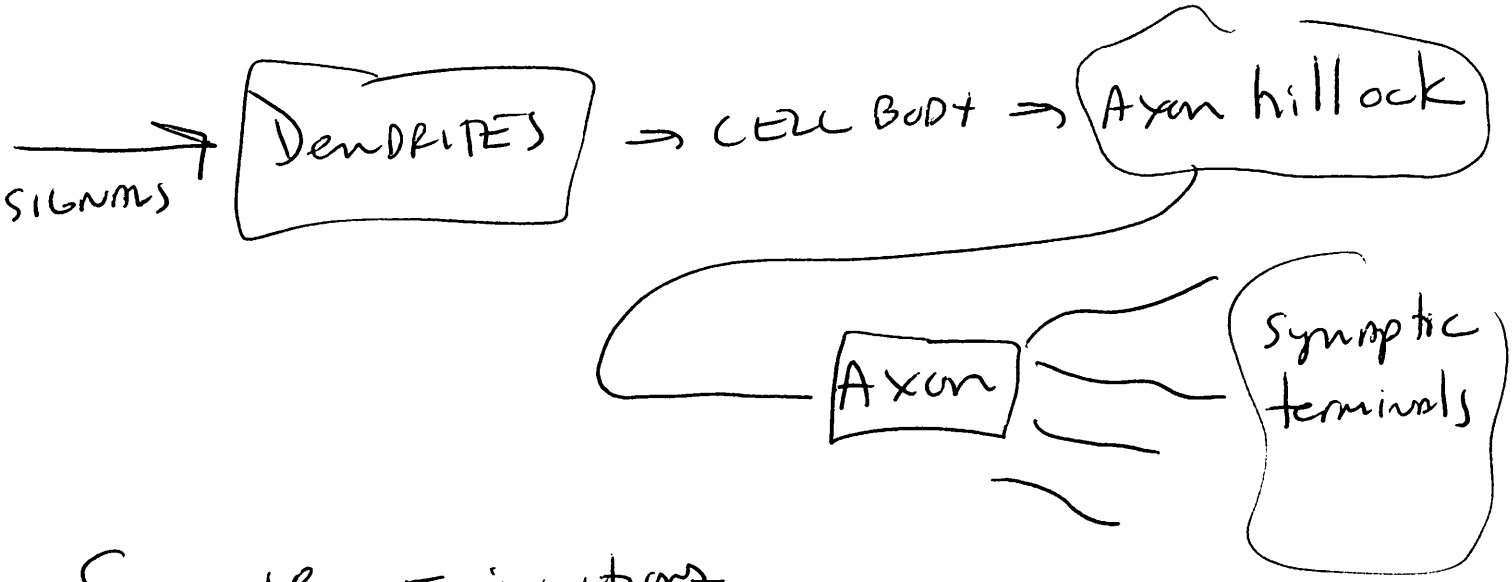
37.1



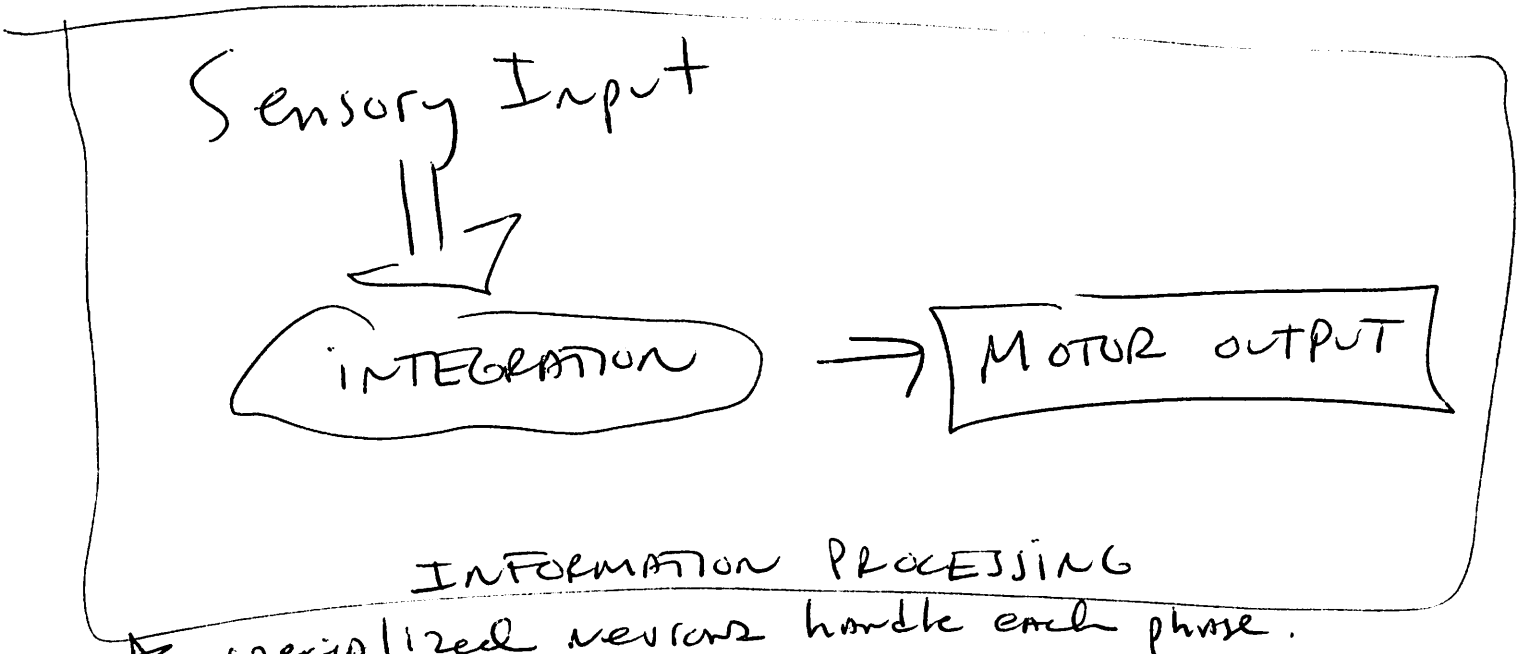
Synapse – junctions
between synaptic terminals of one neuron and the dendrites of the next (i.e. post-synaptic cell)

Pre-synaptic/Post-synaptic Cells (could be muscle or gland)
– relational terms

Neurotransmitters
– chemical messengers

Glial Cells – GLIA
– many more glia than neurons
– "support" ⇒ fluid regulation

Neurons — structurally diverse



★ specialized neurons handle each phase.

(1) Sensory Neurons

- sensors (light, touch, smell, internal conditions)

(2) Interneurons

- Analyze and interpret
- local circuits
- brain or ganglia (clusters of neurons)

(3) Motor Neurons

→ extend out from processing center (brain)
→ signals to muscles, glands.

CENTRAL NERVOUS SYSTEM (CNS)

- performs INTEGRATION
- brain and nerve cord

Peripheral Nervous System (PNS)

- neurons that carry INFO INTO AND OUT OF the CNS
- bundles of them are what we call NERVES

- highly branched dendrites would indicate multiple inputs
- highly branched Axons would indicate multiple outputs.

37.2 Ion pumps and Ion channels

✡ inside of cell is negatively charged relative to outside

Voltage = charge difference

↓

called membrane potential

↓

for a resting neuron, this is called the

Resting Potential = −60 to −80 mV (millivolts)

K^+ and Na^+ are Key Players in forming the resting Potential

GATORADE !!!

K^+ higher inside cell

Na^+ higher outside

Na^+ and K^+ gradients maintained by SODIUM - POTASSIUM PUMP

⇓

uses ATP to pump Na^+ OUT and K^+ IN

Na-K-Pump

- three Na^+ out for every two K^+ coming in

generates some membrane potential

PLUS

Ion Channels - selectively permeable

- K Channels - many more
- Na Channels - fewer.

- Diffusion of K^+ through "leak channels" along concentration GRADIENT establishes the -60 - -80 mV resting potential

↳ its NOT "RUN AWAY" outflow of K^+ because the ensuing electrical gradient counter balances the concentration GRADIENT

Beyond Our Scope

Equilibrium potential (E_{ion})

Nernst Equation

$$E_{ion} = 62\,mV \left(\log \frac{[ion]_{outside}}{[ion]_{inside}} \right)$$

$$E_{K^+} = -90\,mV$$

- the MINUS sign is a measure of how much more NEGATIVE CHARGE there is INSIDE than OUTSIDE

- the resting potential of a mammalian cell is less NEGATIVE than -90 mV

Because ... Sodium channels are allowing some positive charge back in!! (so it comes down to -60 to -80 mV

- E_{Na+} of +62 mV ~~outside the cell~~ theoretically

E_{K+} is -90 mV
E_{Na+} is +62 mV
} in model

- The actual resting potential of a neuron (-60 to -80 mV) is closer to the E_{K+} than the E_{Na+} because there are SO MANY more Potassium Channels