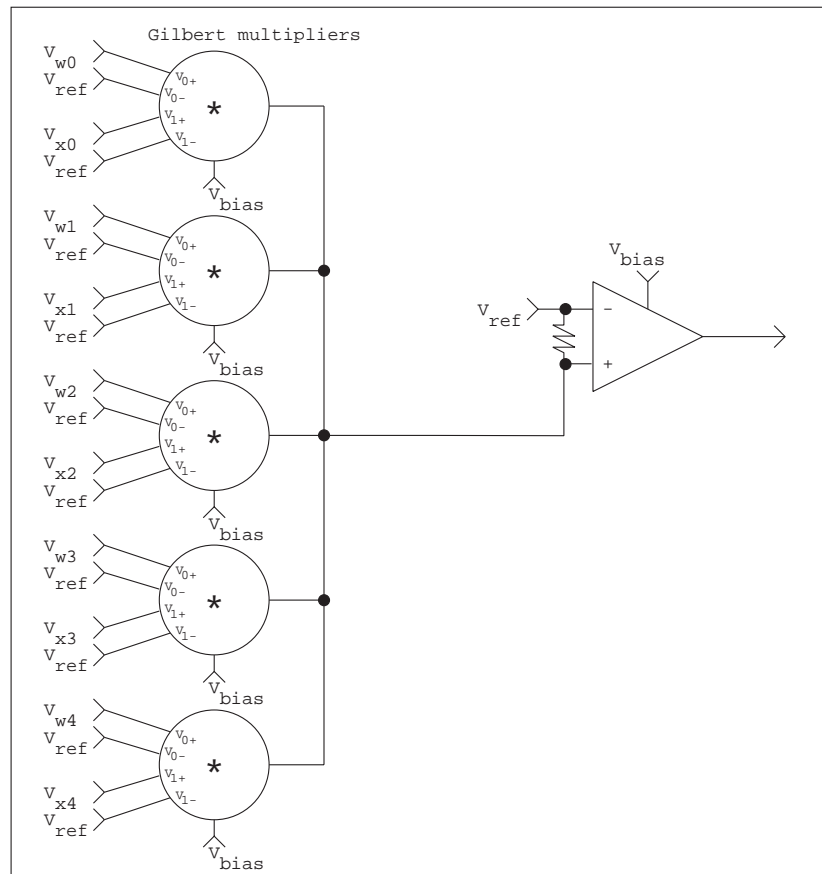


# Perceptron

$$f \left( \sum_i W_i X_i \right)$$

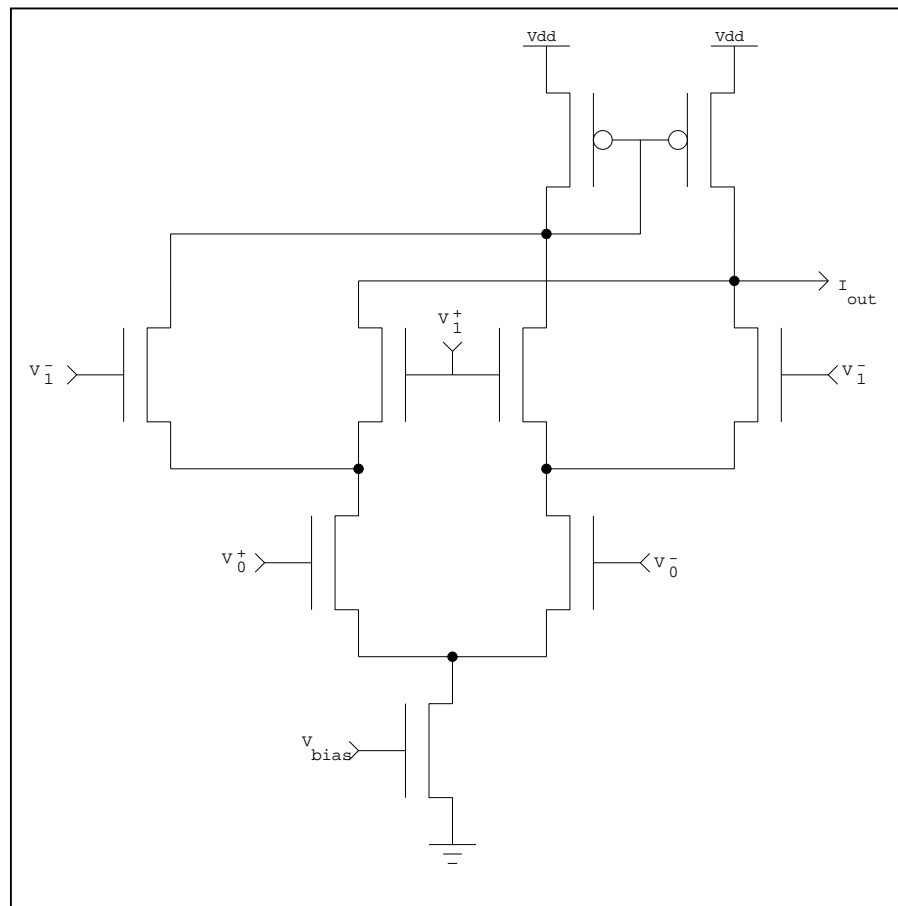


# Possible Perceptron Schematics





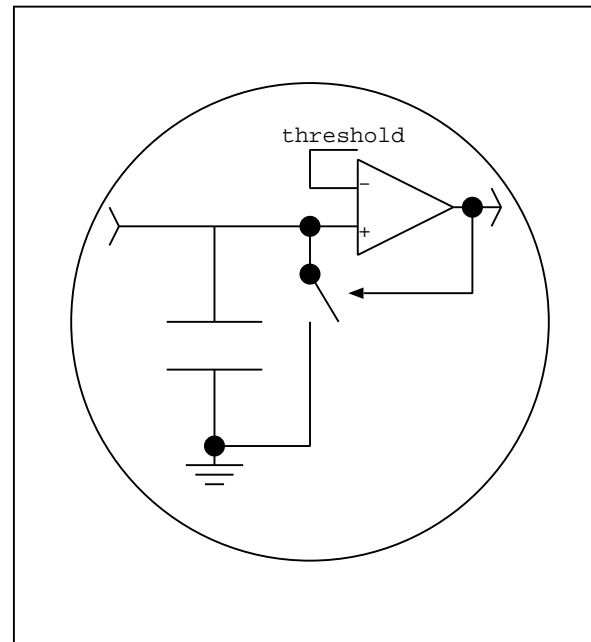
# Gilbert Multiplier





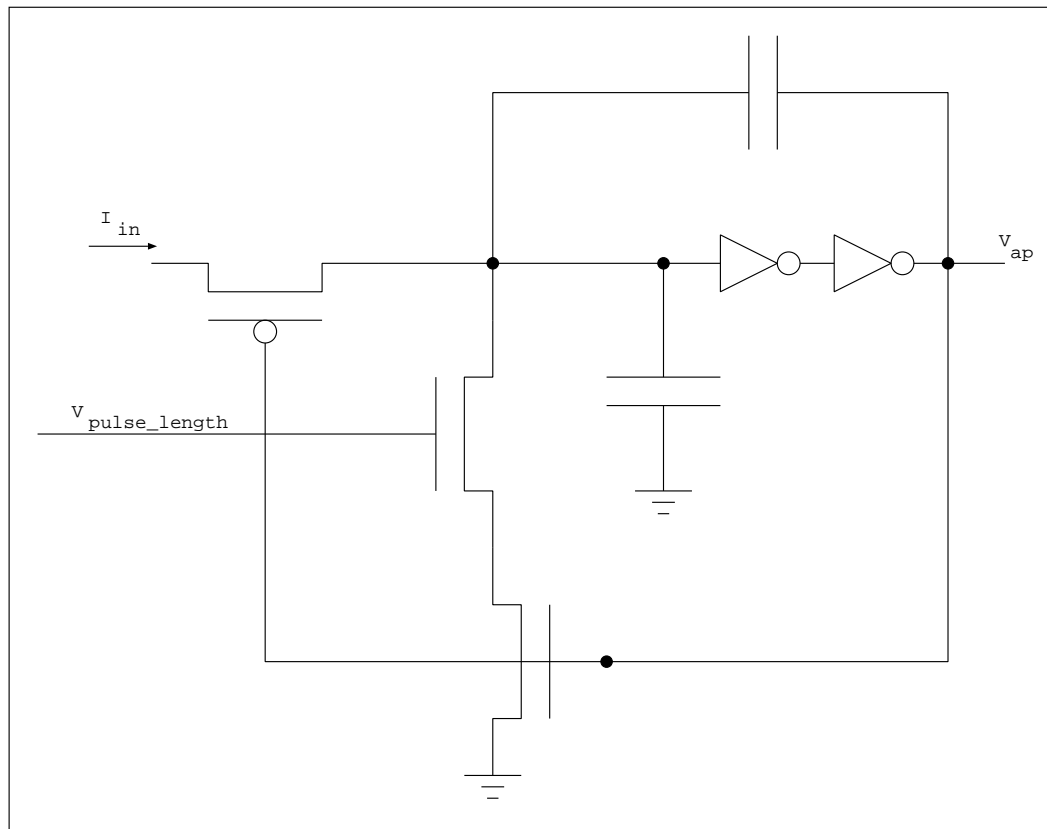


# Integrate-and-Fire Neuron



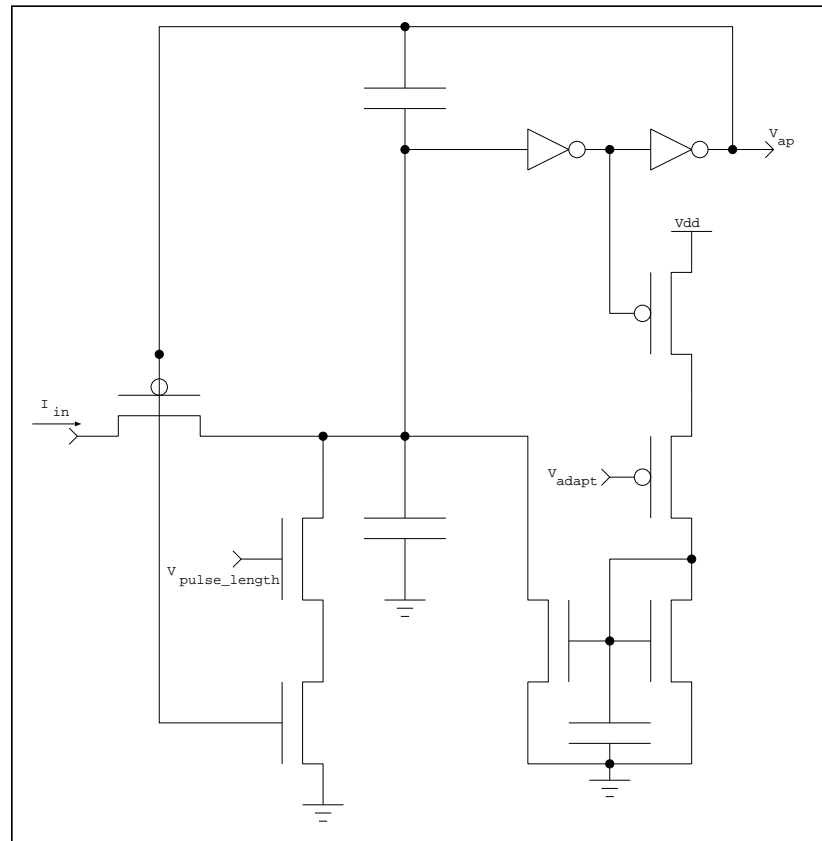


# A Variant of a Integrate-and-Fire Neuron (Carver Mead)



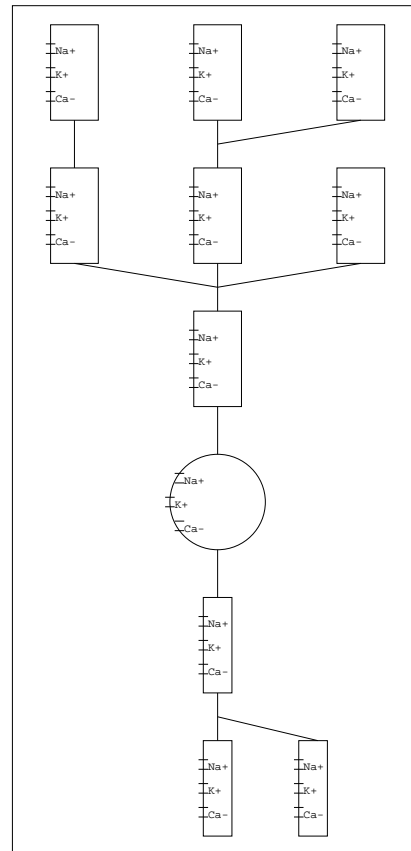


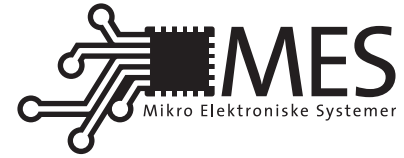
# A Schematics of an Adaptive Integrate-and-Fire Neuron



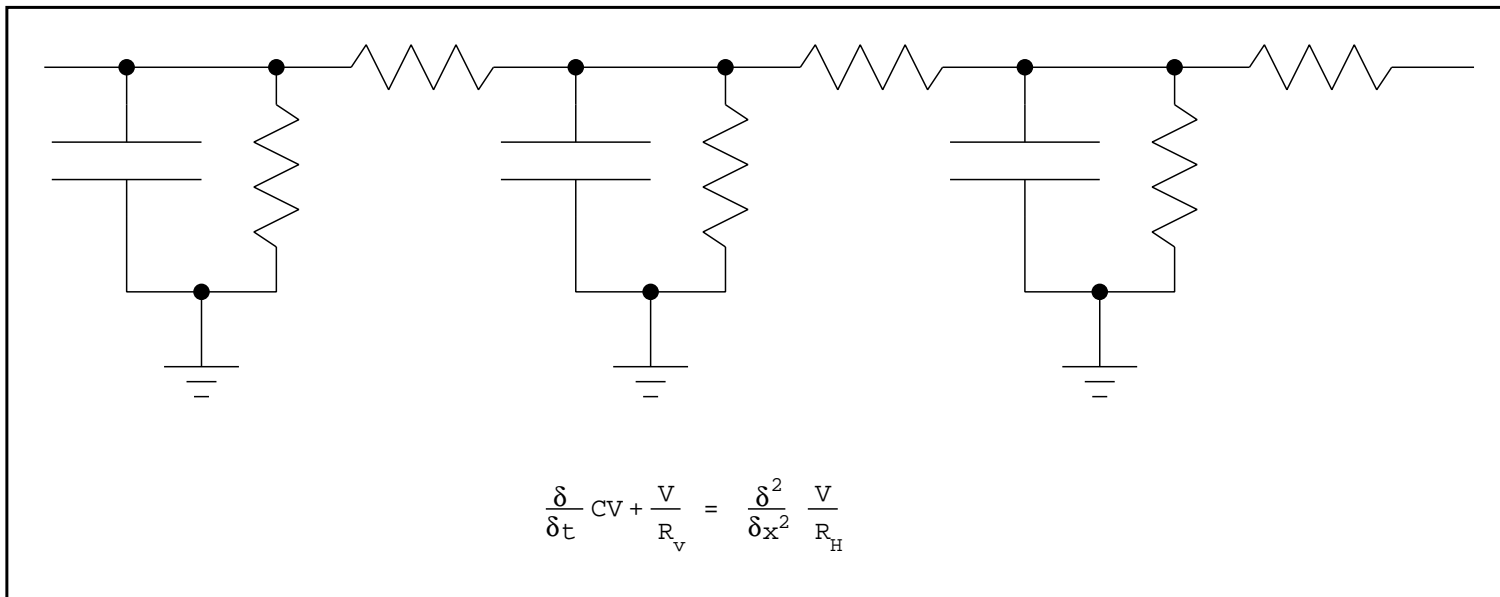


# A Compartmental Model of a Neuron



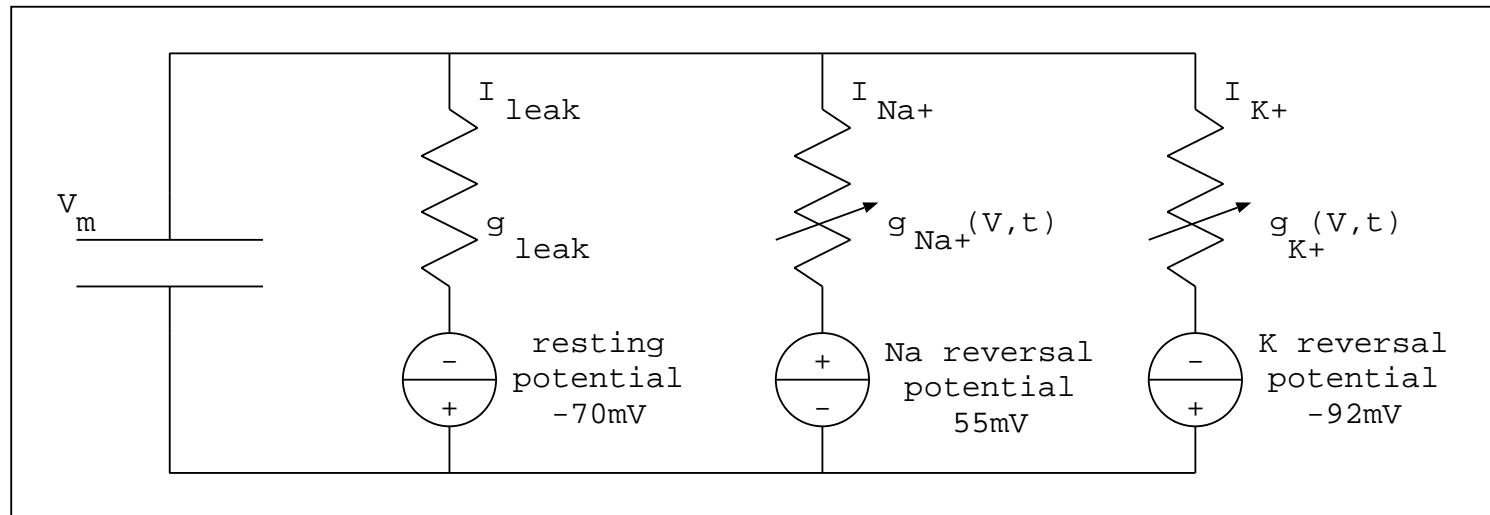


# Model of a Cable





# The Hodgkin Huxley Model of Action Potential Production



# A CMOS Implementation of a HH-soma

