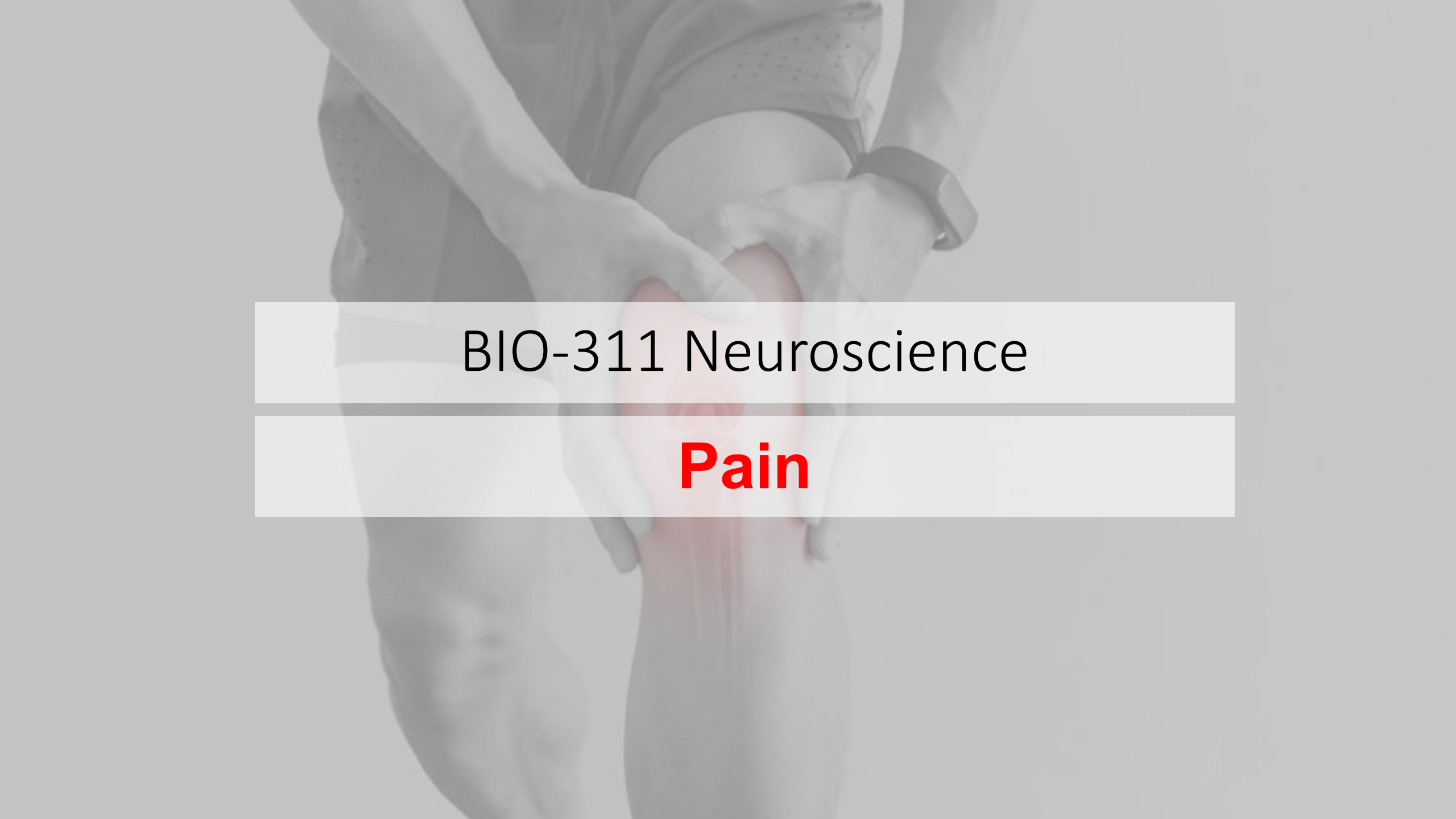




BIO-311 Neuroscience

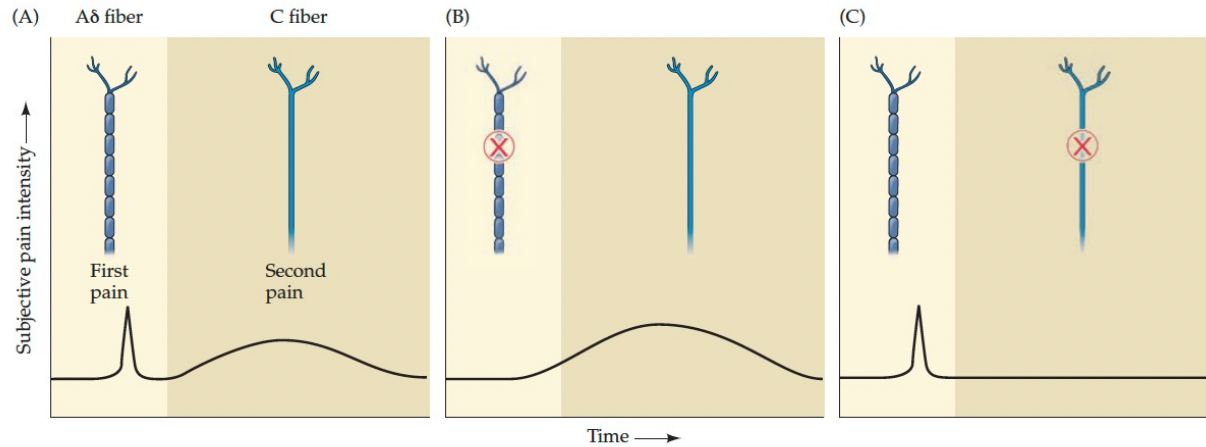
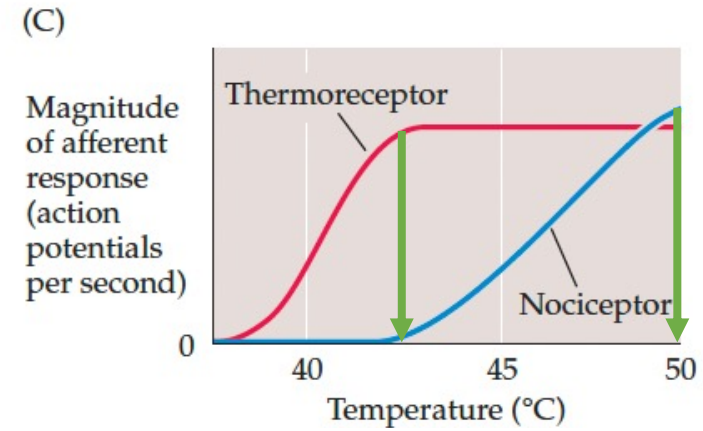
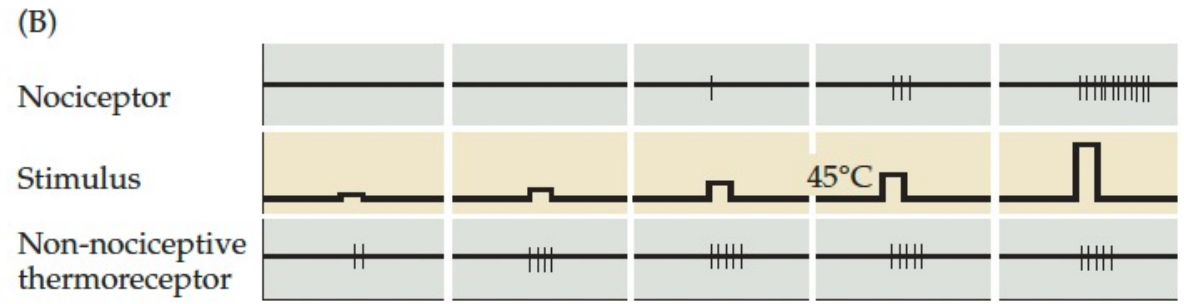
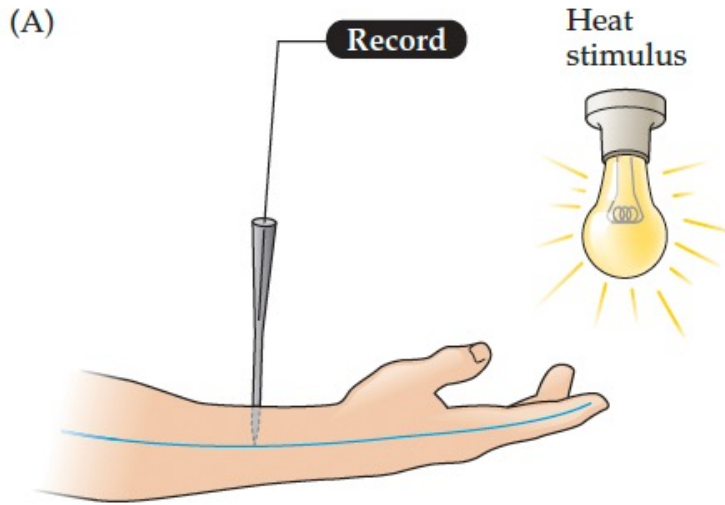
Pain

What is pain?

***PAIN IS THE UNPLEASANT SENSORY AND
EMOTIONAL EXPERIENCE***

associated with stimuli that cause tissue damage.

(Purves)



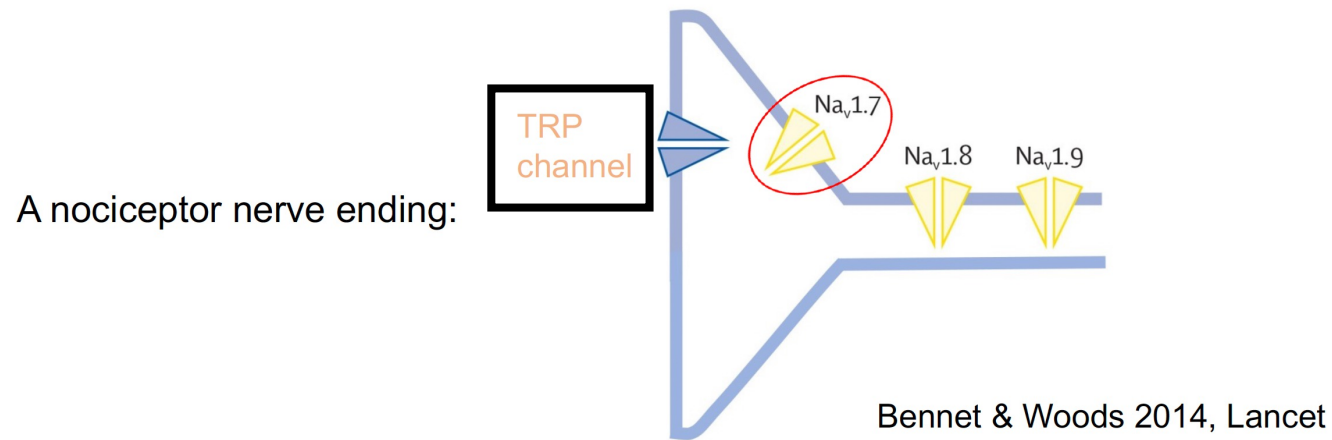
Specialized systems for response to pain

TABLE 9.1 Somatic Sensory Afferents that Link Receptors to the Central Nervous System

SENSORY FUNCTION	RECEPTOR TYPE	AFFERENT AXON TYPE*	AXON DIAMETER	CONDUCTION VELOCITY
Proprioception	Muscle spindle	 Ia, II	13–20 μm	80–120 m/s
Touch	Merkel, Meissner, Pacinian, and Ruffini cells	 Aβ	6–12 μm	35–75 m/s
Pain, temperature	Free nerve endings	 Aδ	1–5 μm	5–30 m/s
Pain, temperature, itch	Free nerve endings (unmyelinated)	 C	0.2–1.5 μm	0.5–2 m/s

Today

Nociception is fundamental



Congenital insensitivity to pain:

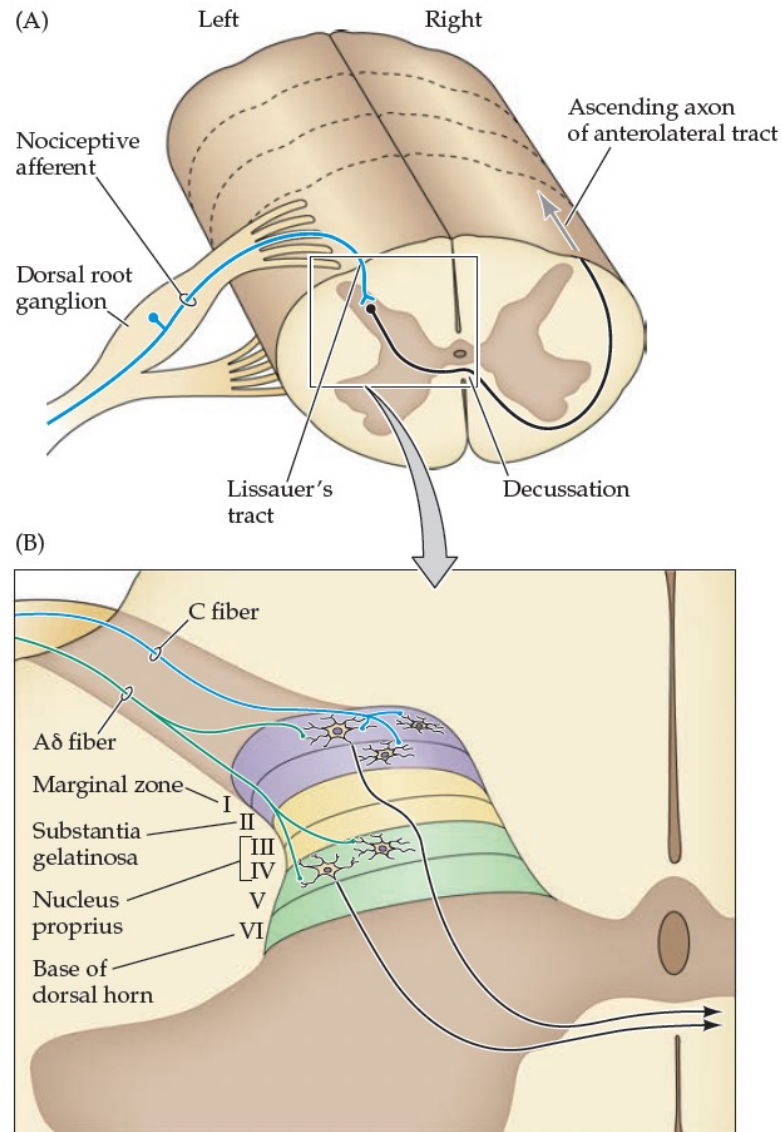
In patients:

- No pain is felt anywhere in the body from birth onwards
- Skin bruises, cuts, and bone fractures. The tip of the tongue is often lost
- Excessive risk-taking behavior leads to early mortality (~20-30 yrs)

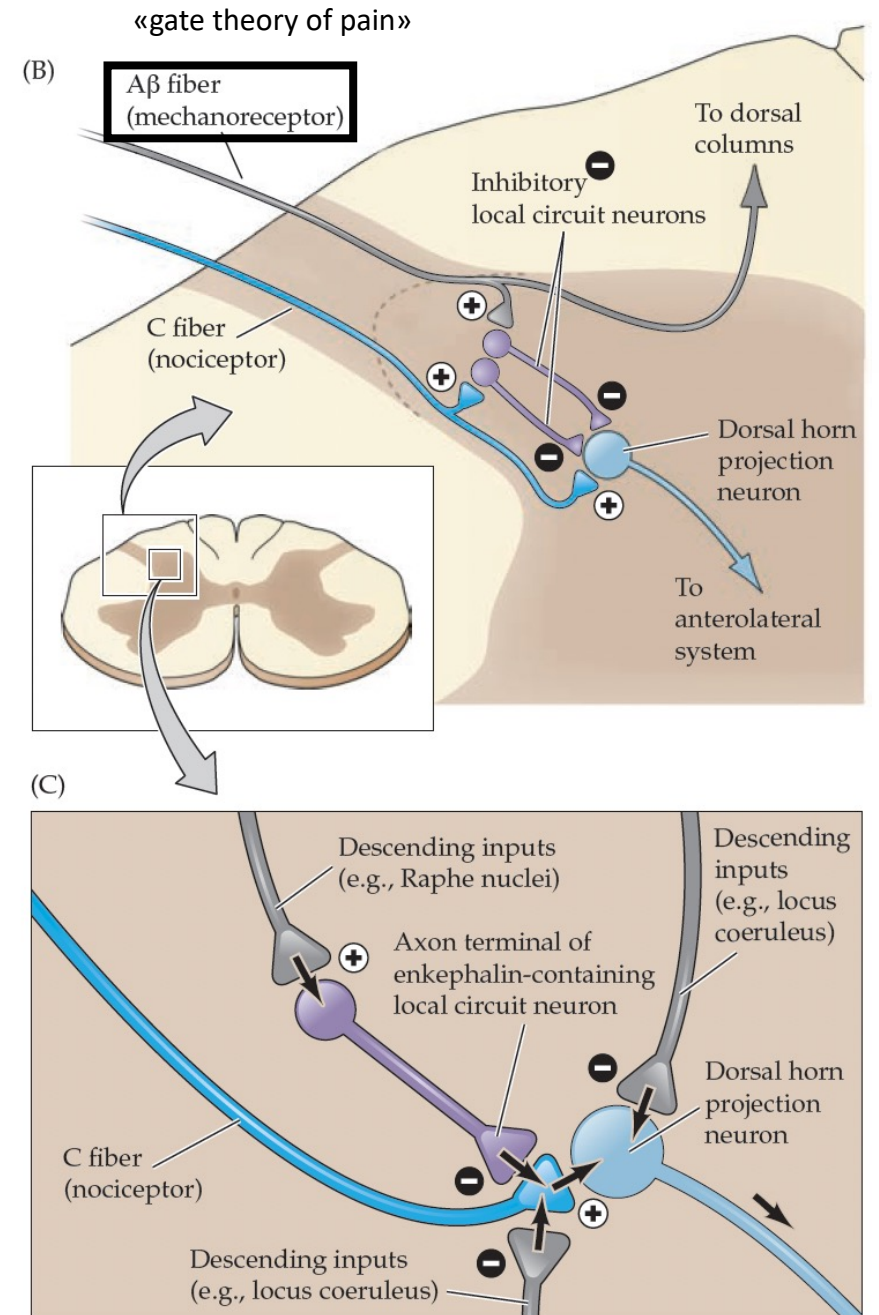
Shows that nociception/pain is needed to protect the body from tissue injury

The wiring of pain

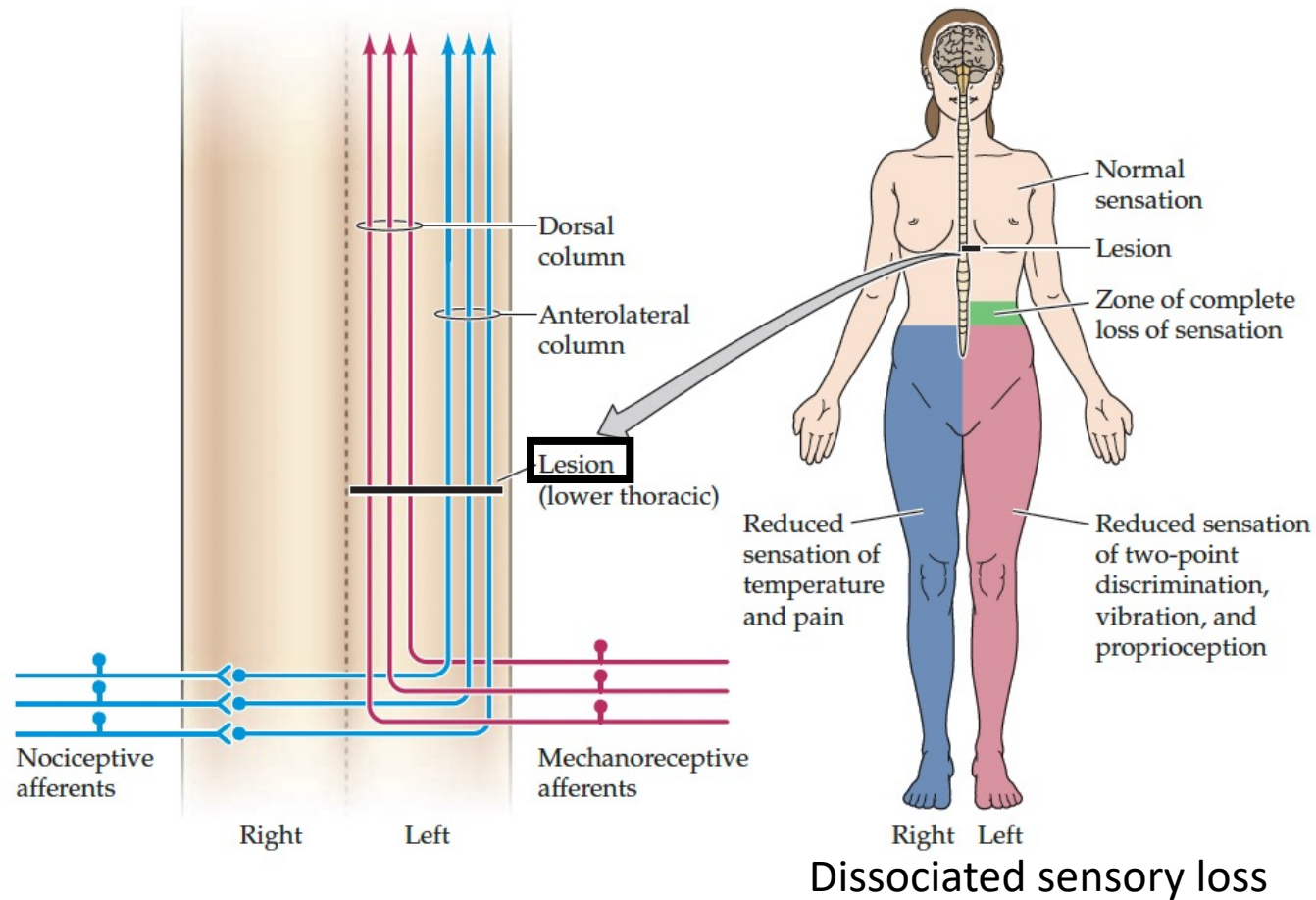
Dorsal root ganglion



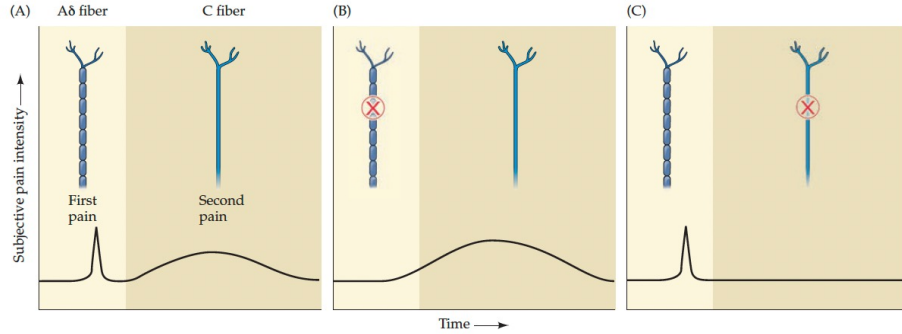
Analgesic mechanisms & endogenous opioids



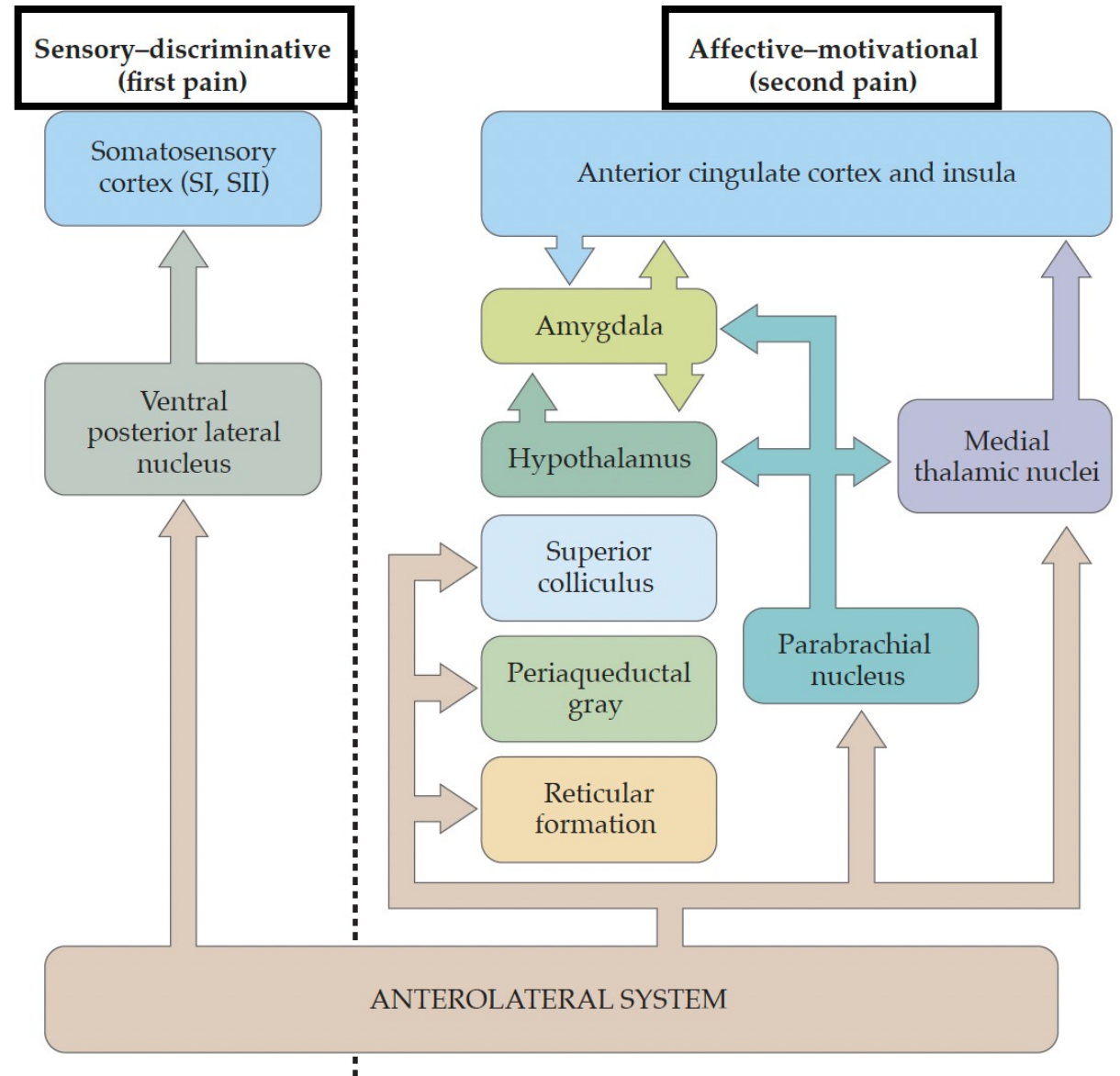
Nociceptive vs mechanosensory pathways



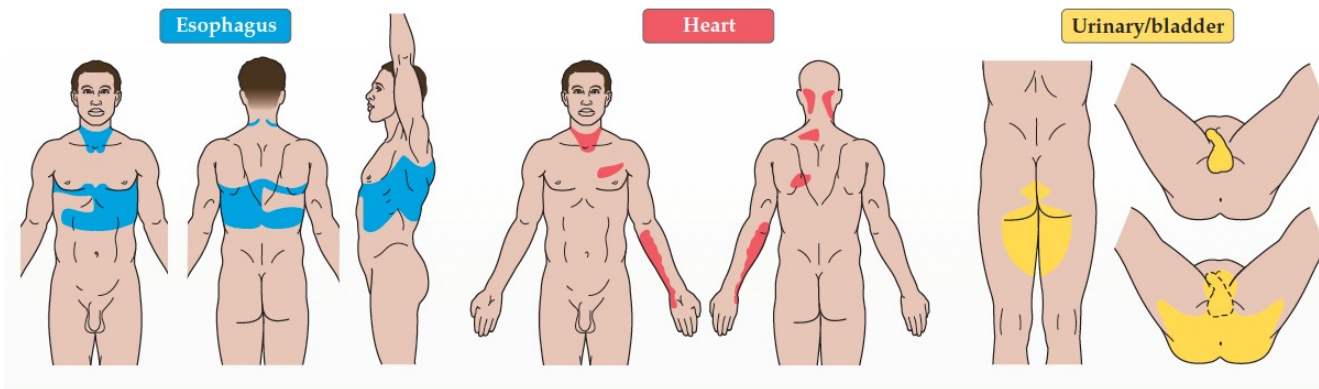
First vs second pain



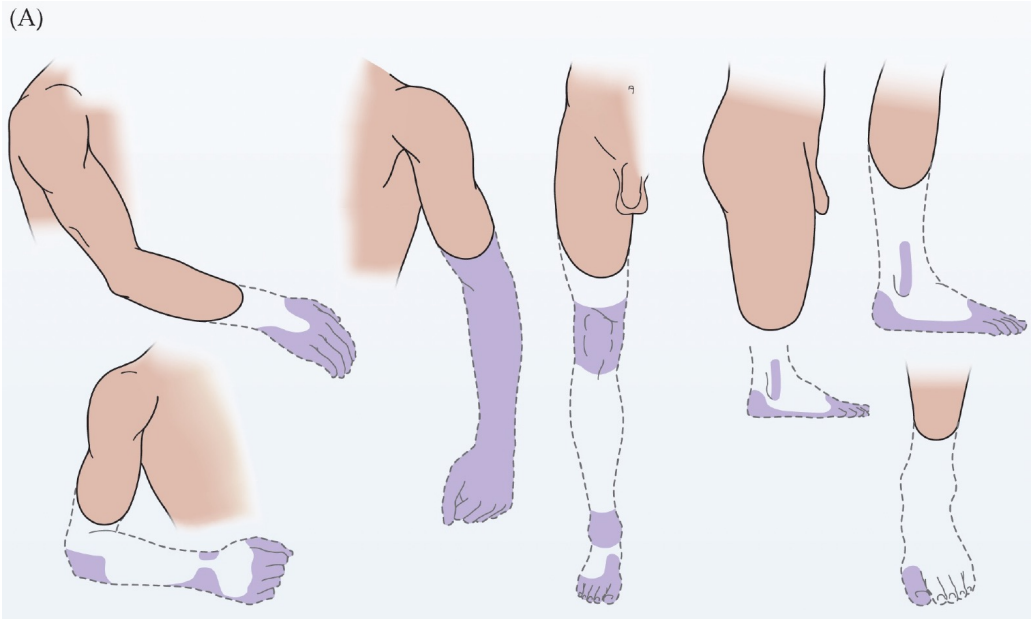
Nothing makes sense in bio
except in the light of evolution!



Clinically-relevant pain phenomena

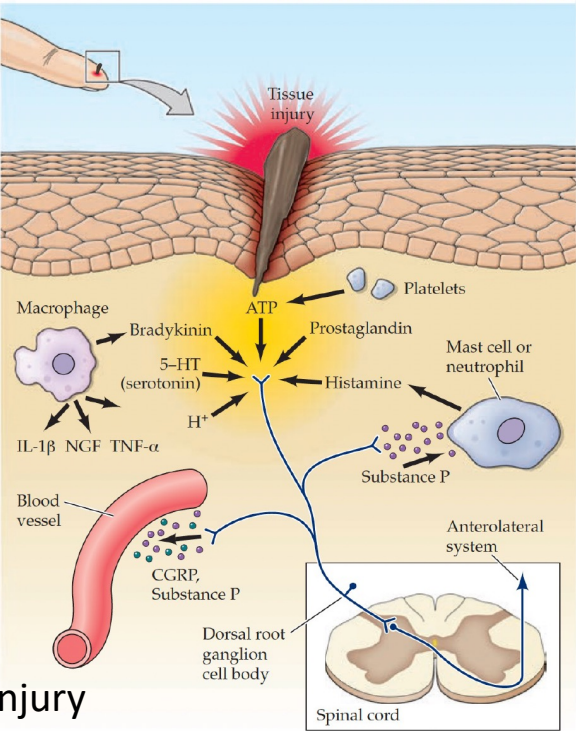


Referred pain
(visceral sensory input)



Phantom pain

Hyperalgesia:
local increase of pain
perception at the site of injury



Pain relief & Placebo:
Eg pain relief by electrical / pharmacological
stimulation of midbrain regions