260-2017-03-29-somatosensation

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Prelude

Today's Topics

- Somatosensation

Types of somatosensation

- Internal (interoceptive)
  - Where am I? How do I feel?
  - Proprioception
- External (exteroceptive)
  - What's in the world?
  - Where is it?

Internal senses

- Vestibular sense
  - Head position (relative to gravity)
  - Head movement (rotation, translation)

The vestibular system is the cause of one of the fastest and most important reflexes in your body – the vestibulo-ocular reflex. This reflex keeps your eyes pointing in the same direction even when your head moves.

Internal senses

- Kinesthesia
  - Body position
  - Movement
- Pain

External senses

- Cutaneous senses (touch)
  - Hot, cold
  - Pressure
  - Vibration
  - Damage (pain)
- Plus kinesthesia (why?)

Cutaneous receptors

Receptors specialize

Combined thermo and chemo receptors

- Why are spicy foods hot?
- Why are minty foods cool?

Combined thermo and chemo receptors

- Menthol/mint receptor (CMR1)
  - Also signals "cool"
- Vanilloid Receptors (VR1, VRL1)
  - Also signal "hot
  - Capsaicin

Menthol & vanilloid receptors

Size/speed trade-off

From skin to brain

- Cutaneous receptors
- Dorsal root ganglion
- Ventral posterior lateral thalamus
- Primary somatosensory cortex (S1)
  - Parietal lobe

Dermatomes

Dermatomes

Functional segregation

Functional segregation

- Dorsal column/medial leminiscal pathway
  - Touch, proprioception
- Spinothalamic tract
  - Pain, temperature

Somatatopic maps

Non-uniform mapping of skin surface

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Non-uniform mapping of skin surface

http://jov.arvojournals.org/data/Journals/JOV/933499/jov-3-10-1-fig001.jpeg

Columnar organization/functional segregation

Phantom Limbs

What/where

- Perceiving Where
  - Somatotopic maps – where on skin
  - Kinesthesia – configuration of limbs
- Perceiving What
  - Patterns of smoothness, roughness, shape, temperature

Somatosensation in other animals

Next time...

- The "real" reason for brains