

10^{11} neurons
 (10^5 per mm^3)
 10^{15} synapses

from *Neuroscience: Exploring the Brain* by M.F. Bear, B.W. Connors, and M.A. Paradiso, 2001

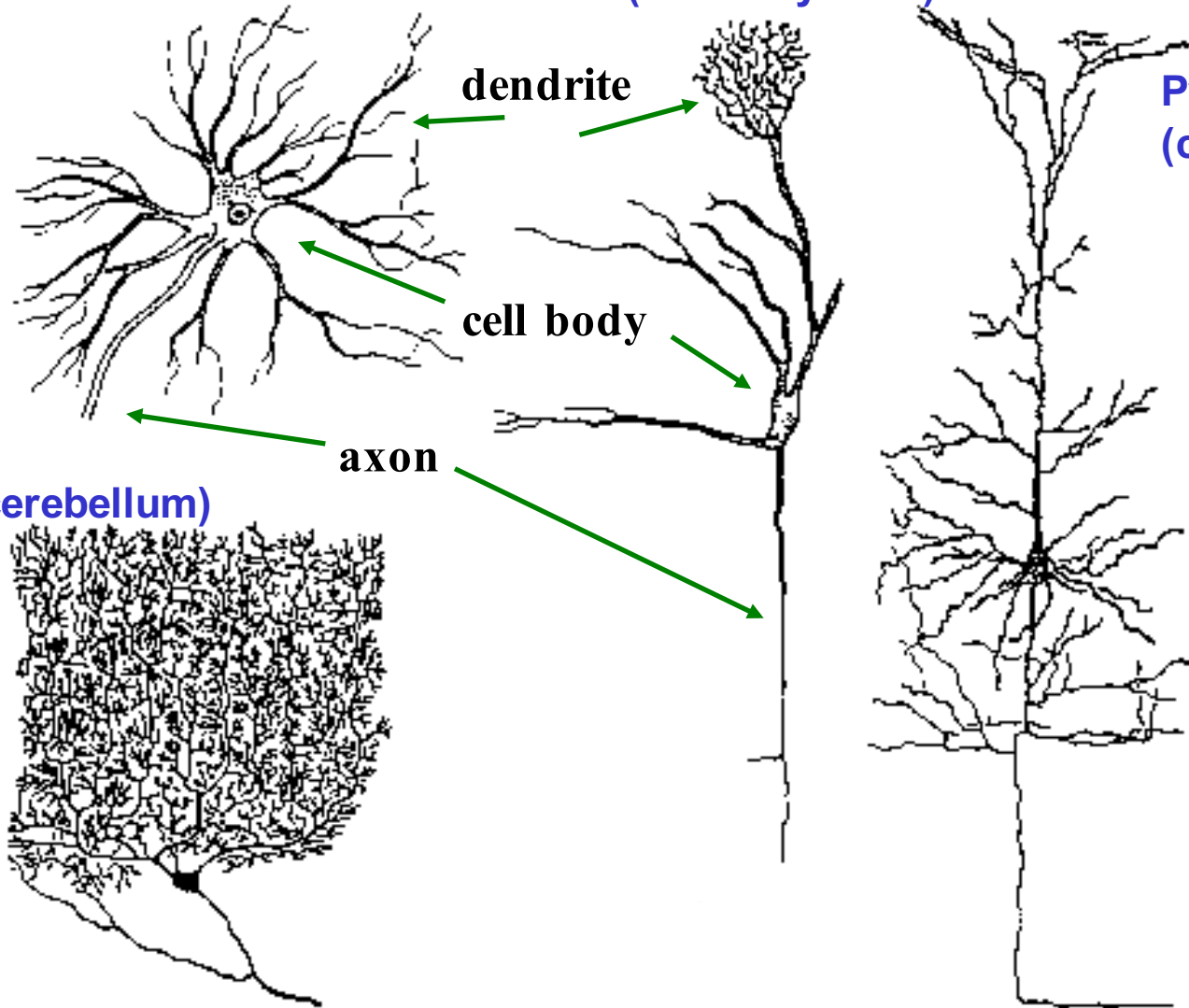
Electrical signals come IN to dendrites, are “integrated” in cell body, result goes OUT axon

motor neuron (spinal cord)

**mitral cell
(olfactory bulb)**

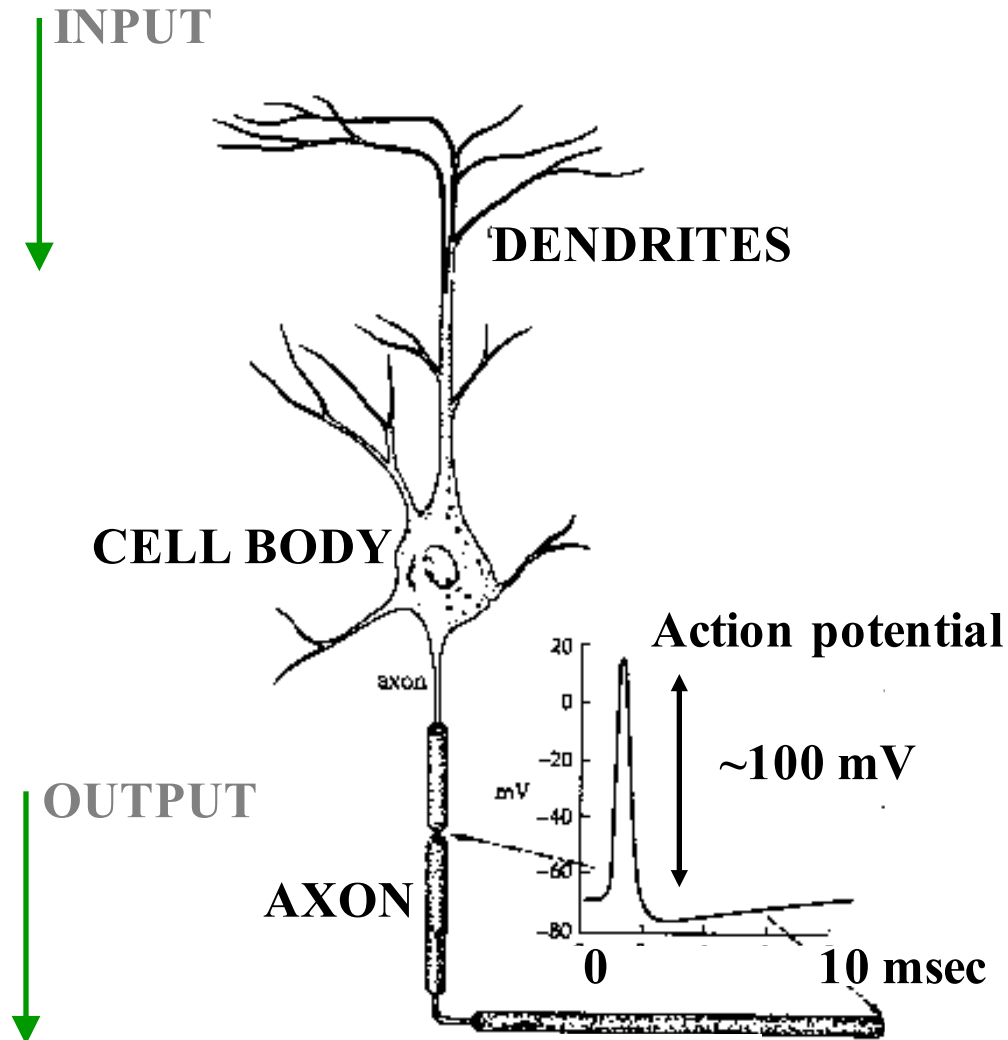
**Pyramidal cell
(cortex)**

Purkinje cell (cerebellum)



From Nicholls et al, 1992, Fisher and Boycott, 1974, Johnston and Wu, 1997

Given sufficient input, neurons “fire action potentials” – fast voltage transients

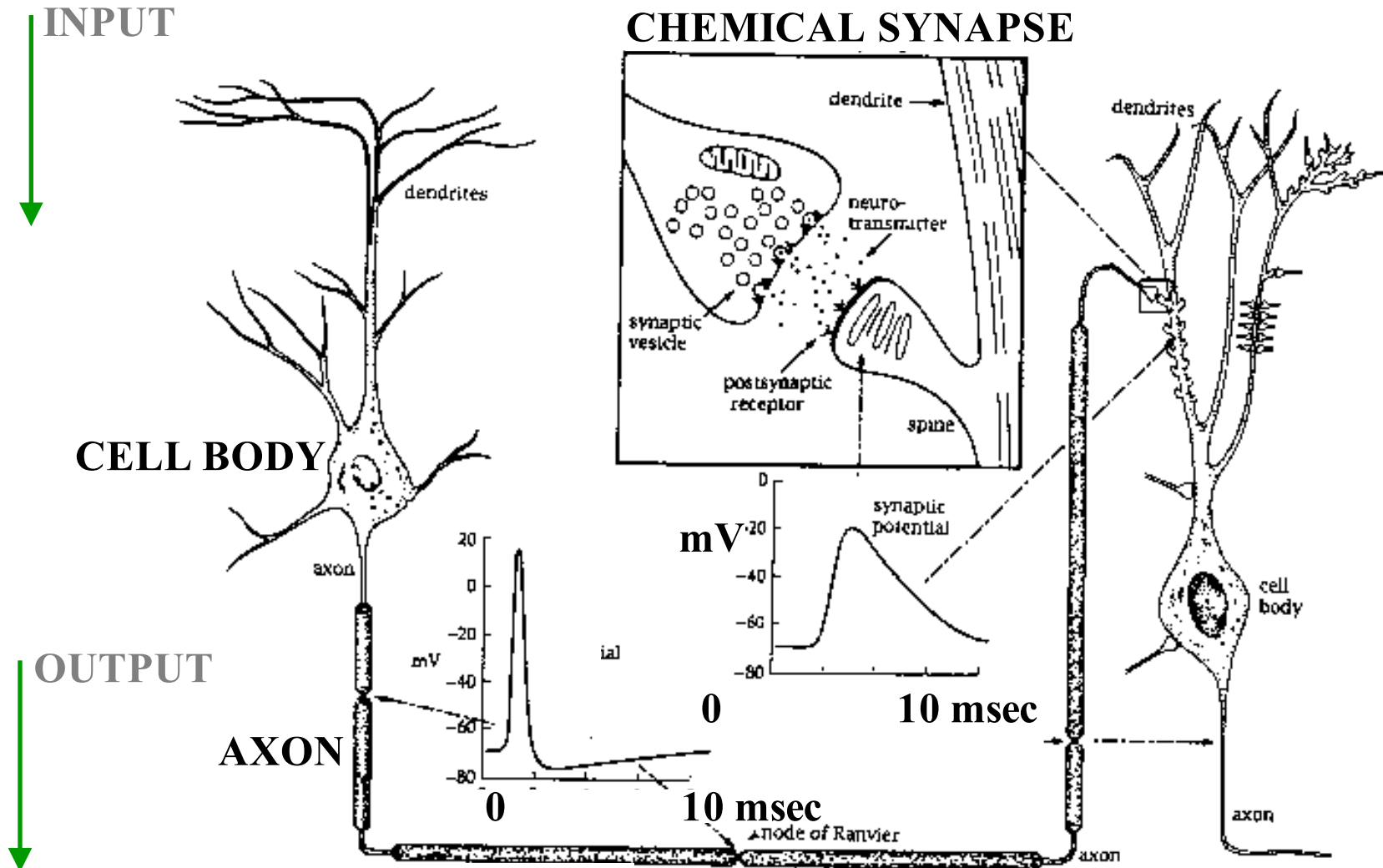


Voltage V : set by "excess charge" inside vs outside membrane (more later)

Johnston and Wu, 1997

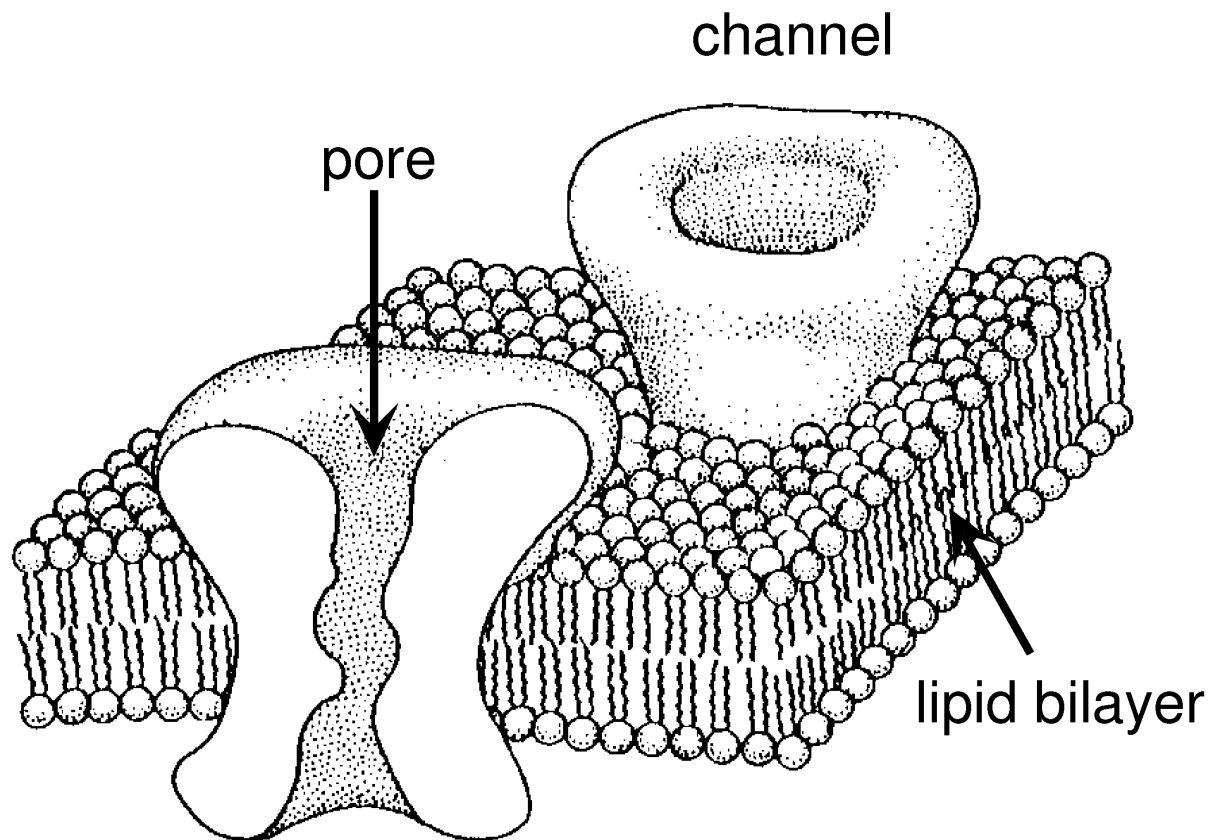
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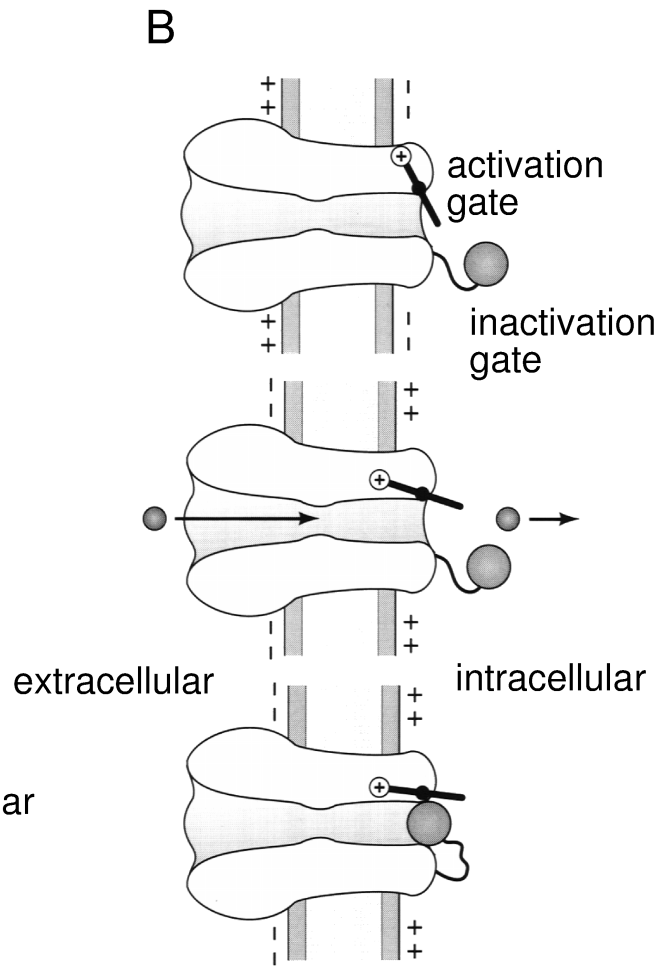
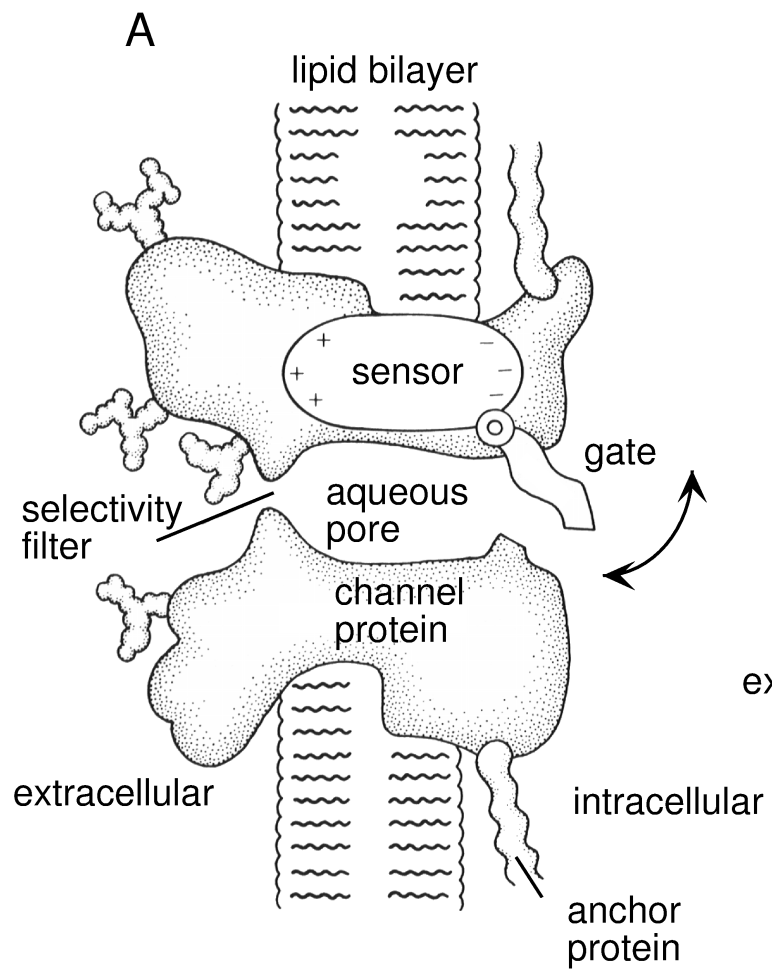
...which are communicated to downstream neurons via synapses



Johnston and Wu, 1997

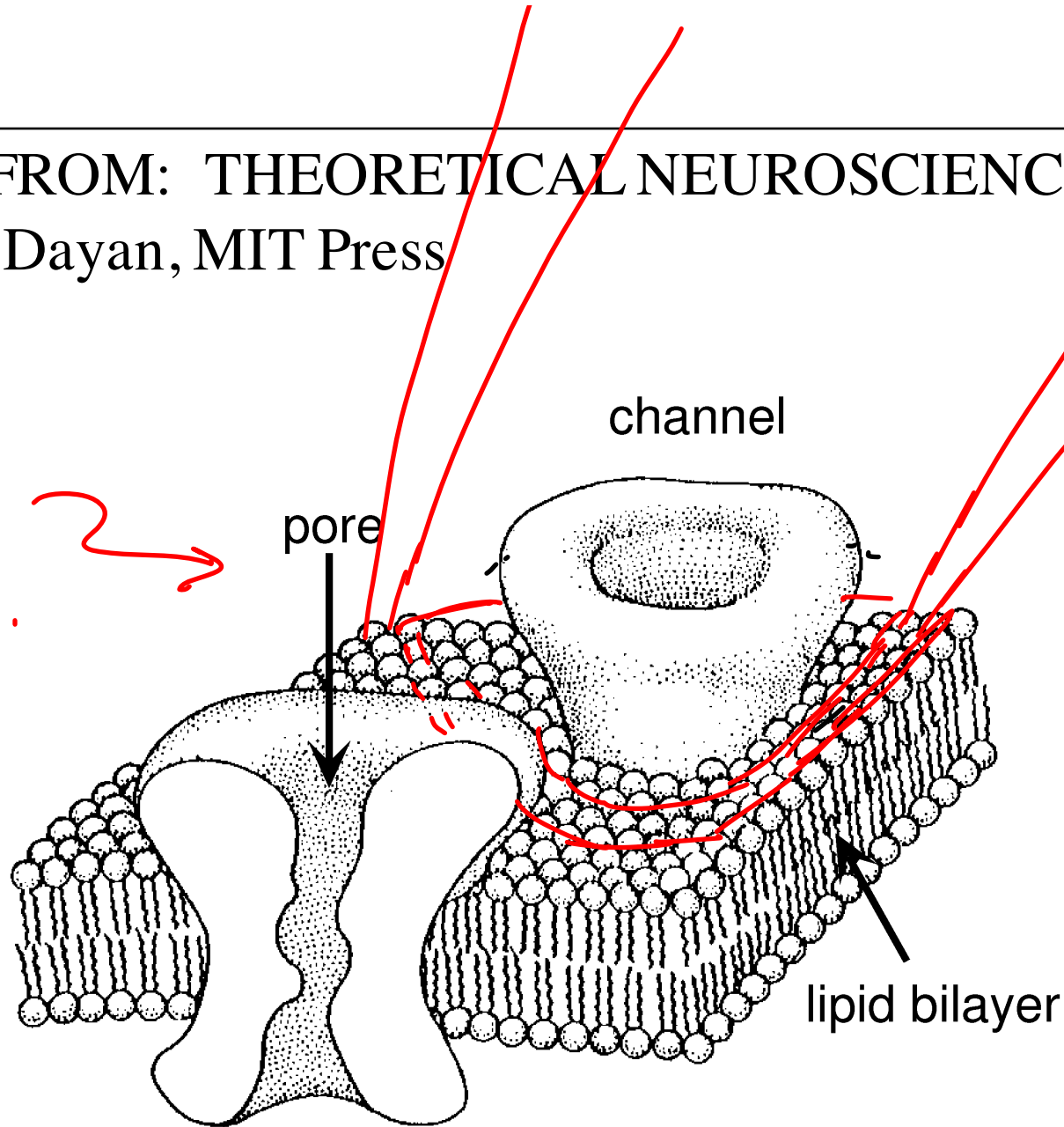
FIGURES FROM: THEORETICAL NEUROSCIENCE,
Abbott and Dayan, MIT Press





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Not to scale!
Sparse channels,
"large"
electrode tip...



Nehrer +
Salemann
(1976)
Single -
channel
patch
clamp

Current $I_j(t)$

