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
Sound

• What do you hear?
  – Sound 1
  – Sound 2
Sound

- Sound Processing
  - Component Frequencies
  - Location

- Sound Reintegration
Sound
Sound
Taste

• What do you taste?
Taste

- Flavor Processing
  - Salt, Sweet, Sour, Bitter, Umami
  - Smell

- Touch Sensations
  - Texture (Touch)
  - Temperature (Touch)

- Taste Reintegration
Taste

(a) Fungiform papillae
(b) Taste bud
(c) Taste fibers of cranial nerve
(d) Gustatory (taste) cell

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Taste
Smell

- What do you smell?
Smell

- Odor Processing
  - Volatile compounds

- Odor Reintegration
Smell

Instead of proceeding directly to the thalamus like other sensory systems, scent signals first travel to brain regions that process emotions and memory.
Touch

- What do you feel?
Touch

• Somatosensory (Touch) Processing
  – Fine Touch
  – Temperature
  – Vibration
  – Pain

• Somatosensory Reintegration
Touch
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

The corticolimbic system

Anterior cingulate cortex
Affect, selective attention and social interactions

Dorsolateral prefrontal cortex
Motivation/executive function

Brodmann area 9

Brodmann area 10

Amygdala
Emotional stress and learning

Hippocampus
Learning and memory
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?
How do you feel?
How do you feel?
Fear

Role of amygdala

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
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