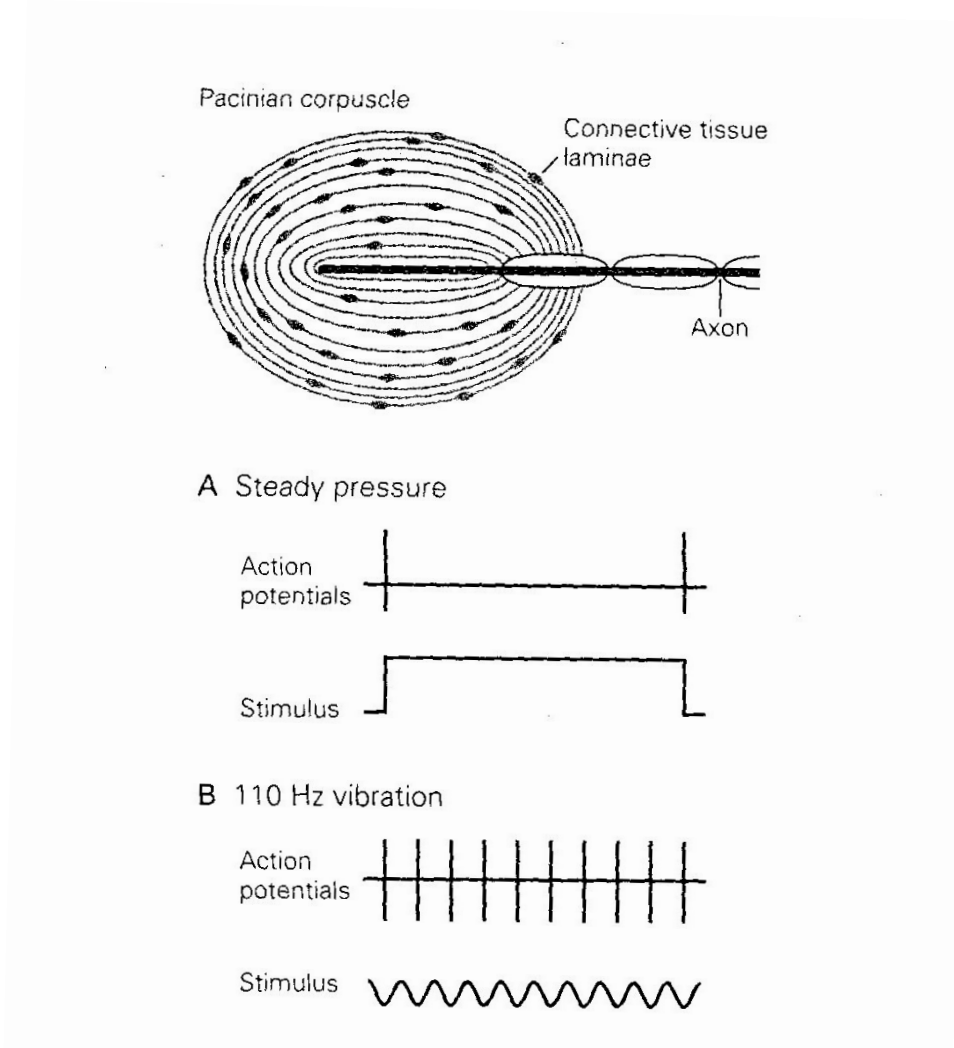
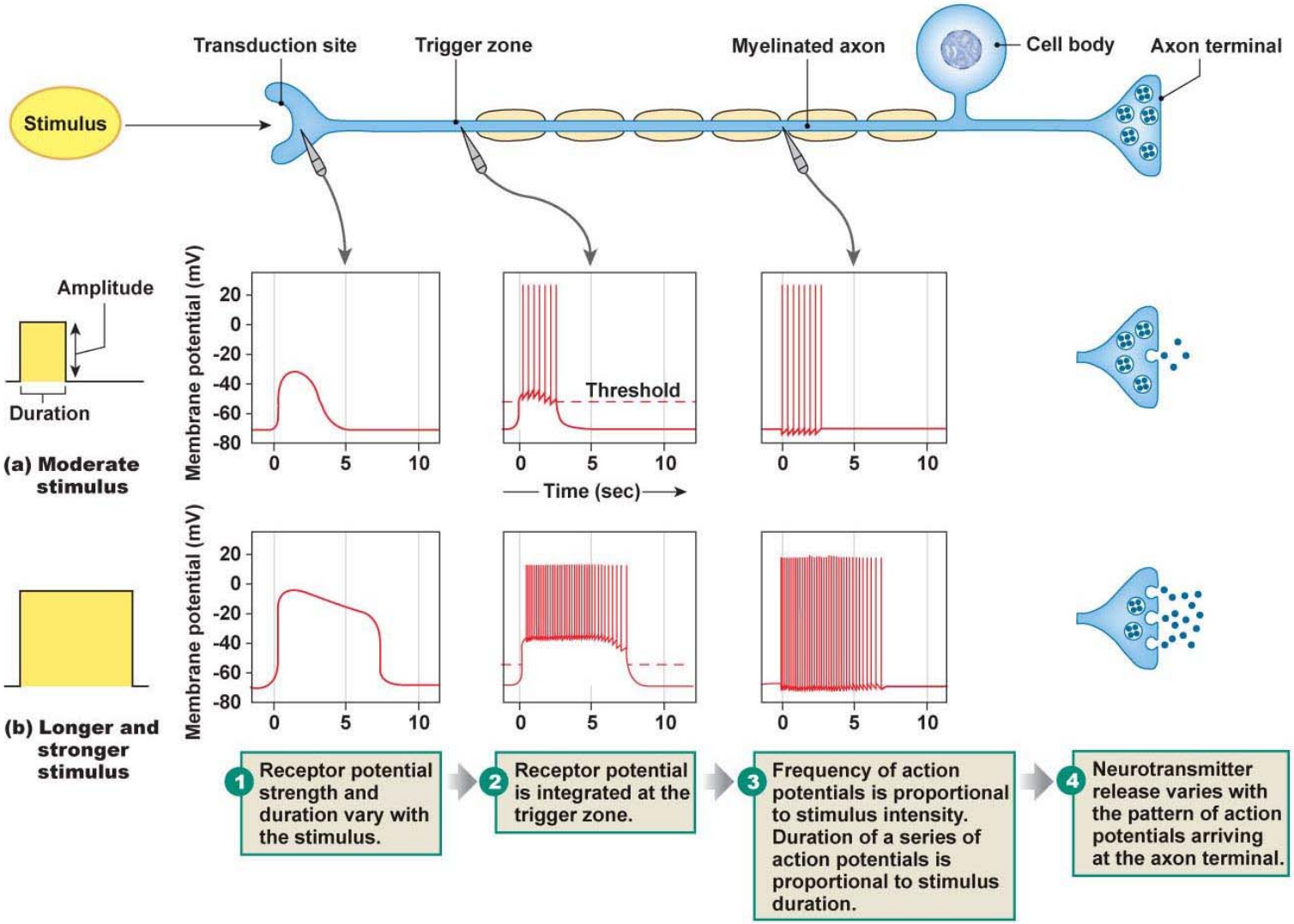
Temporal resolution of touch: receptor morphology



Touch sensitivity: intensity and duration coding



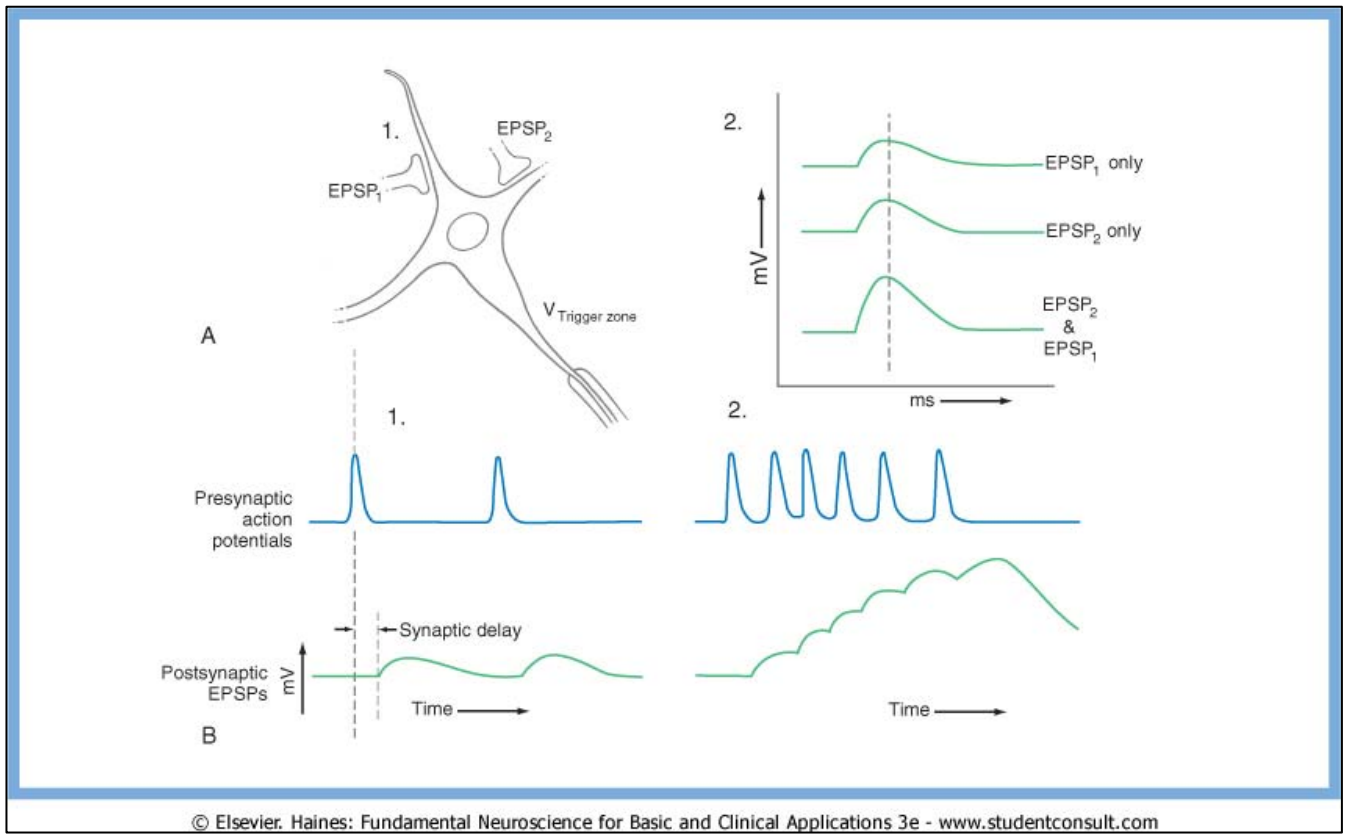
Specialized structures confer acuity, temporal resolution, and sensitivity

Cutaneous Mechanoreceptors and Their Associated Fiber Types and Sensations

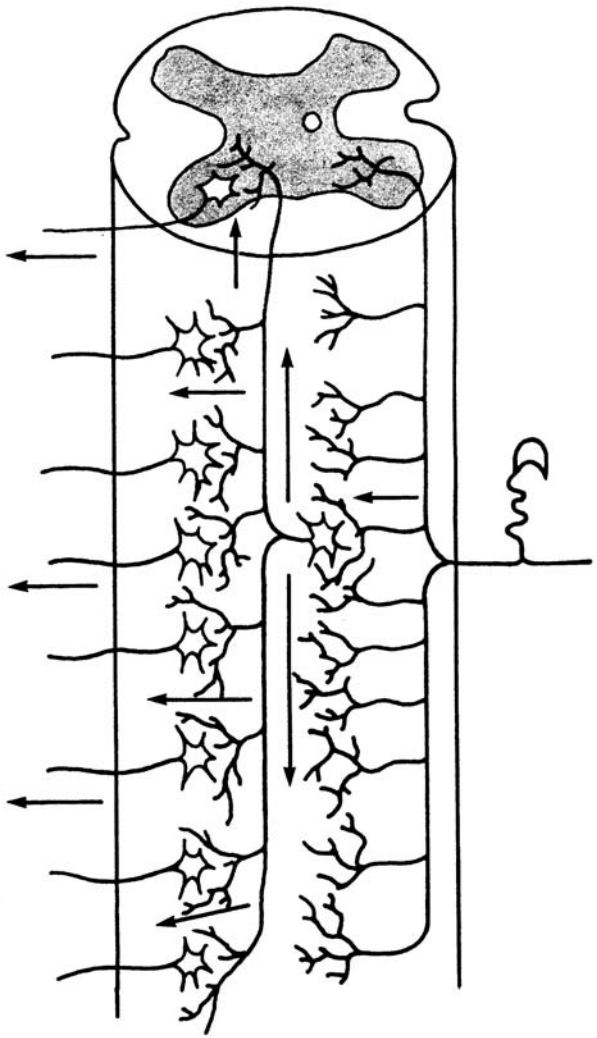
Receptor Type (Adaptation Rate)	Sensation (Microstimulation)	Fiber Type (Group)	Receptive Field Size (Average)	Number per cm^2 Fingertip	Palm
Meissner corpuscle (RA)	Tap, flutter 5-40 Hz	II	Small (~50 mm^2)	>100	40
Hair follicles (RA, SA)	Motion, direction	II	N/A	N/A	N/A
Pacinian corpuscle (RA)	Vibration 60-300 Hz	II	Large	20	10
Merkel cell (SA)	Touch-pressure	II	Small (~45 mm^2)	70	30
Ruffini complex (SA)	Unknown	II	Large	50	15

RA, rapidly adapting; SA, slowly adapting.

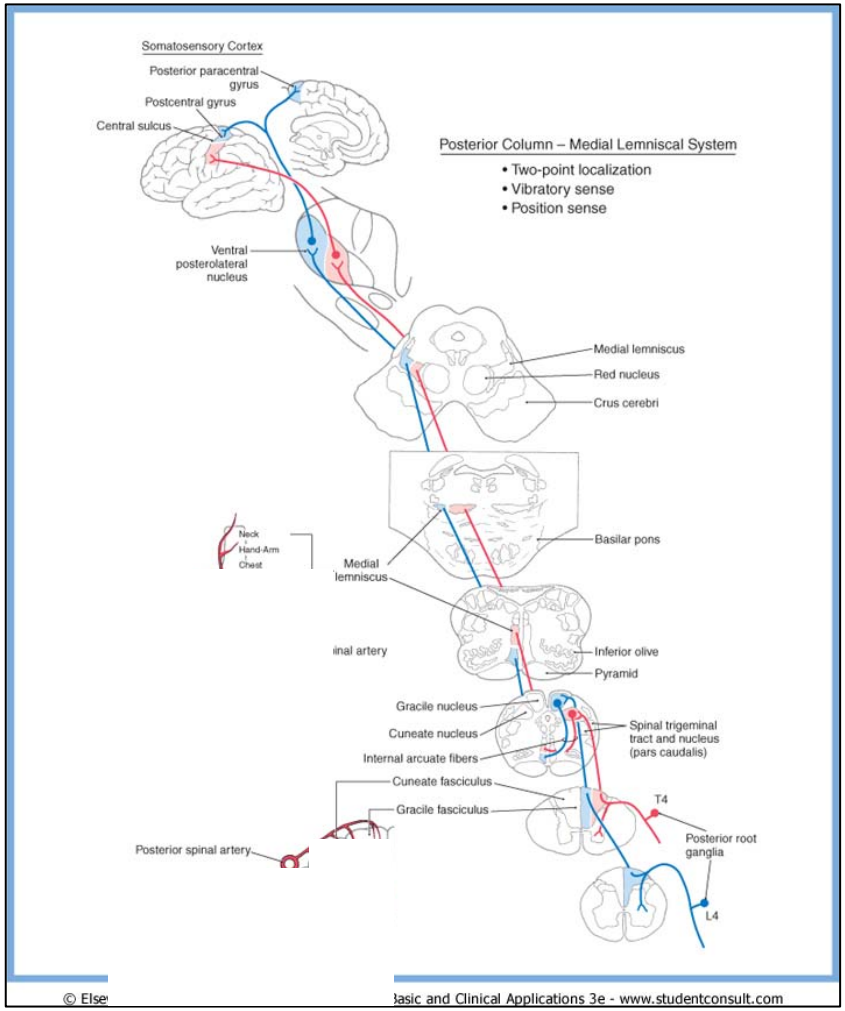
Information is transmitted from the primary sensory afferent to other neurons in the CNS at synapses.



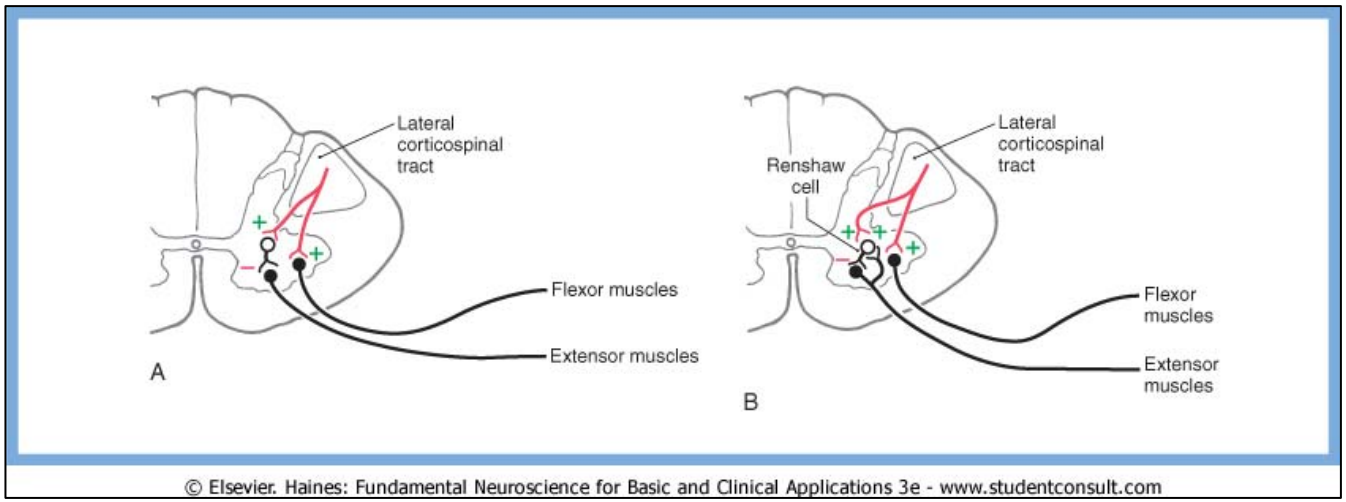
First main target for somatosensory information is other neurons in the spinal cord

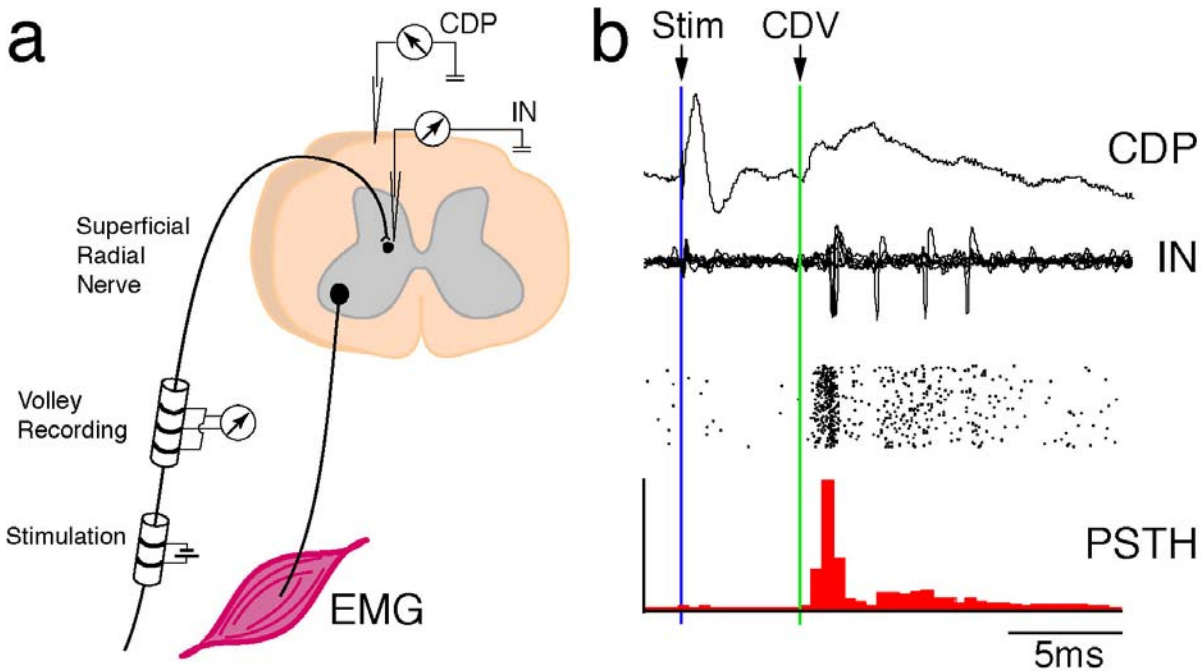


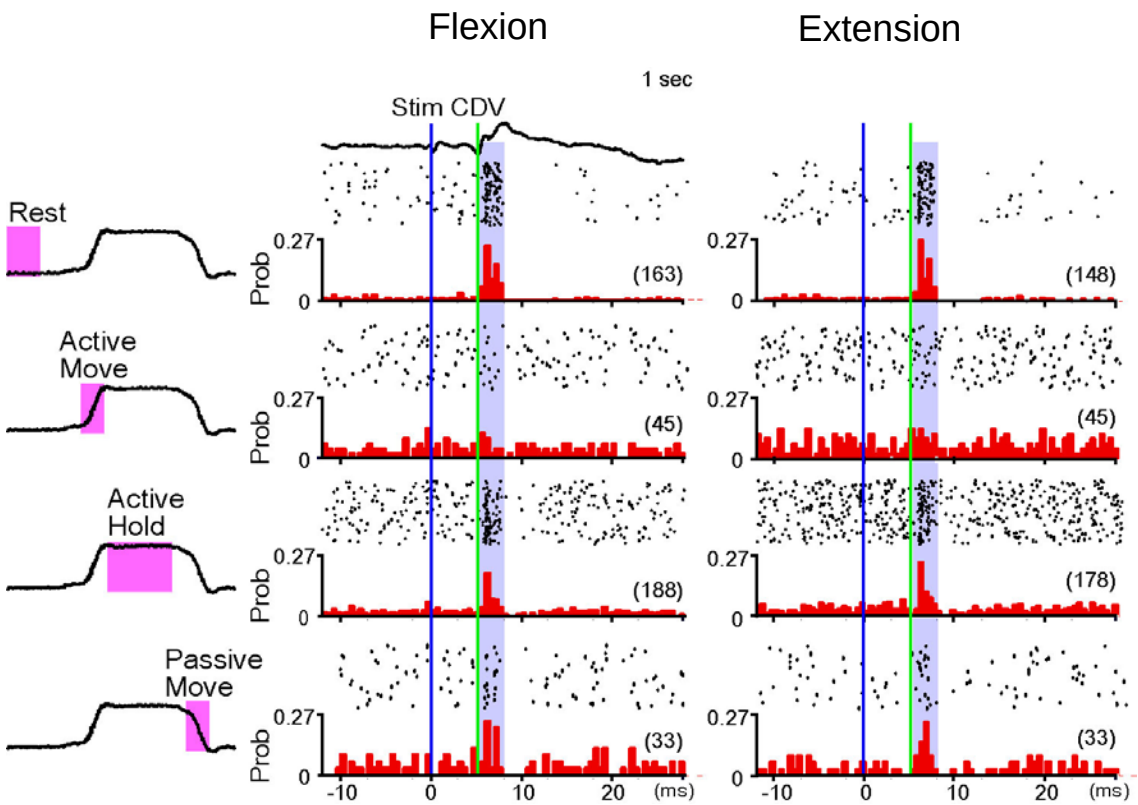
Second main target for somatosensory information is the cerebral cortex

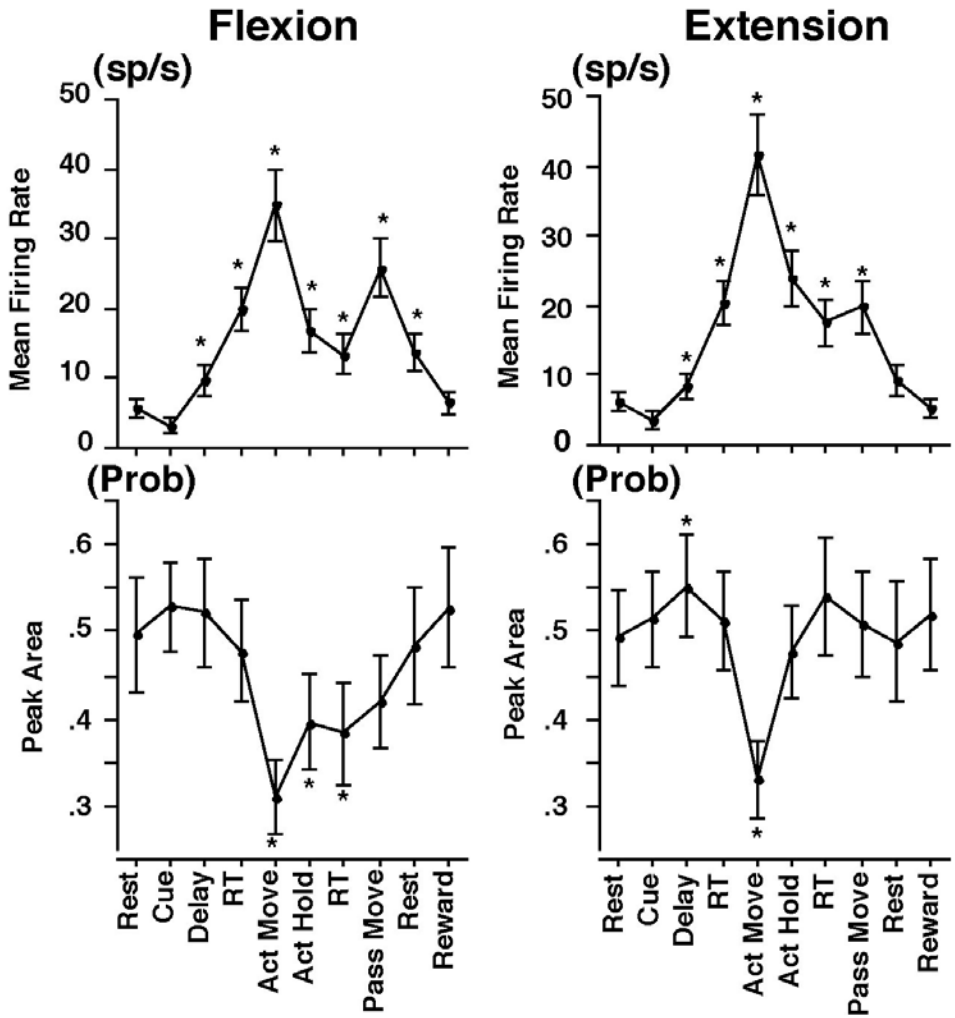


Convergence of information on neurons in ascending pathways

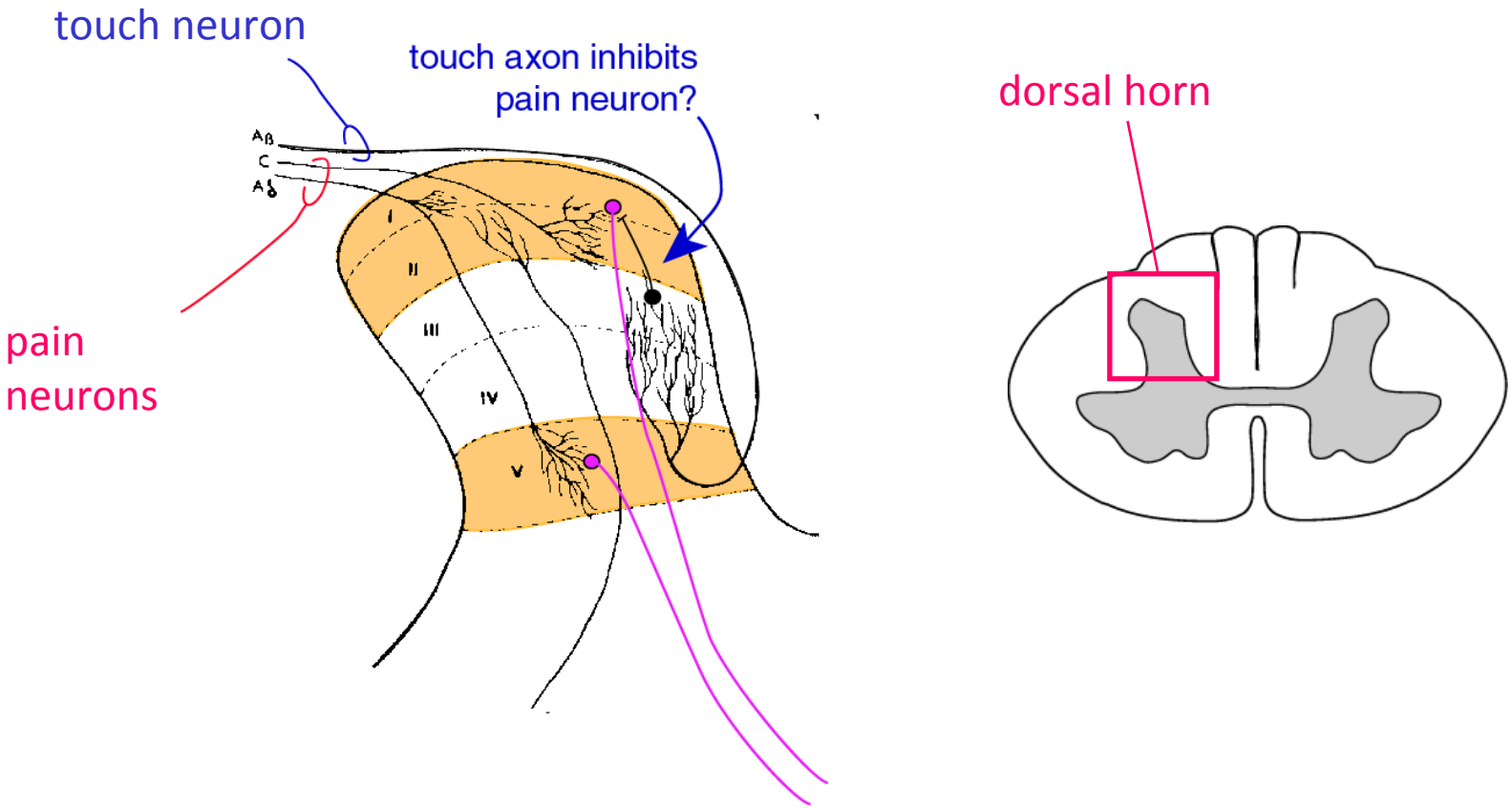


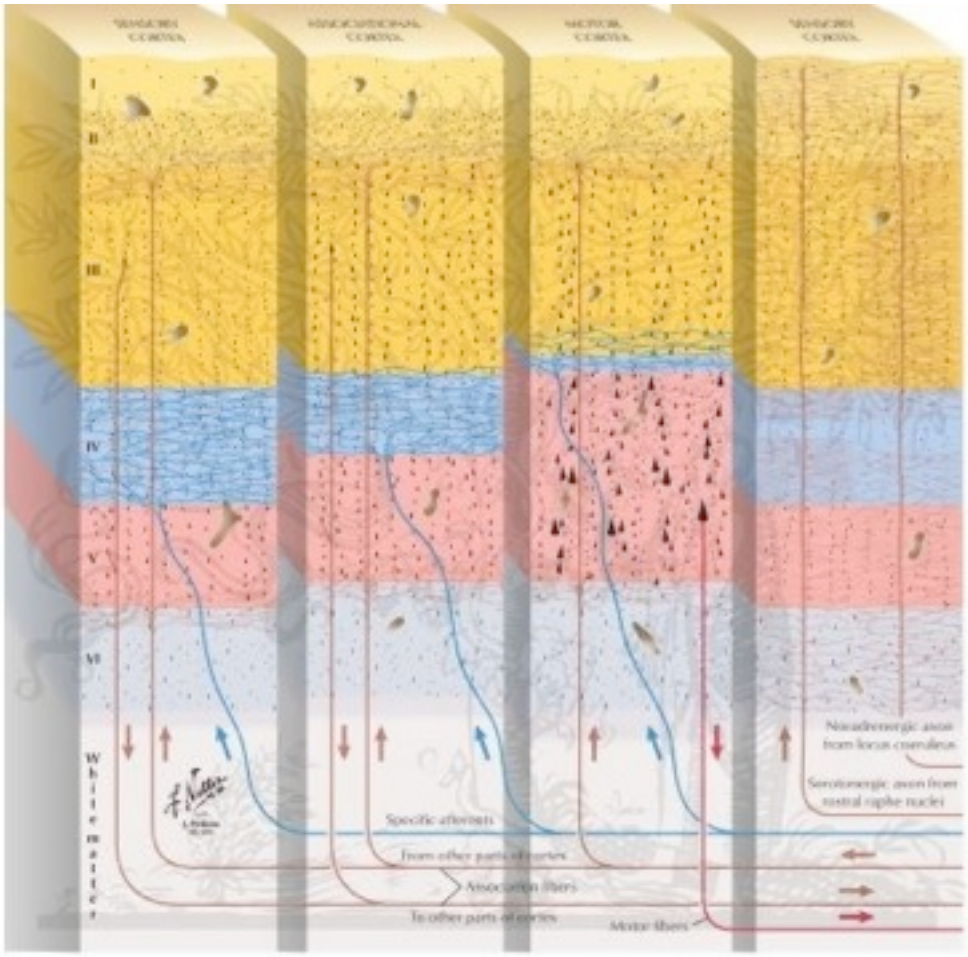

a
CDP
IN
Superficial
Radial
Nerve
Volley
Recording
Stimulation
EMG
b
Stim
CDV
CDP
IN
PSTH
5ms

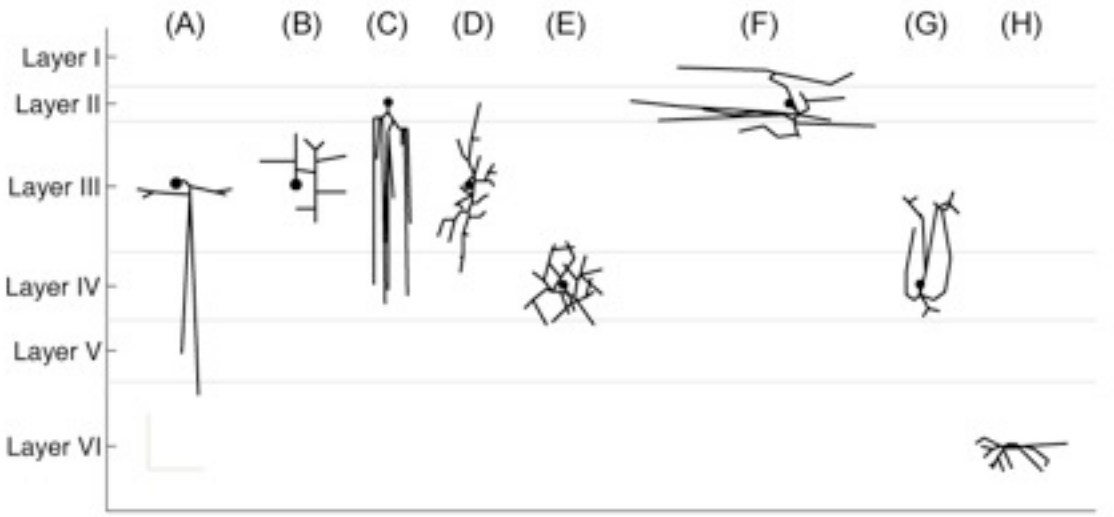

Flexion
Extension
1 sec
Stim CDV
Rest
Active Move
Active Hold
Passive Move
Prob
0.27
0
(163)
(148)
(45)
(45)
(188)
(178)
(33)
(33)
-10
0
10
20
(ms)


Flexion
Extension
(sp/s)
Mean Firing Rate
50
40
30
20
10
0
(Prob)
Peak Area
.6
.5
.4
.3
Rest
Cue
Delay
RT
Act Move
Act Hold
RT
Pass Move
Rest
Reward

Examples of information processing in "relay" nuclei:
why does rubbing the injured site reduce the pain?






(A)
(B)
(C)
(D)
(E)
(F)
(G)
(H)
Layer I
Layer II
Layer III
Layer IV
Layer V
Layer VI