Sensation and Emotion:

A discussion of human interaction with the insect world

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Introduction

- Introductory Comments
- Learning Objectives
- Part I – Sensory Experience – our awareness of the insect world
- Anatomy & Physiology
  - Special Senses: Vision, Hearing, Smelling Tasting
    - End Organs, Cranial Nerves
  - Somatic Sensation
    - External (Touch): Vibration, Temperature, Fine Sensation
    - Internal : Itch, Pain
    - Sensory End Organs &Peripheral Nerves
  - Central Nervous System: Spinal Cord, Brain Stem, Cerebral Cortex
- Part II – Emotional Experience – our reaction to insect world
  - Limbic System
    - Integration of Sensory Inputs
    - Memory Systems
    - Papez Circuit
  - Emotion
    - Anger disgust, fear, happiness, sadness, and surprise
- Conclusion

Objectives

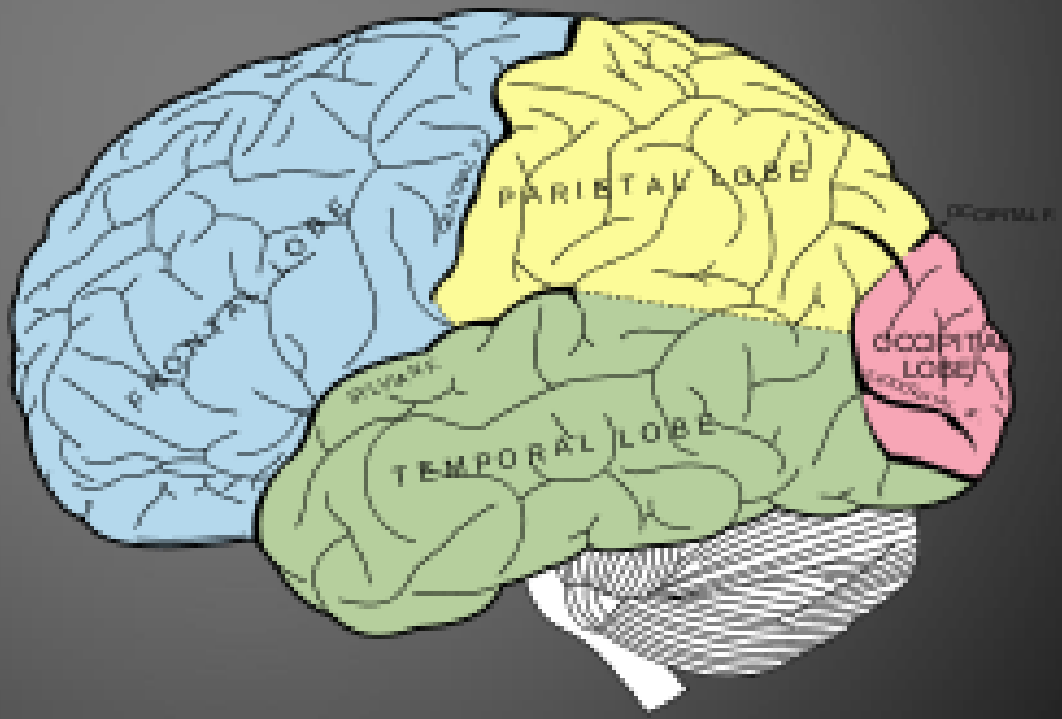
- To appreciate the brain, or more specifically, the central nervous system, from an anatomical (structural) perspective.
- To understand the physiology (function) of the central nervous system.
- To appreciate how mind and thought emerge from the structure and function of the brain.

Part I

- We need to orient ourselves to the different parts of the nervous system to understand how we receive information about the physical world

Anatomy

- Lobes of the Cerebrum
  - Frontal
  - Temporal
  - Parietal
  - Occipital



Anatomy

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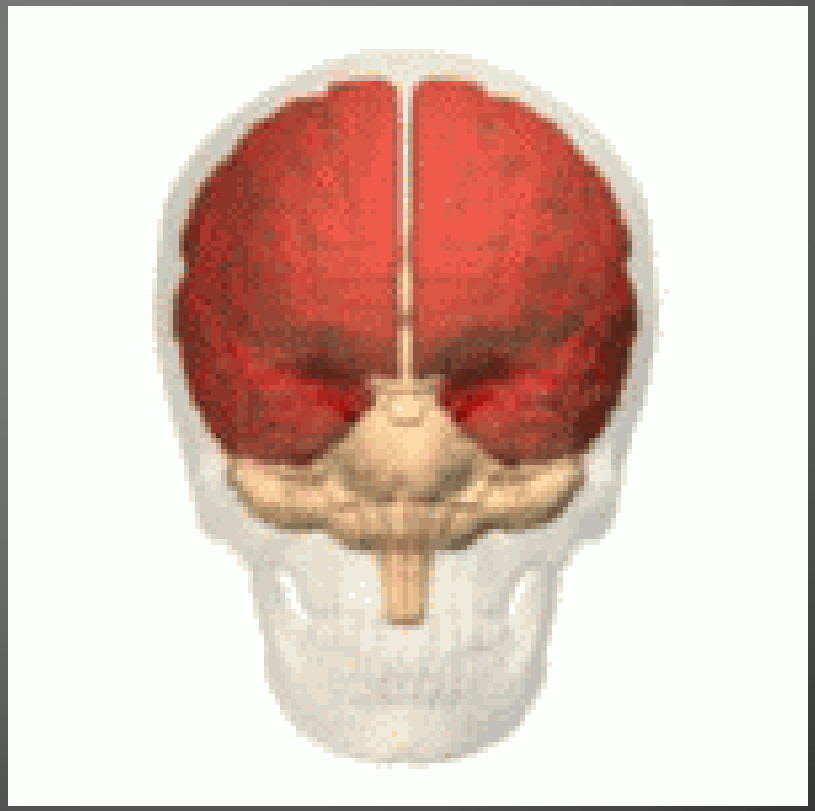
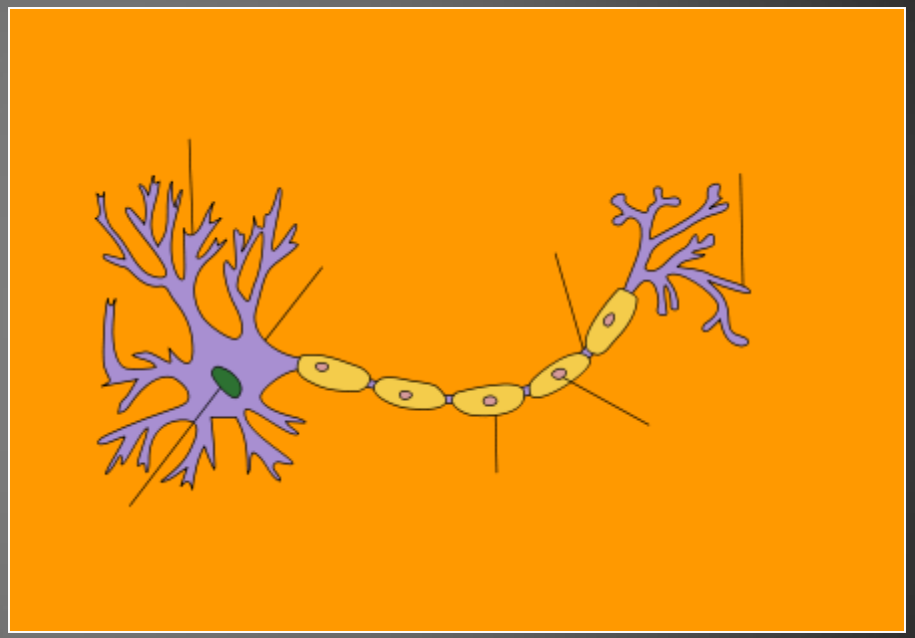


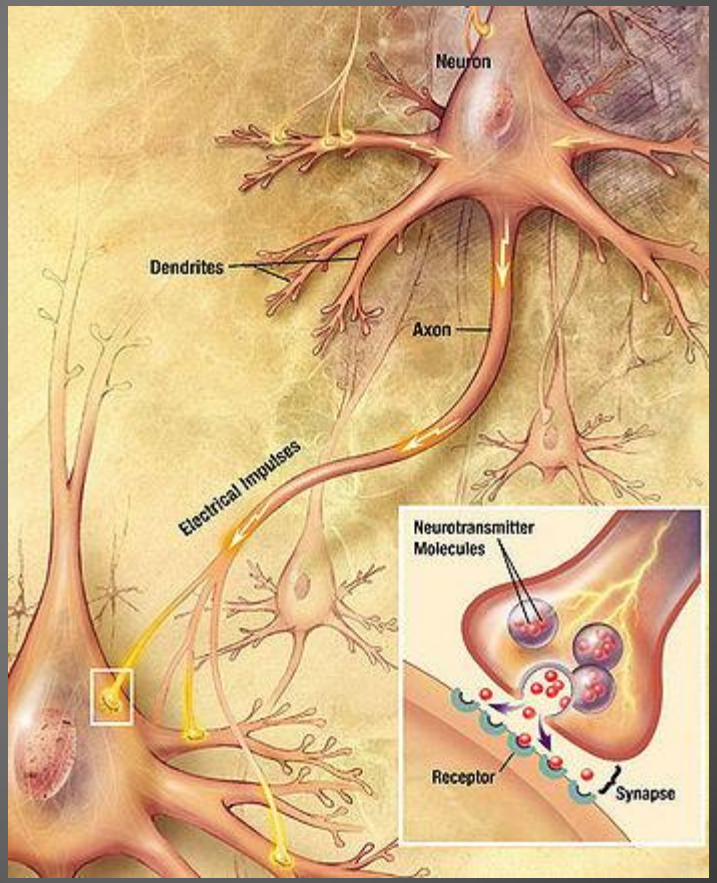
Anatomy

- Neurons and Glia
  - Dendrites
    - The “Inputs”
  - Cell body
    - The “Computer”
  - Axon
    - The “Output”



Physiology

- Neurons
  - Electrical
  - Electrochemical

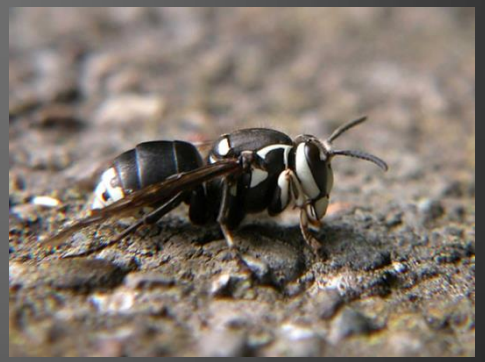


Sensory Systems

- What is the purpose of the sensory systems?
- What are the different senses?
- How is this processed by the nervous system?

Sight

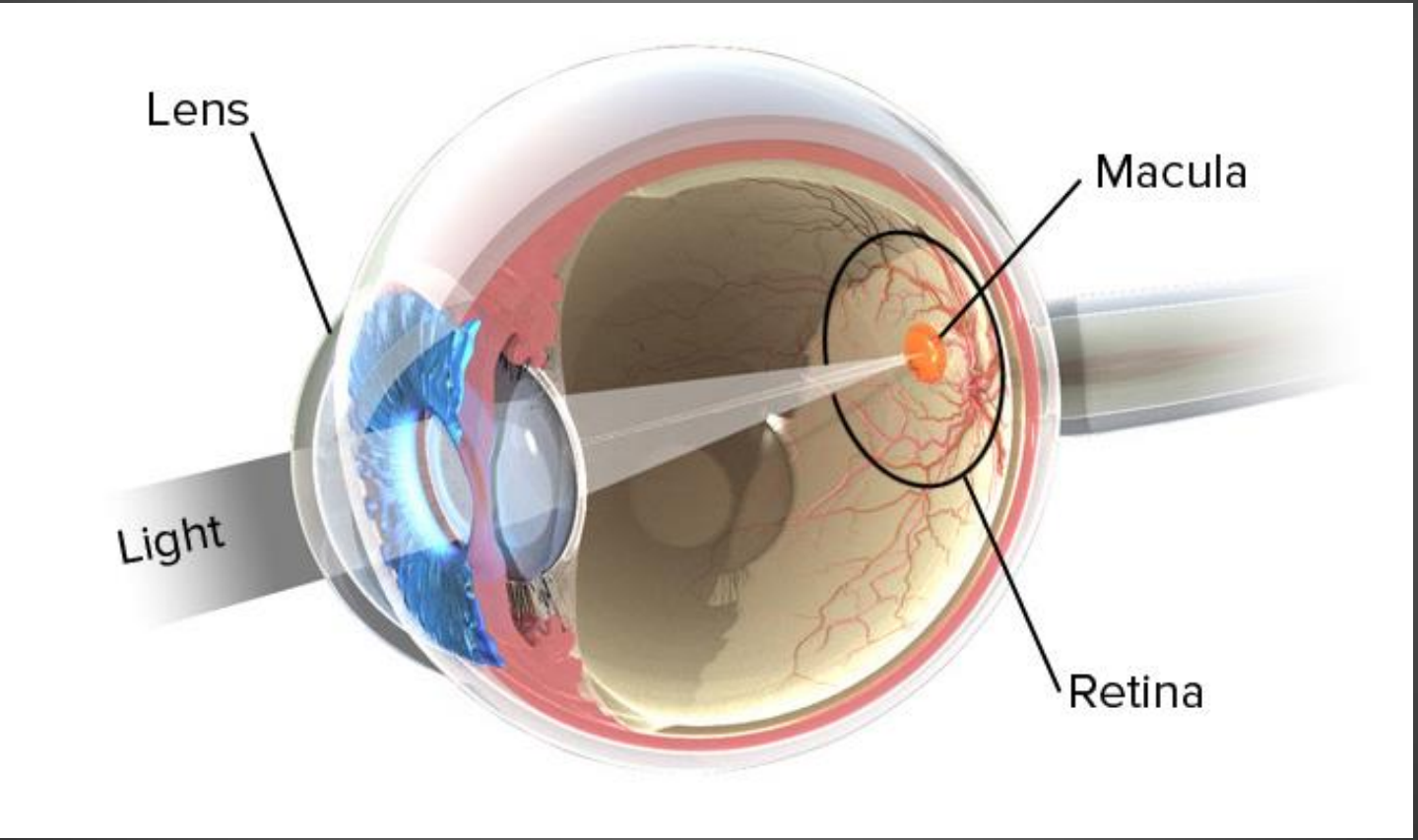
- What do you see?



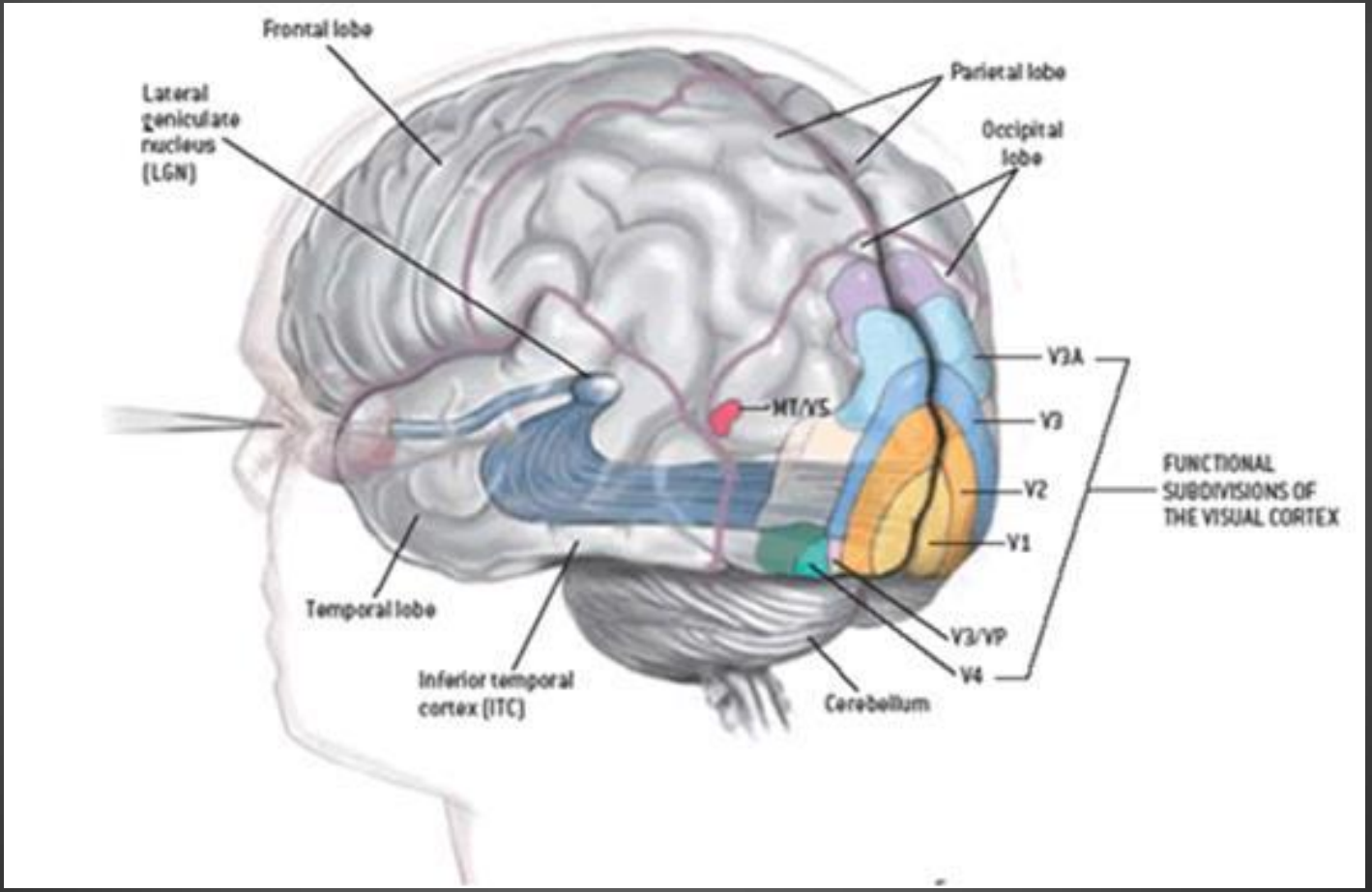
Sight

- Image Processing - Segmentation
  - Form/Color Pathways
  - Motion/Localization Pathways
- Image Reintegration
  - All of these features are then reintegrated at various points in the brain for use by other systems

Sight



Sight


Frontal lobe
Lateral geniculate nucleus (LGN)
Parietal lobe
Occipital lobe
V3A
MT/V5
V3
V2
V1
FUNCTIONAL SUBDIVISIONS OF THE VISUAL CORTEX
Temporal lobe
Inferior temporal cortex (ITC)
V3/VP
V4
Cerebellum

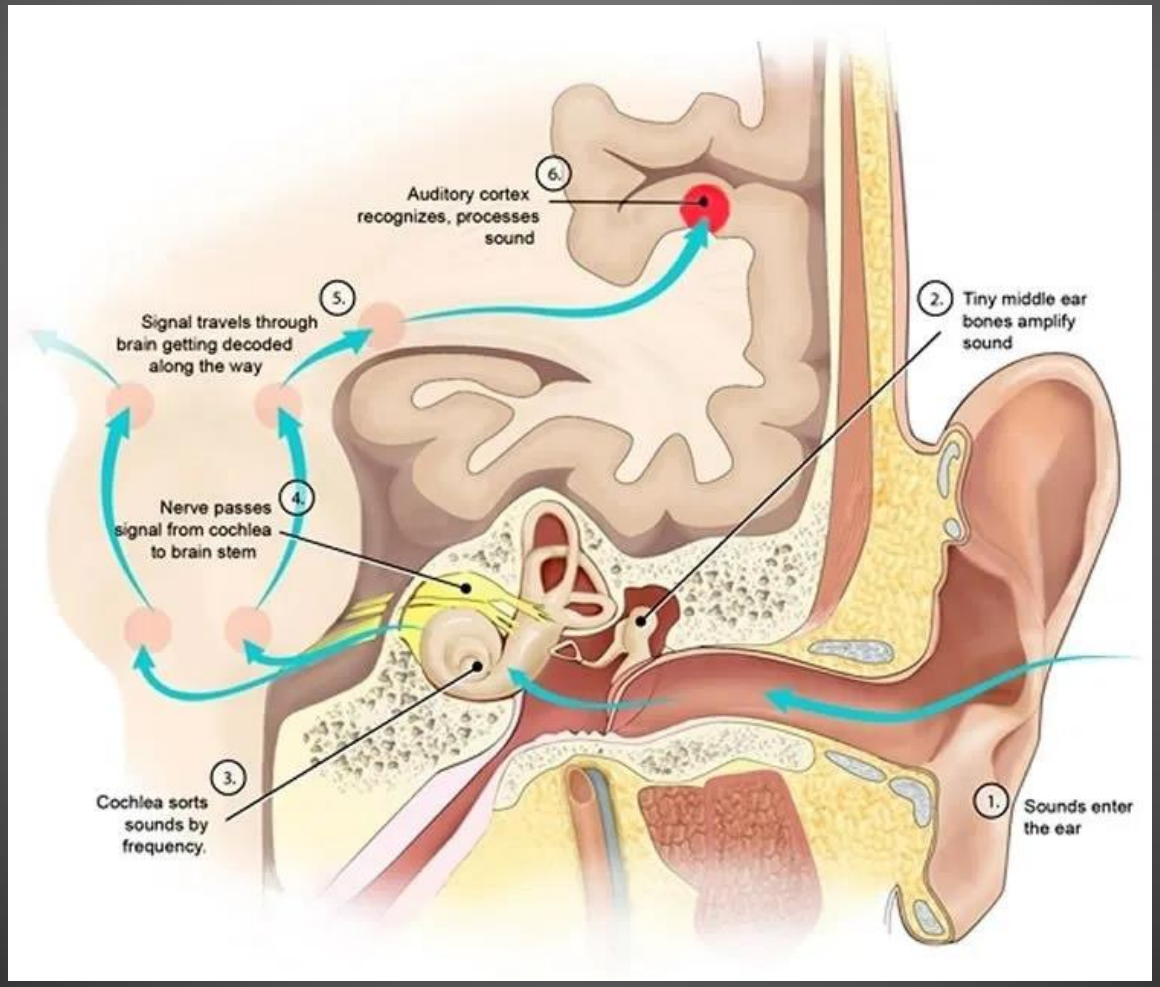
Sound

- What do you hear?
  - Sound 1
  - Sound 2

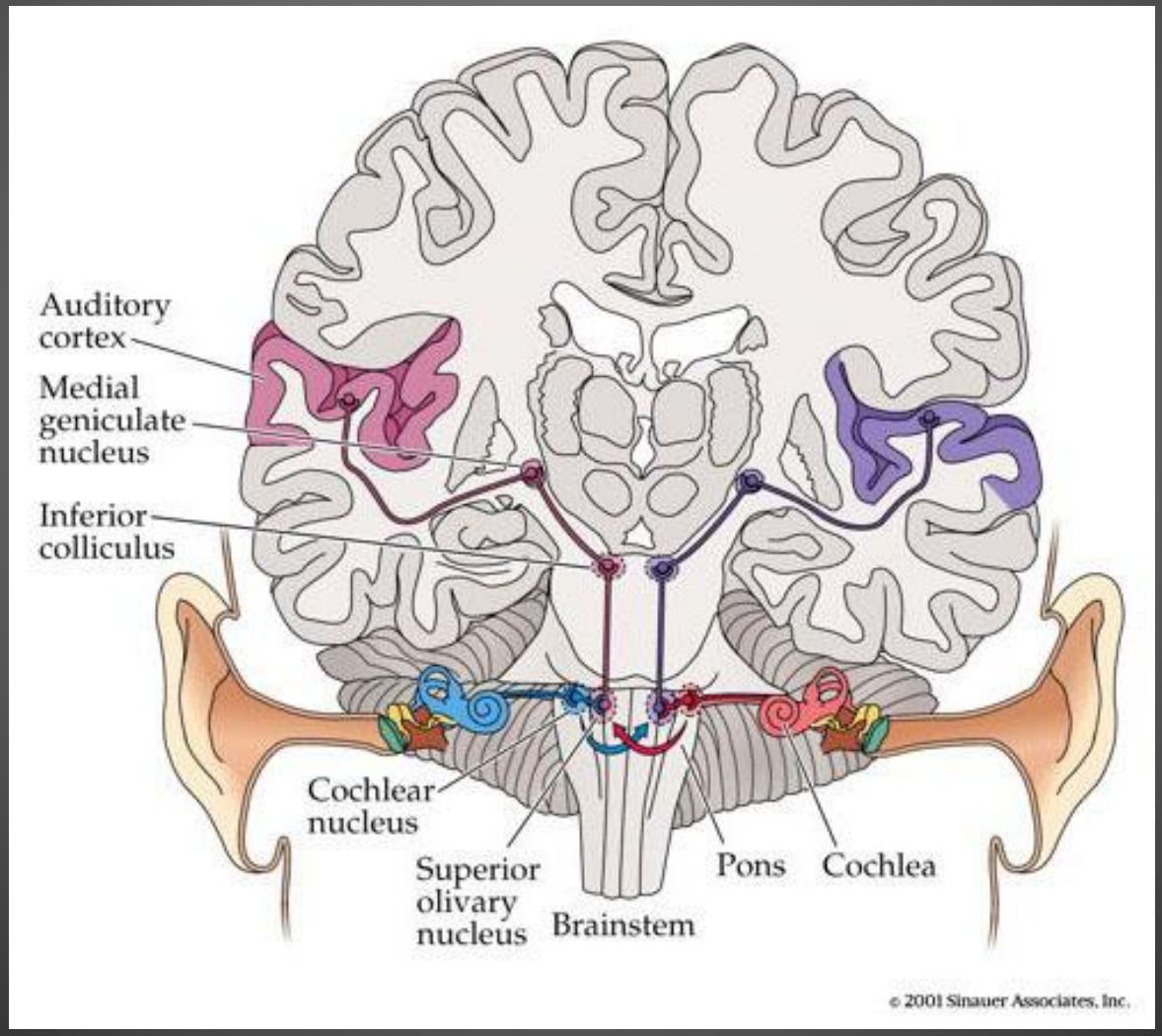
Sound

- Sound Processing
  - Component Frequencies
  - Location
- Sound Reintegration

Sound


6. Auditory cortex recognizes, processes sound
5. Signal travels through brain getting decoded along the way
4. Nerve passes signal from cochlea to brain stem
3. Cochlea sorts sounds by frequency.
2. Tiny middle ear bones amplify sound
1. Sounds enter the ear

Sound


Auditory cortex
Medial geniculate nucleus
Inferior colliculus
Cochlear nucleus
Superior olivary nucleus
Brainstem
Pons
Cochlea
© 2001 Sinauer Associates, Inc.

Taste

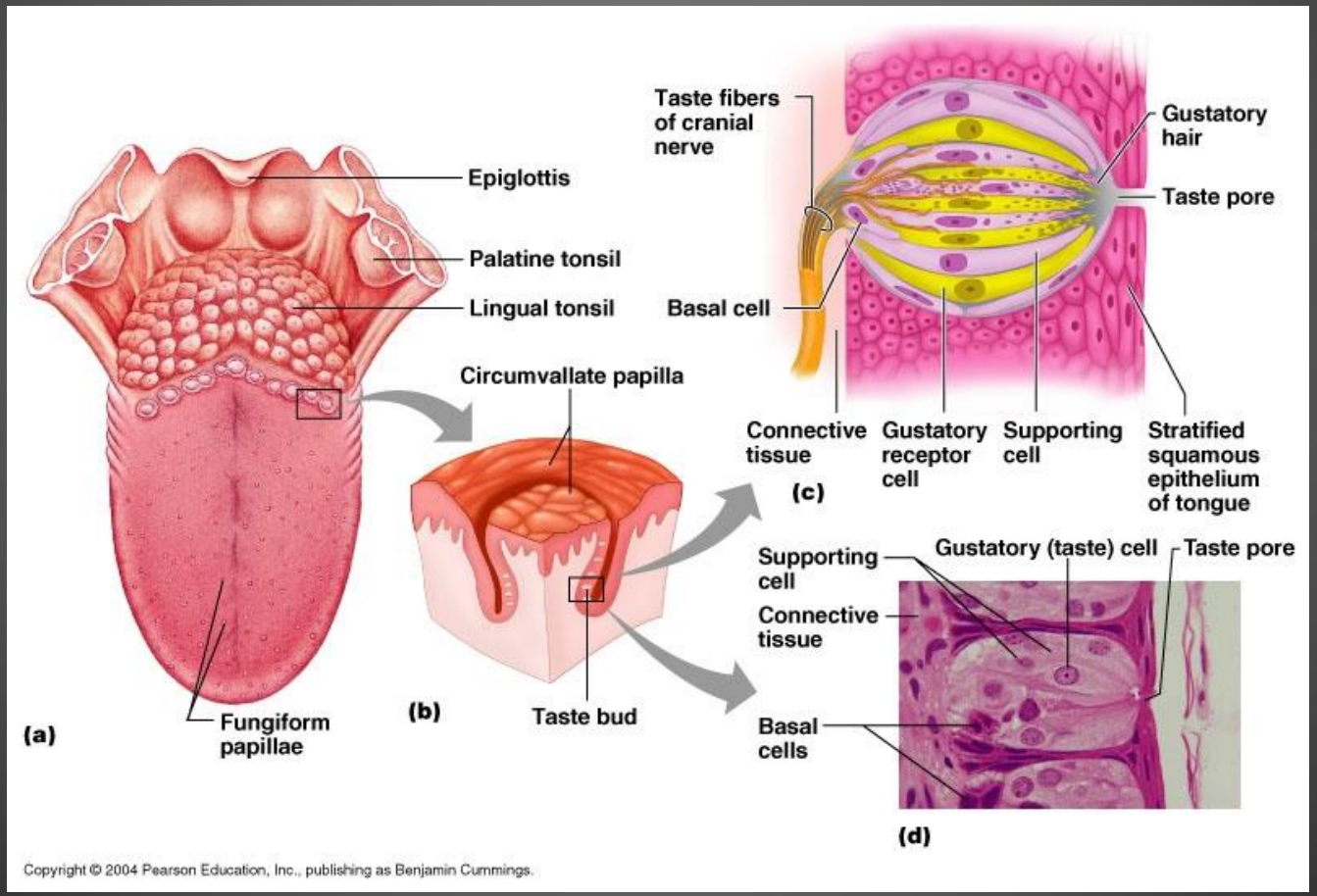
- What do you taste?

Taste

- Flavor Processing
  - Salt, Sweet, Sour, Bitter, Umami
  - Smell
- Touch Sensations
  - Texture (Touch)
  - Temperature (Touch)

- Taste Reintegration

Taste


Epiglottis
Palatine tonsil
Lingual tonsil
Circumvallate papilla
Fungiform papillae
(a)
(b)
Taste bud
Taste fibers of cranial nerve
Gustatory hair
Taste pore
Basal cell
Connective tissue
Gustatory receptor cell
Supporting cell
Stratified squamous epithelium of tongue
(c)
Supporting cell
Gustatory (taste) cell
Taste pore
Connective tissue
Basal cells
(d)
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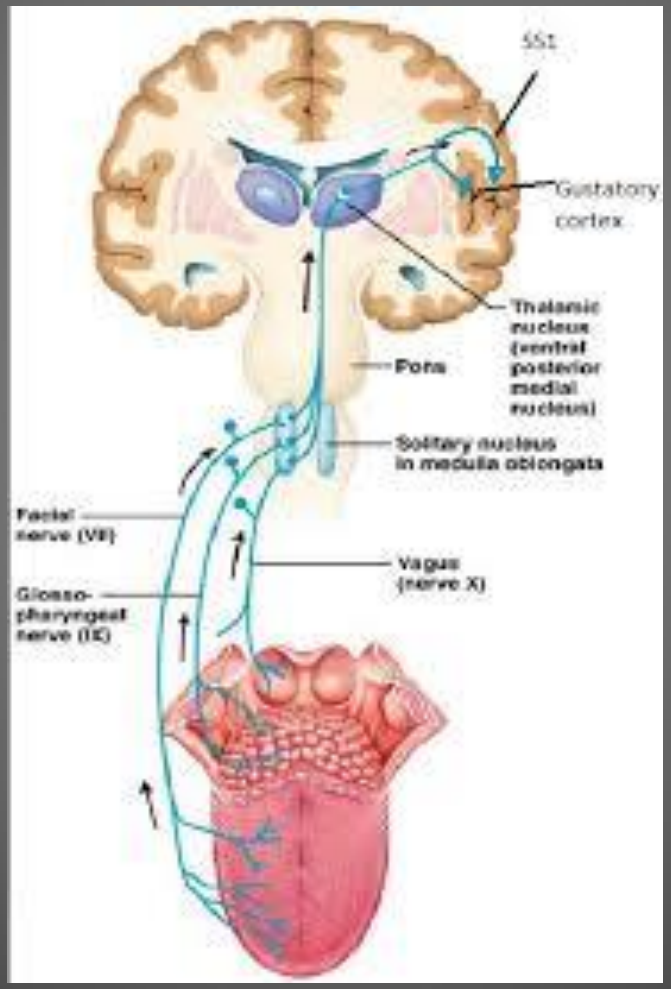
Taste


SSI
Gustatory cortex
Thalamic nucleus (ventral posterior medial nucleus)
Pons
Solitary nucleus in medulla oblongata
Facial nerve (VII)
Vagus (nerve X)
Glosso-pharyngeal nerve (IX)

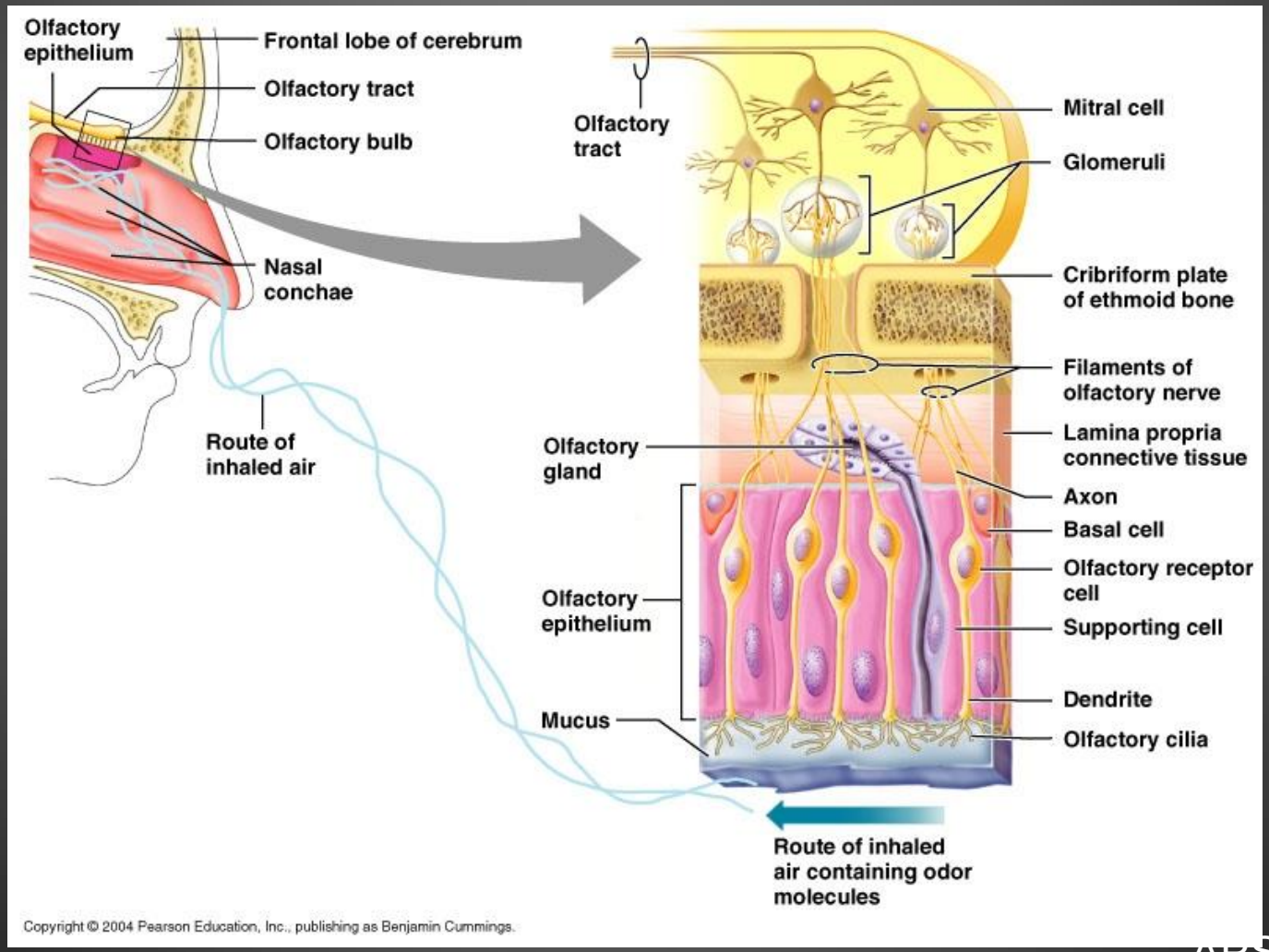
Smell

- What do you smell?

Smell

- Odor Processing
  - Volatile compounds
- Odor Reintegration

Smell


Olfactory epithelium
Frontal lobe of cerebrum
Olfactory tract
Olfactory bulb
Nasal conchae
Route of inhaled air
Olfactory tract
Mitral cell
Glomeruli
Cribriform plate of ethmoid bone
Filaments of olfactory nerve
Lamina propria connective tissue
Olfactory gland
Axon
Basal cell
Olfactory receptor cell
Olfactory epithelium
Supporting cell
Dendrite
Mucus
Olfactory cilia
Route of inhaled air containing odor molecules
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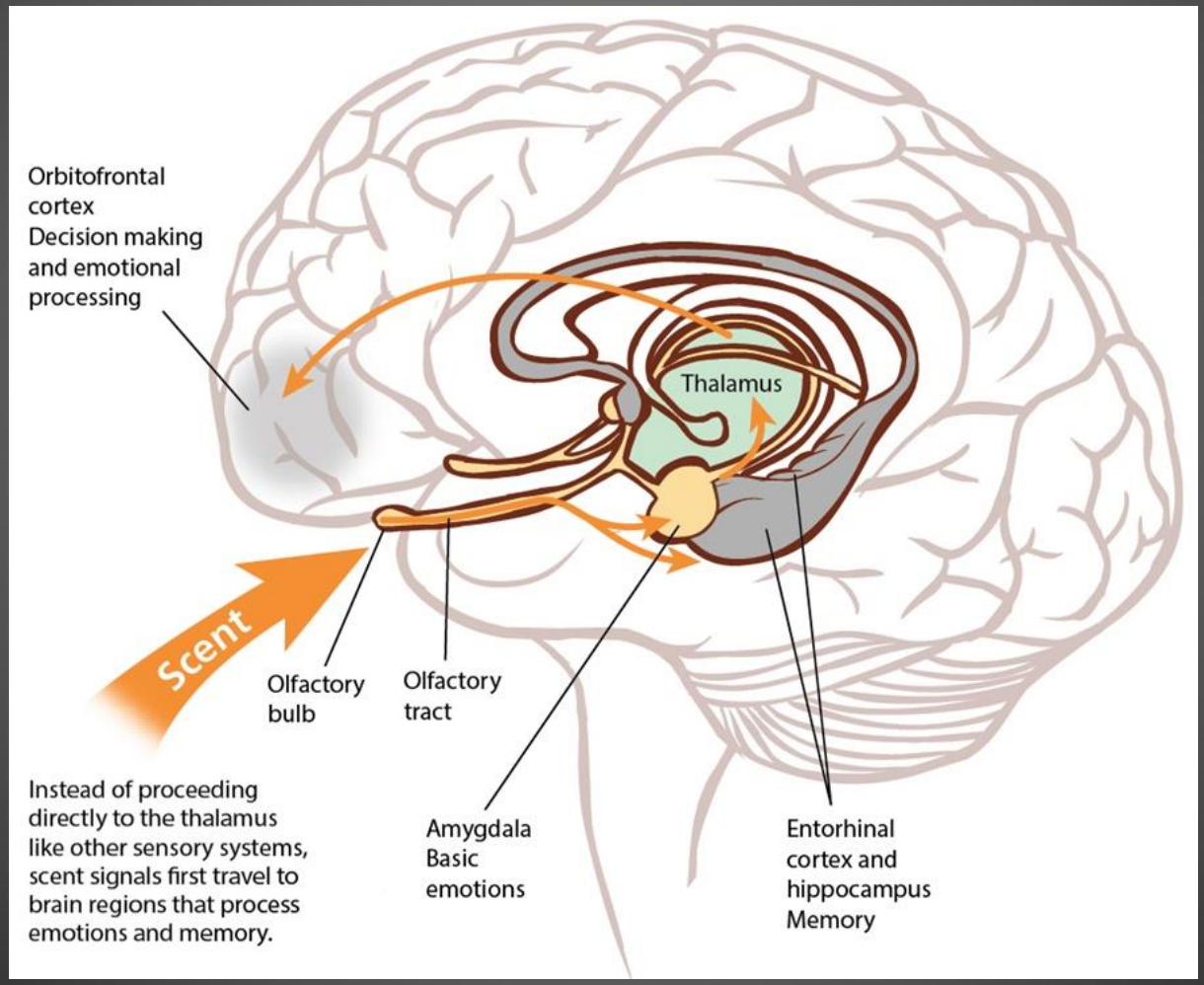
Smell


Orbitofrontal cortex
Decision making and emotional processing
Thalamus
Scent
Olfactory bulb
Olfactory tract
Instead of proceeding directly to the thalamus like other sensory systems, scent signals first travel to brain regions that process emotions and memory.
Amygdala
Basic emotions
Entorhinal cortex and hippocampus
Memory

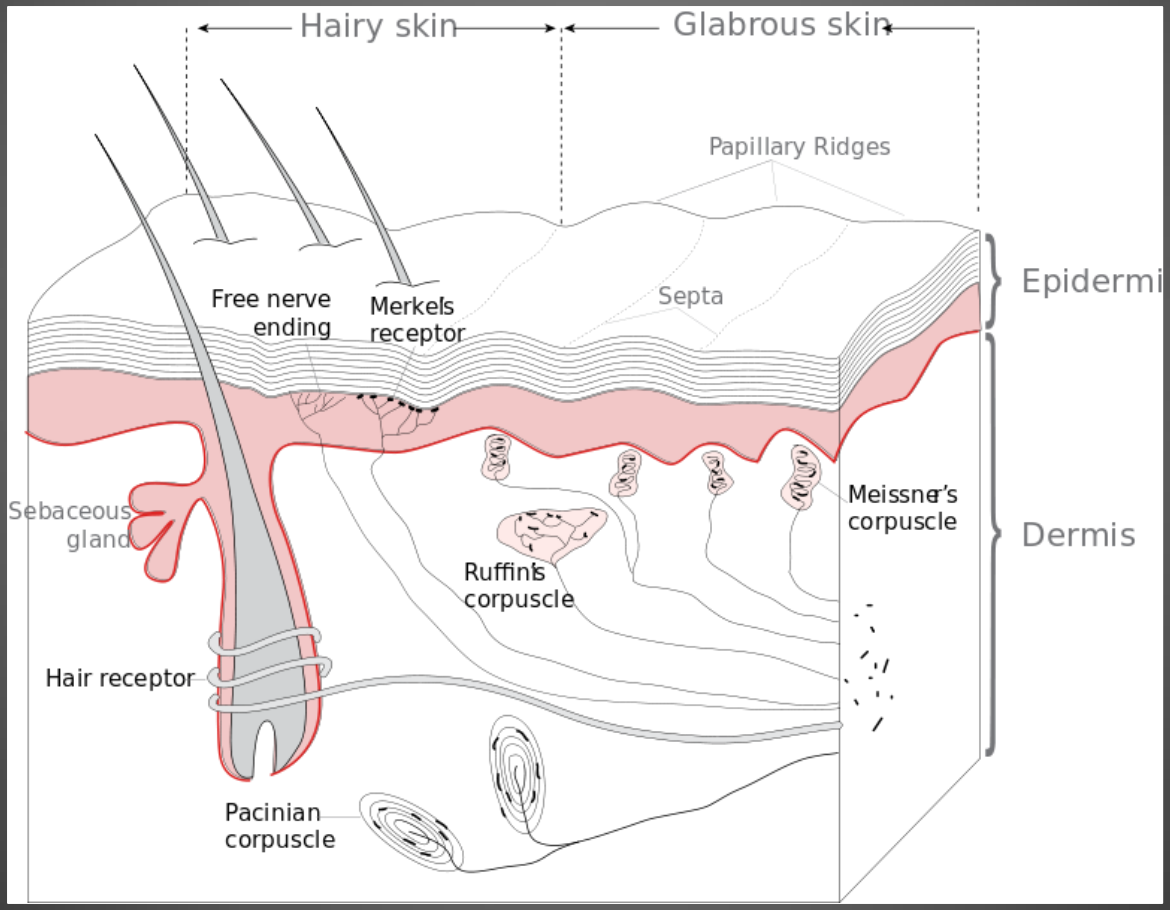
Touch

- What do you feel?

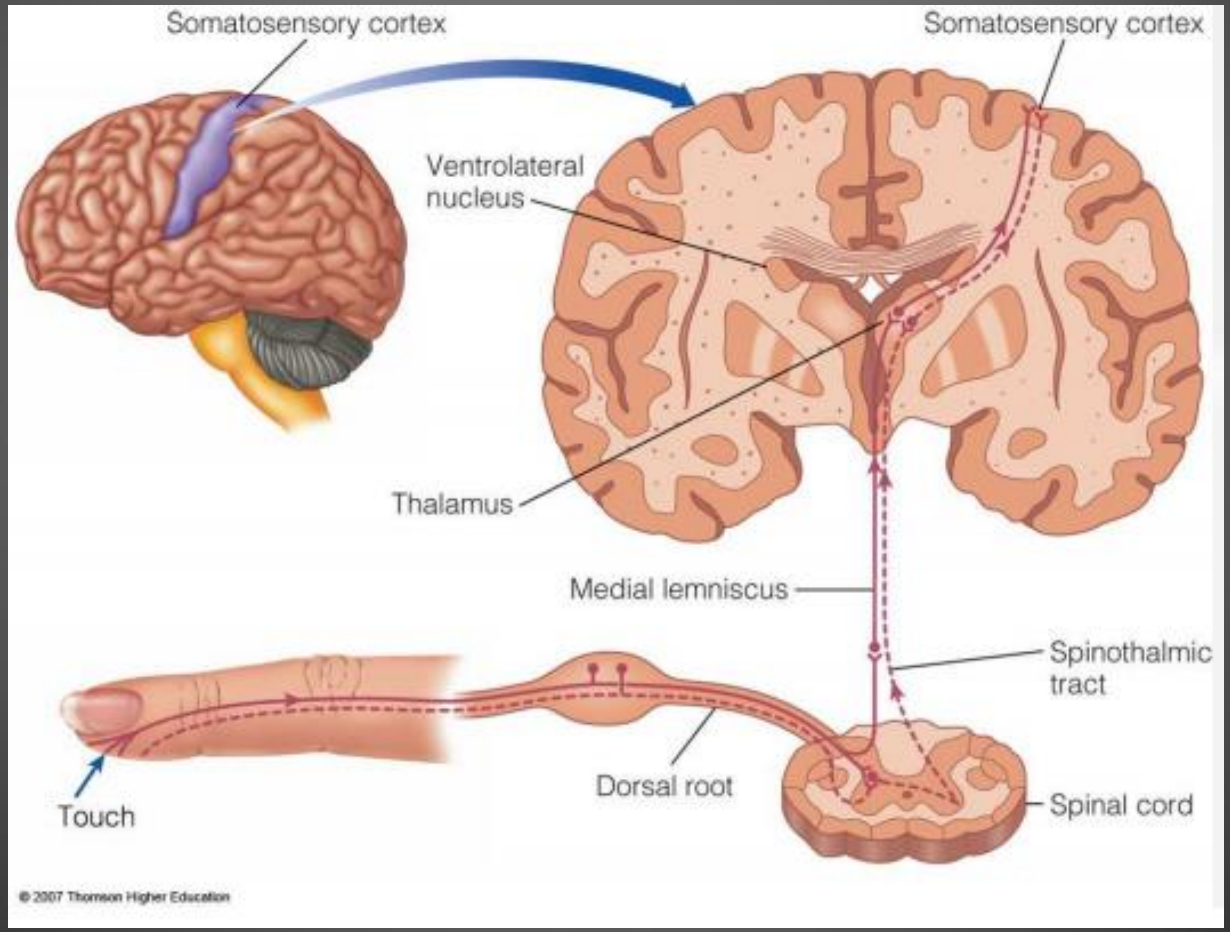
Touch

- Somatosensory (Touch) Processing
  - Fine Touch
  - Temperature
  - Vibration
  - Pain
- Somatosensory Reintegration

Touch


Hairy skin
Glabrous skin
Papillary Ridges
Epidermi
Free nerve ending
Merkels receptor
Septa
Sebaceous gland
Meissner's corpuscle
Dermis
Ruffini's corpuscle
Hair receptor
Pacinian corpuscle

Touch


Somatosensory cortex
Somatosensory cortex
Ventrolateral nucleus
Thalamus
Medial lemniscus
Spinothalmic tract
Dorsal root
Spinal cord
Touch
© 2007 Thomson Higher Education

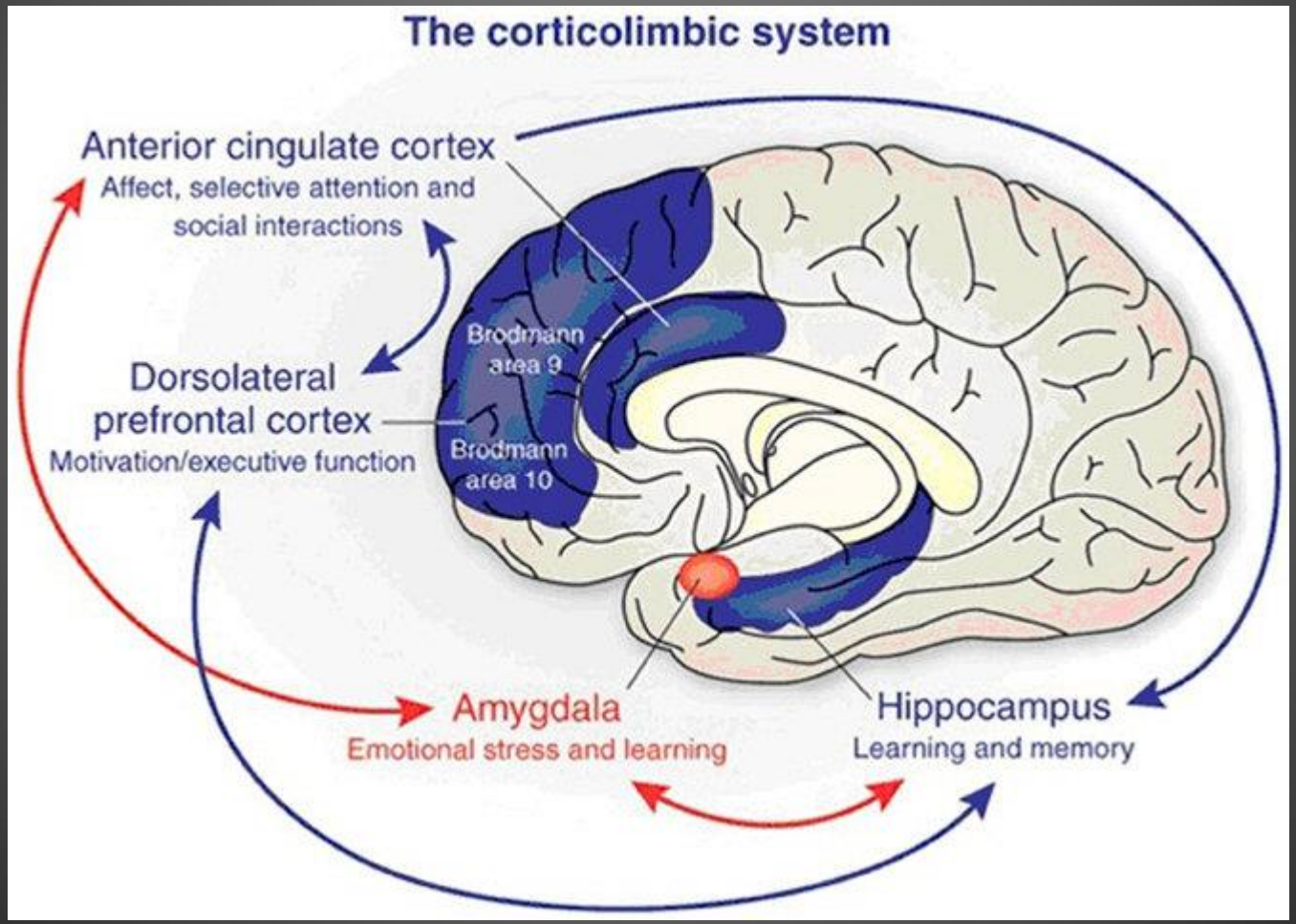
Part II

- Let's now switch gears…
- How is the sensory experience used in shaping our behavioral response?

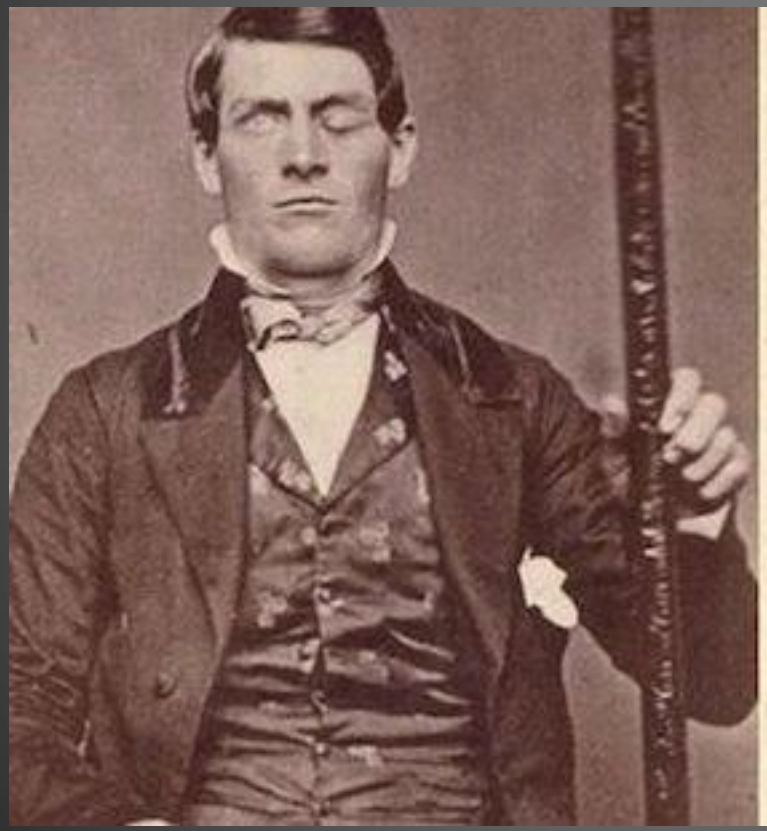
Emotion

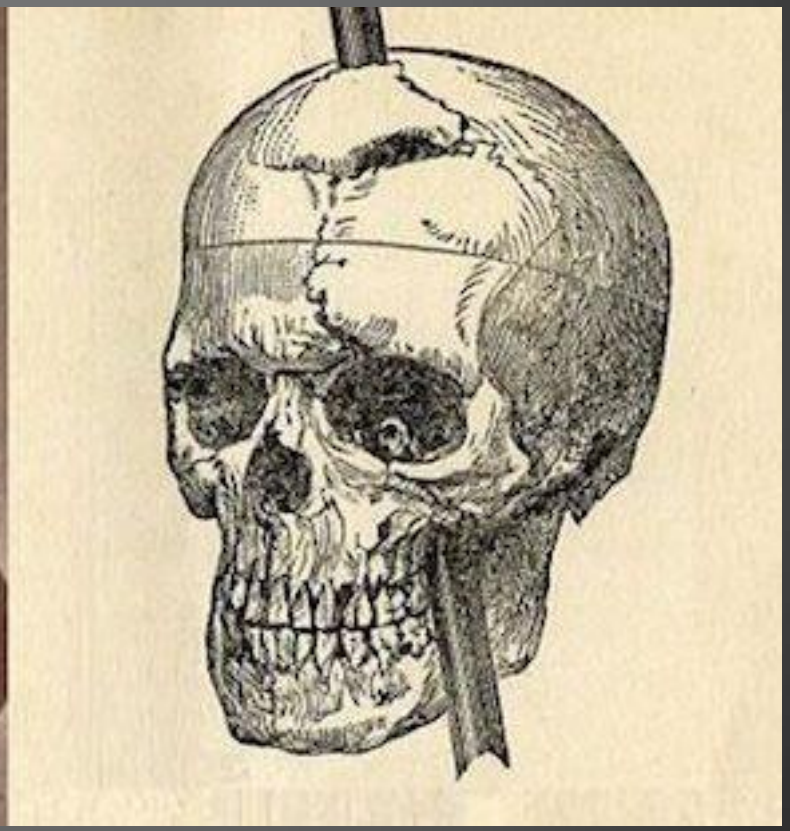
- What is the purpose of emotion?
- What are the different emotions?
- Where is this processed in the brain?

Learning and Behavior



Emotion

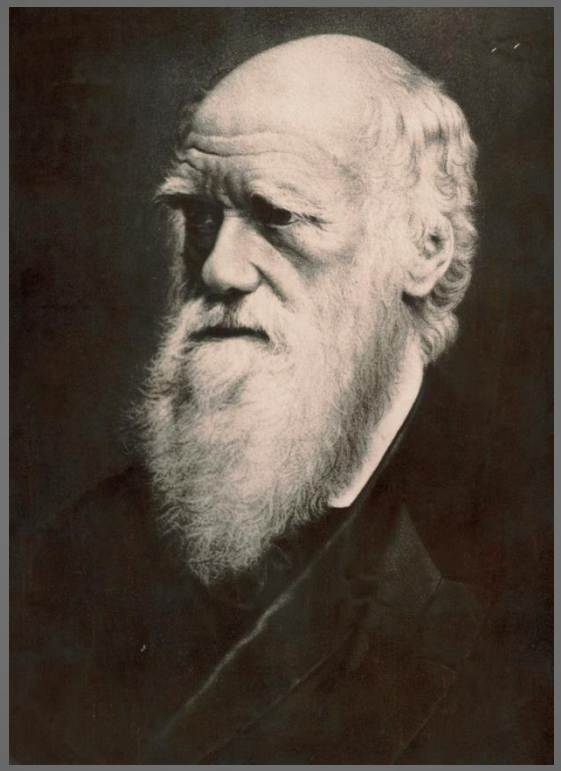




Emotion

- Kluver-Bucy Syndrome

Emotion



The Expression of the Emotions in Man and Animals, 1872

Emotion

- Anger
- Fear
- Surprise
- Disgust
- Happiness
- Sadness

How do you feel?

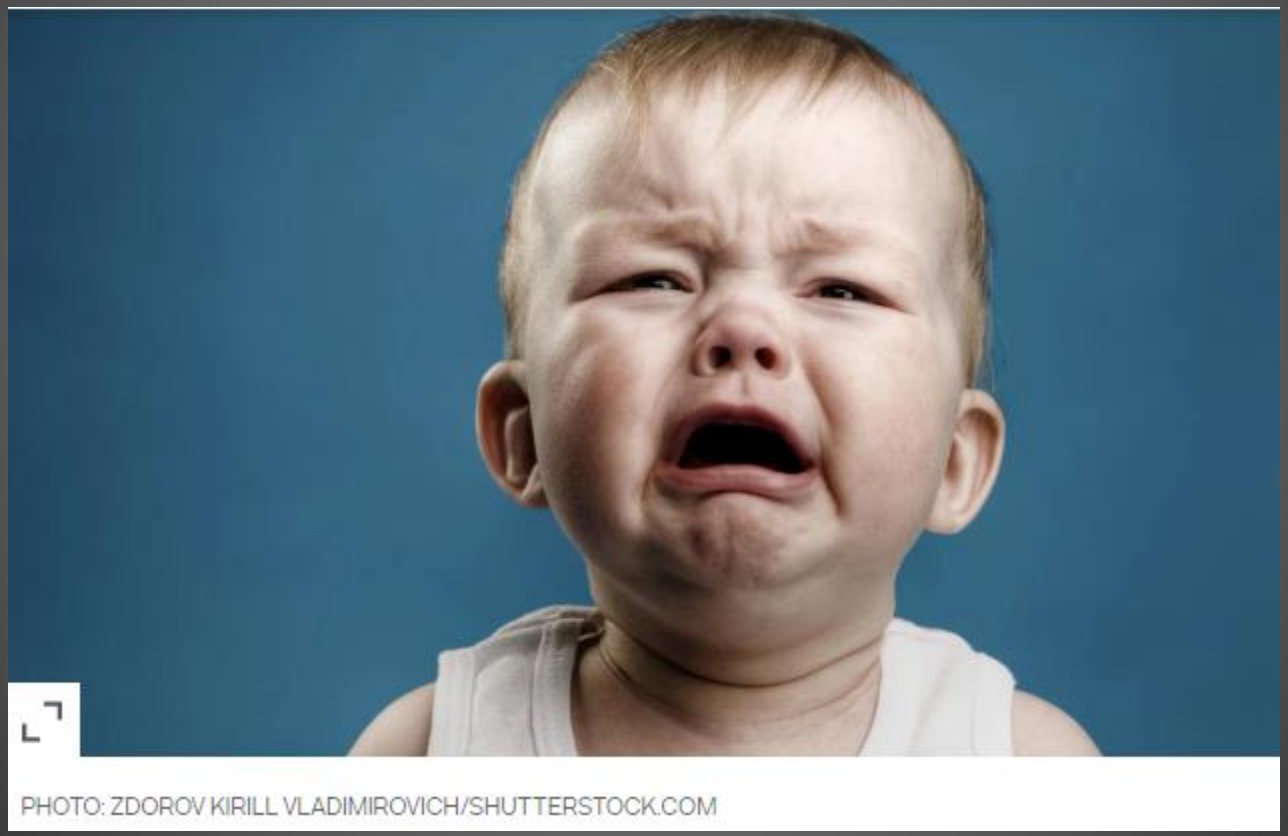
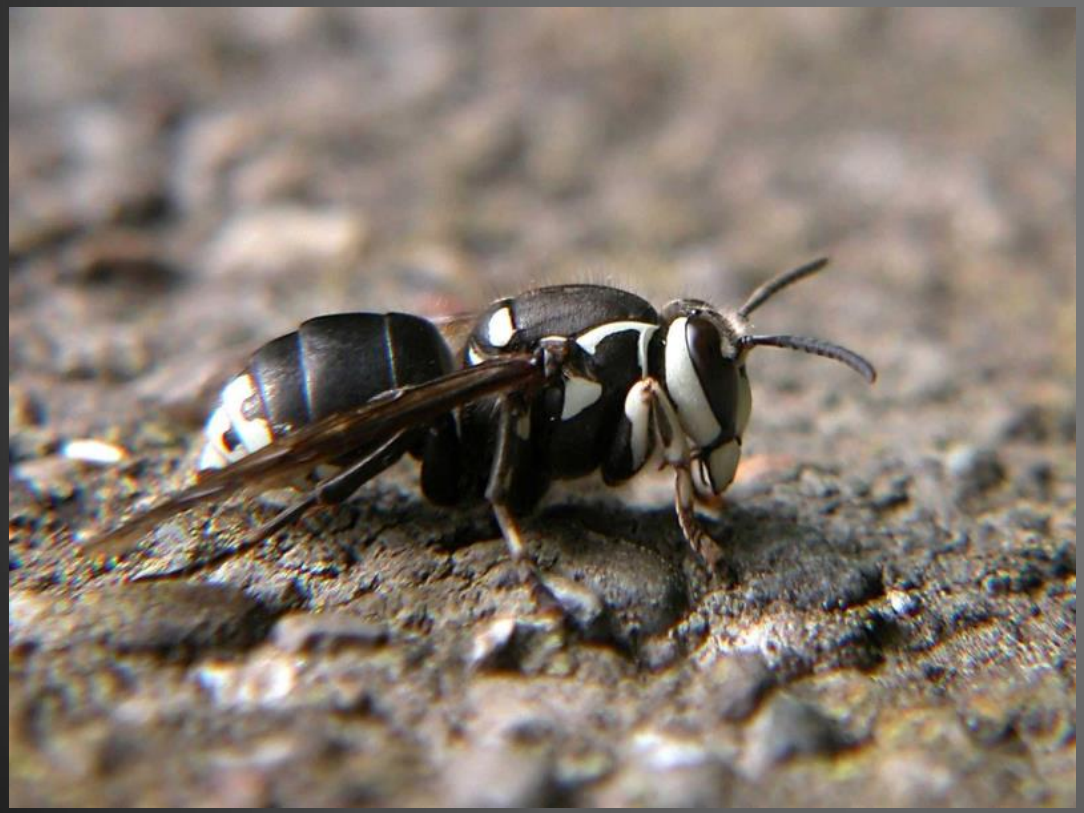


PHOTO: ZDOROV KIRILL VLADIMIROVICH/SHUTTERSTOCK.COM

How do you feel?

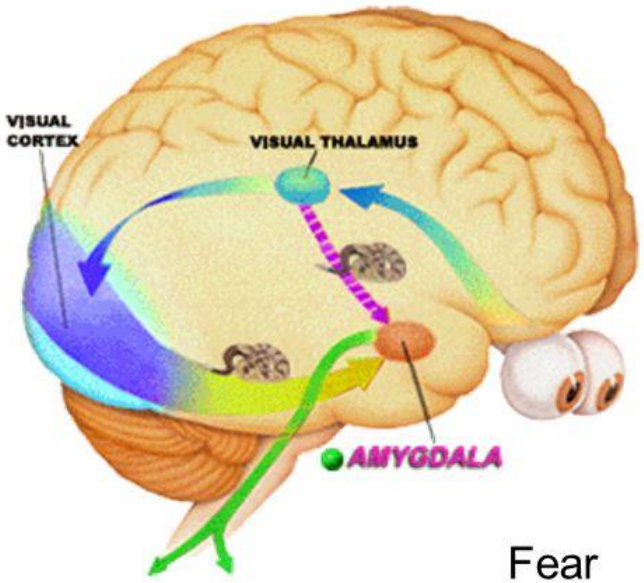
How do you feel?

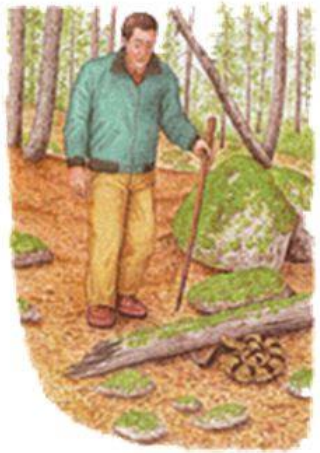


Fear

Role of amygdala

Rage





Fear

Illustration based on LeDoux JE (1994) Emotion, Memory, and the Brain. Scientific American.

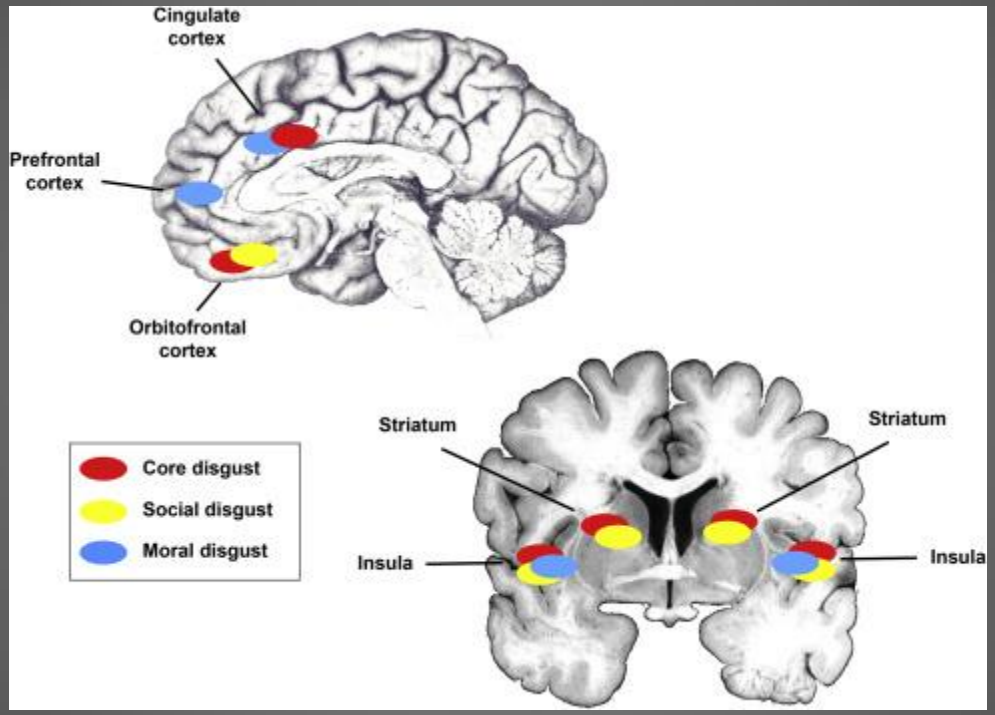
How do you feel?

Disgust

- Core Disgust
- Animal-Nature Disgust
- Interpersonal Disgust
- Moral Disgust

- What is the purpose of disgust?

Disgust



Vicario et al.

Emotion

- How does disgust develop?
  - Experimental psychology
    - Paul Rozin PhD
- How do we as individuals vary in our responses?
  - Moral Psychology
    - Jonathan Haidt, PhD

Emotion

- Intuition leads, reason follows
- Cultural norms

Emotion

Special to The Chronicle / By Juan Carlos Reyes

How do you feel?

Integration

- Our sensory systems enable us to interact with the physical world
- Our experience with the physical world – either positive or negative drives our future responses through the emotional system

Integration

- We learn to avoid harmful encounters by feeling anger, fear, disgust, sadness (pain)
- We learn to seek out beneficial encounters by feeling happiness (pleasure)
- We can modify our intuition or initial reactions through reason and intellect