



Biological Research Strategies and Hormones



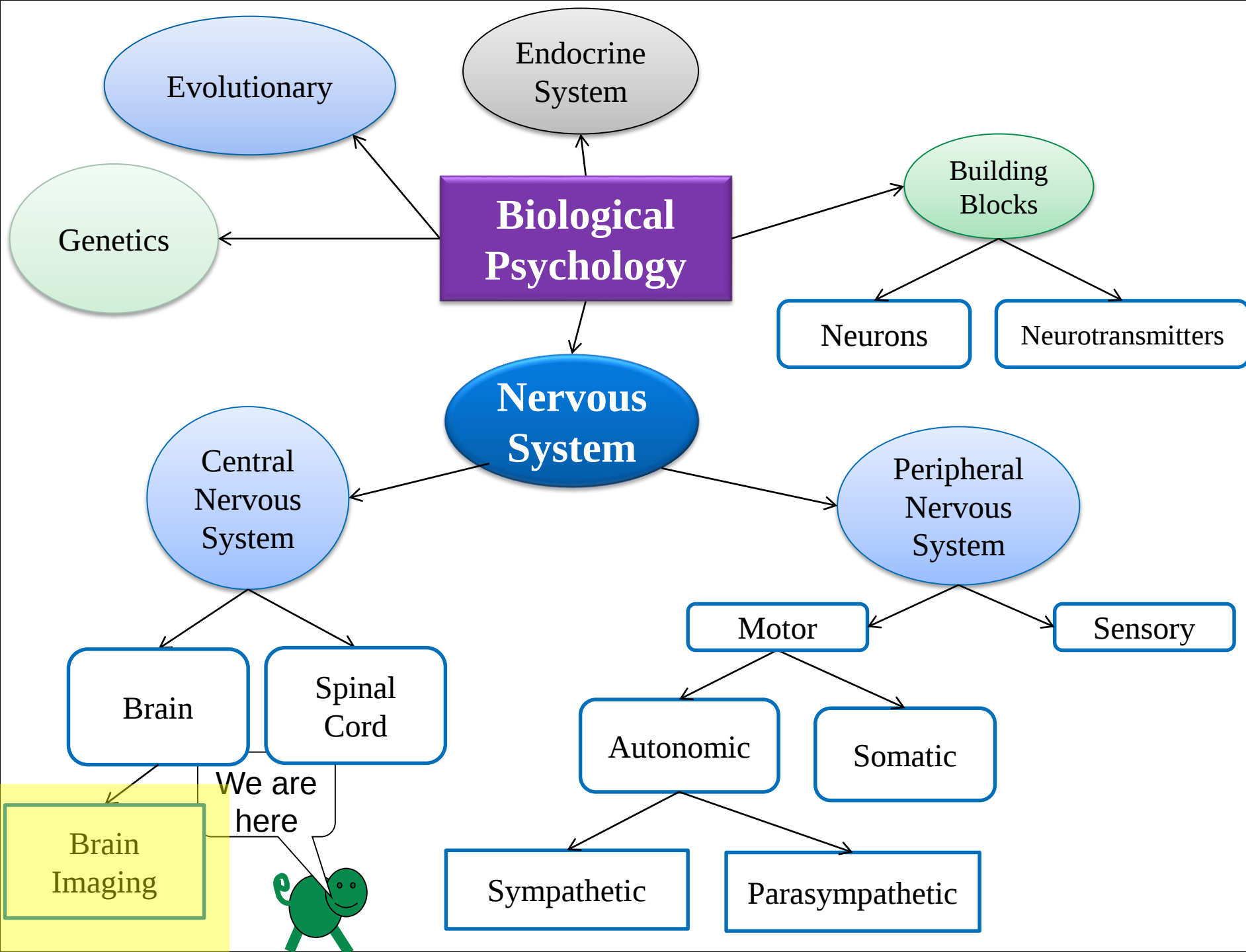
WHS AP Psychology



Unit 3: Biological Psychology

Essential Task 3-6:

Detail historic and contemporary research strategies and technologies that support research (*case studies like Phineas Gage, split-brain research, sleep research (EEGs), structural imaging (CAT Scans and MRIs), and functional imaging (PET scans and fMRIs).*





Essential Task 3-6:

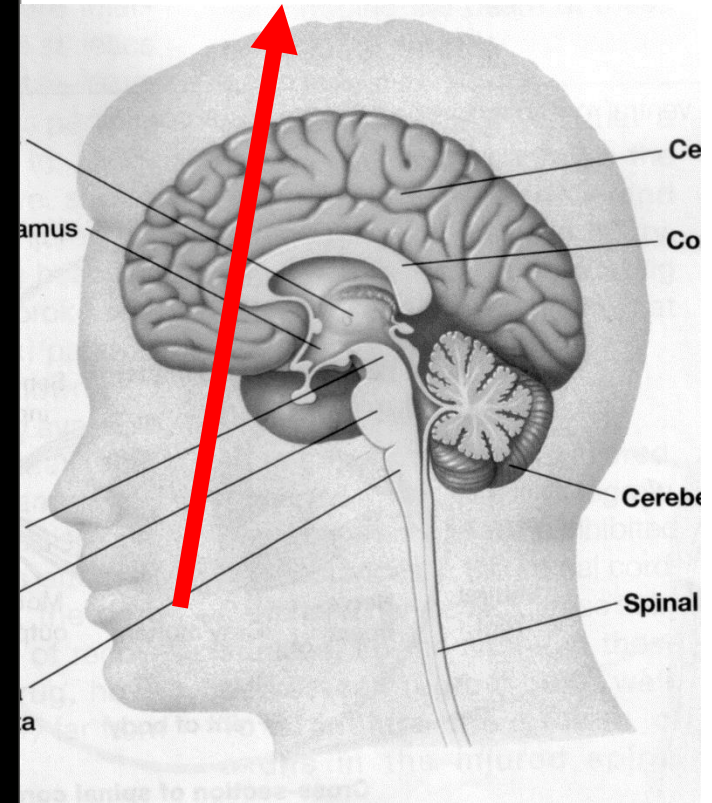
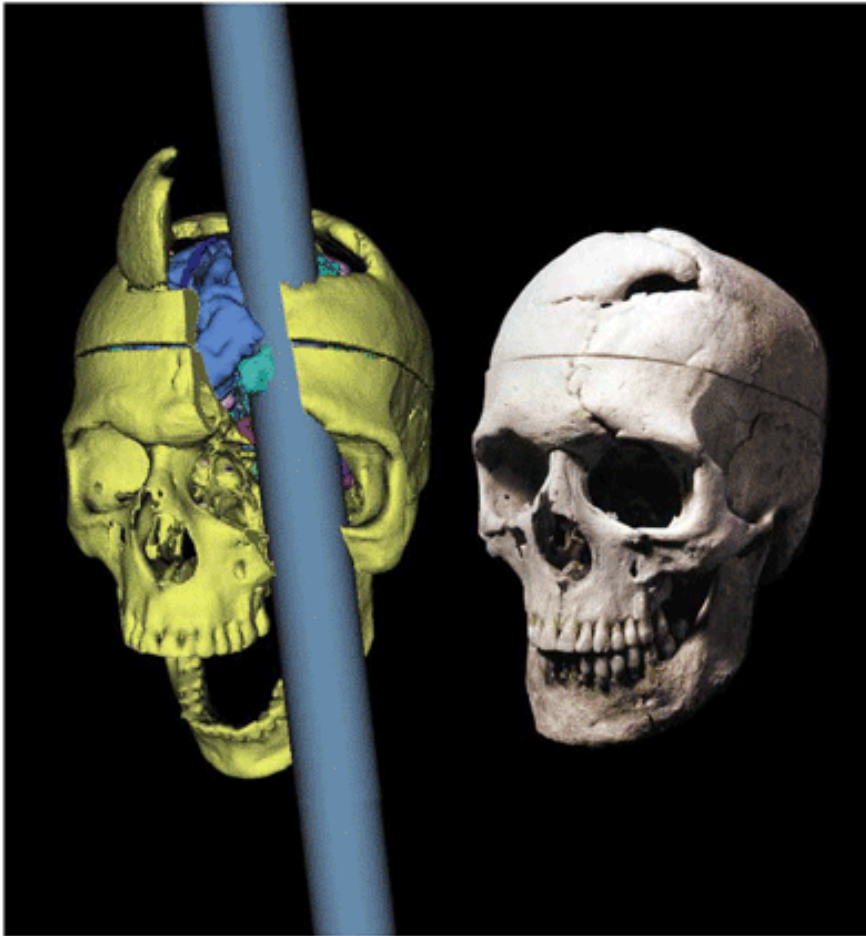
Outline

- Detail historic *case studies* like [Phineas Gage](#) and [split-brain research](#)
- Contemporary research strategies and technologies
 - [lesions](#)
 - [microelectrodes](#)
 - [sleep research \(EEGs\)](#)
 - *structural imaging* ([CAT Scans](#) and [MRIs](#))
 - *functional imaging* ([PET scans](#) and [fMRIs](#))



Case Studies: Phineas Gage

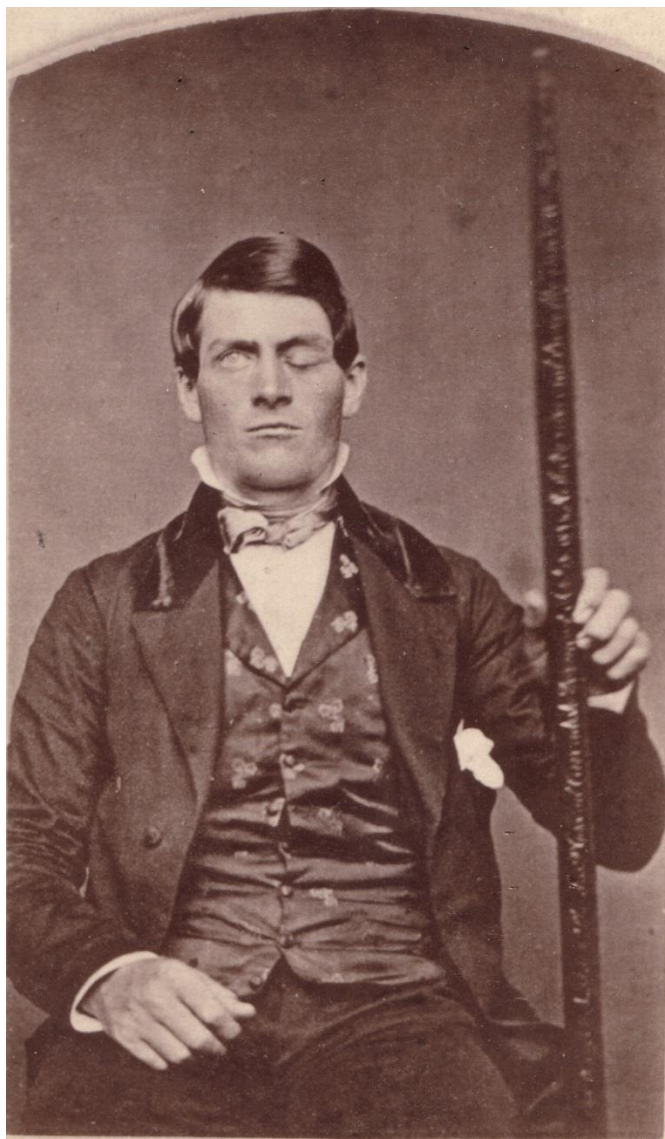
Outline





Gage

[Outline](#)





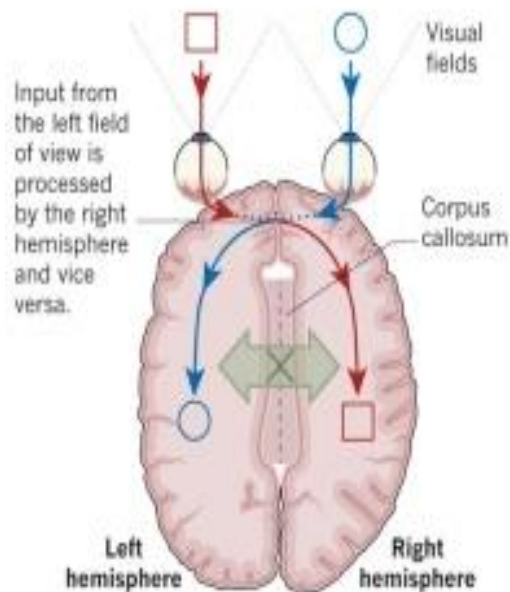
Split Brain Research

Outline

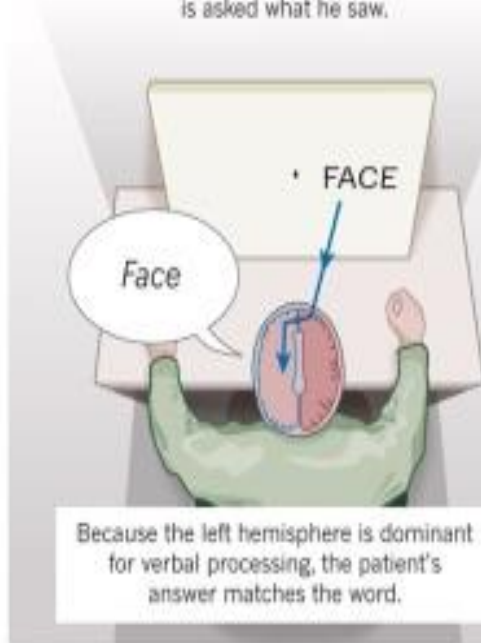
OF TWO MINDS

Experiments with split-brain patients have helped to illuminate the lateralized nature of brain function.

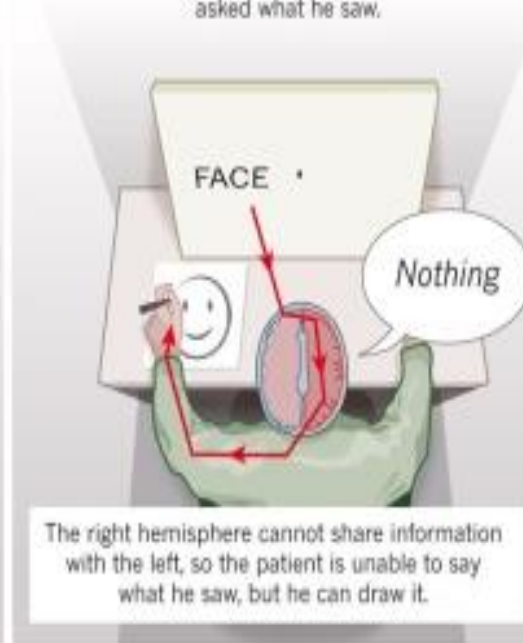
Split-brain patients have undergone surgery to cut the corpus callosum, the main bundle of neuronal fibres connecting the two sides of the brain.



A word is flashed briefly to the right field of view, and the patient is asked what he saw.



Now a word is flashed to the left field of view, and the patient is asked what he saw.



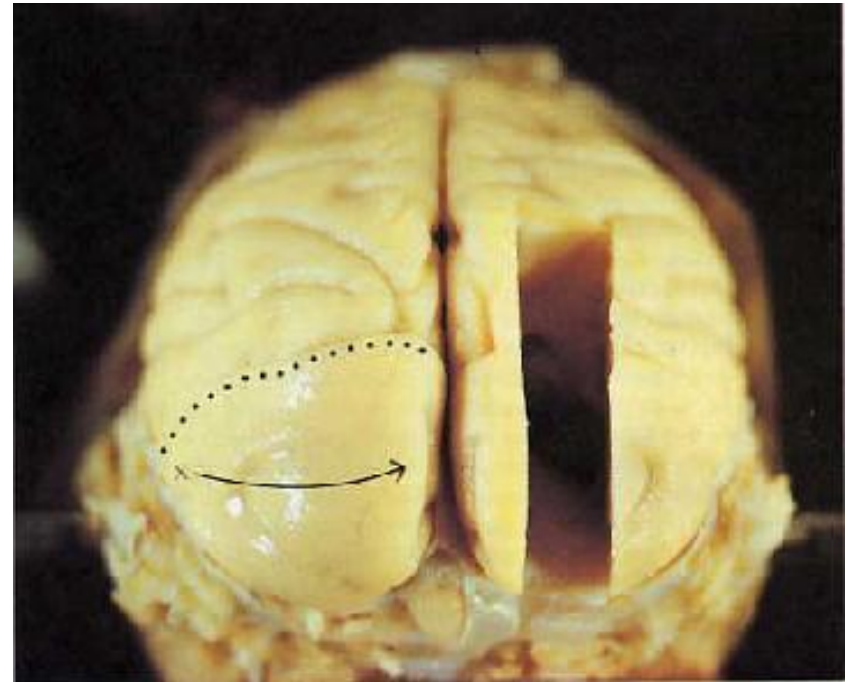


Lesion

Outline

Techniques to Study the Brain

A brain **lesion** experimentally destroys brain tissue to study animal behaviors after such destruction.



Hubel (1990)



Microelectrode Techniques

Outline

- Very small **electrodes** inserted into individual **neurons**
- Used to study activity of a single neuron





EEG (Electroencephalogram)

Outline

- Macroelectrode Techniques
- Used to get a picture of **overall activity** in the brain
- An example is an which uses **electrodes placed on a person's scalp** to measure an amplified recording of the **electrical waves** sweeping across the brain's surface.





Sleep Research

Outline

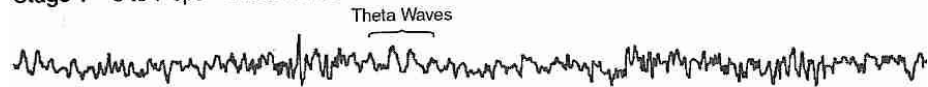
Awake – low voltage – random, fast



Drowsy – 8 to 12 cps – alpha waves



Stage 1 – 3 to 7 cps – theta waves



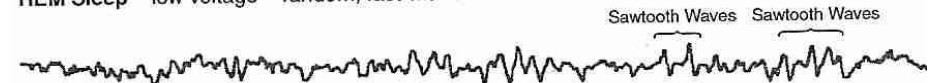
Stage 2 – 12 to 14 cps – sleep spindles and K complexes



Delta Sleep – 1/2 to 2 cps – delta waves $>75 \mu V$



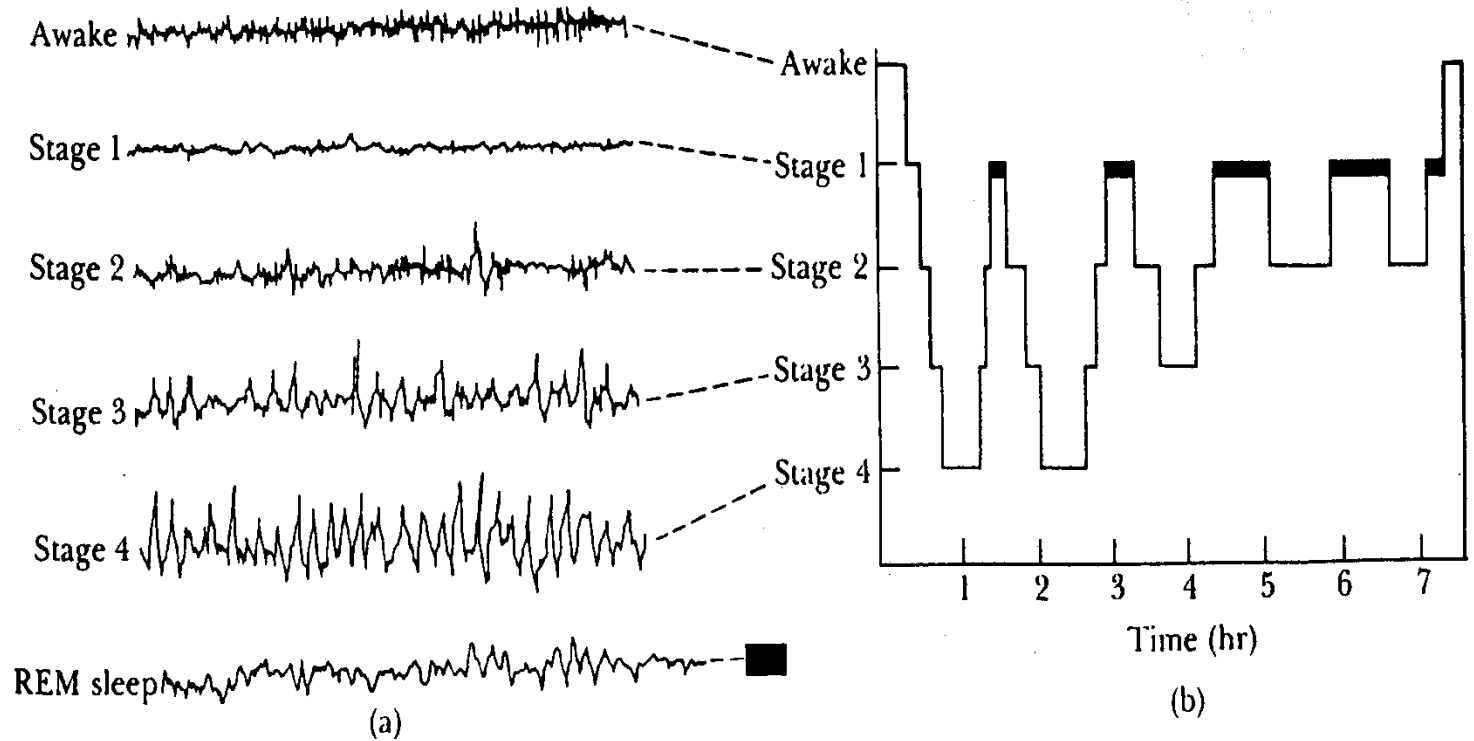
REM Sleep – low voltage – random, fast with sawtooth waves





Sleep Research

Outline

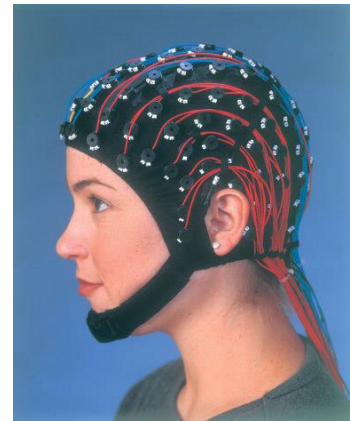




EEG imaging

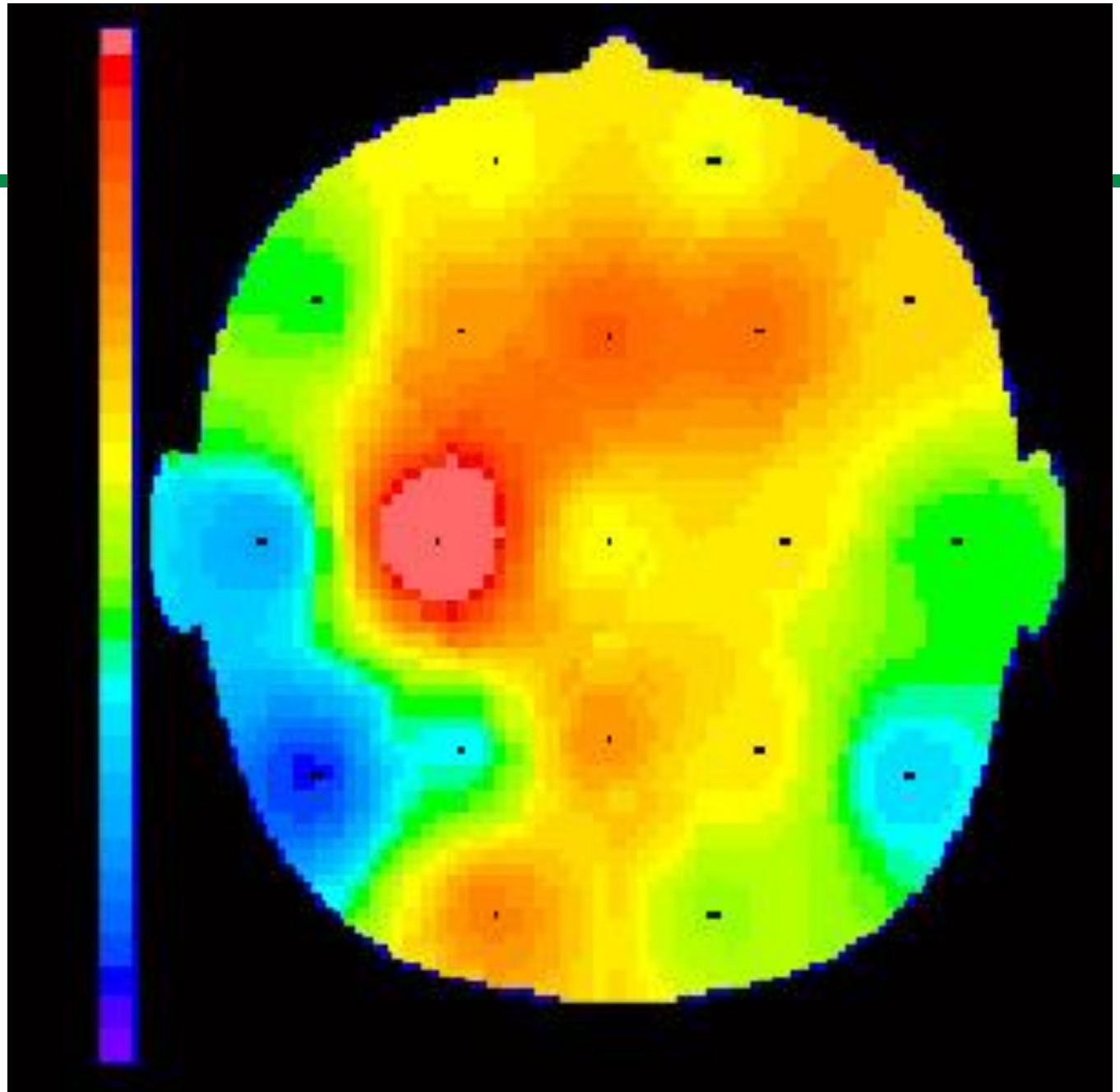
Outline

- 21 Sensors on the scalp record changes in electrical activity and feed them into a computer. The computer translates them into color and motion on a map of the brain displayed on a television monitor



:):

[Outline](#)





Brain Imaging

[Outline](#)

Structural Imaging

CAT Scan

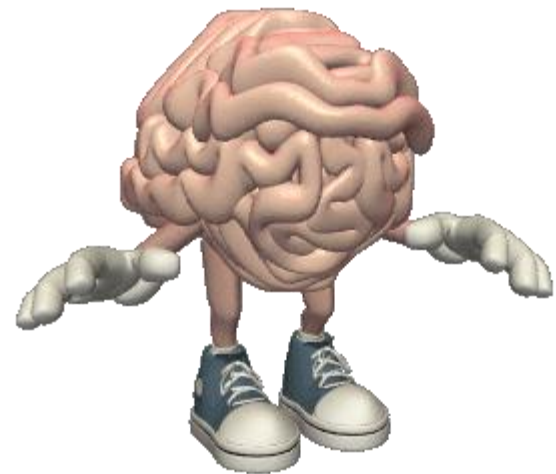
MRI



Functional Imaging

PET Scan

fMRI



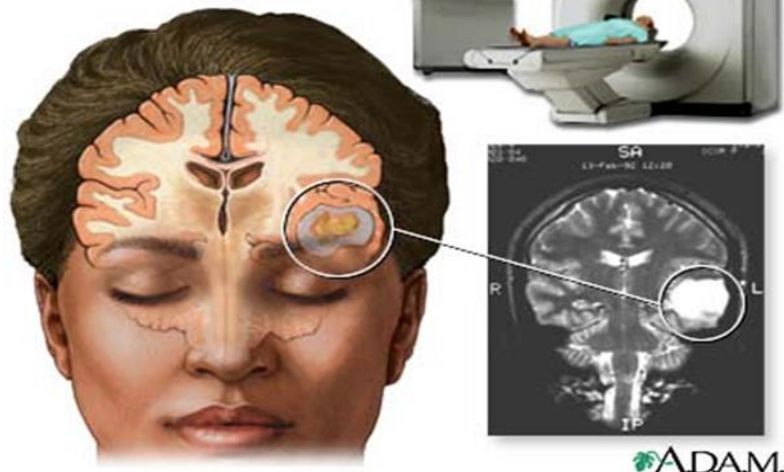


CAT Scans

Outline

- Computerized Axial Tomography (CAT-scan)
 - Uses X-rays to create a 3-dimensional image of the brain
 - CT scans can often show the size and locations of brain abnormalities caused by tumors, blood vessel defects, blood clots, strokes and other problems.

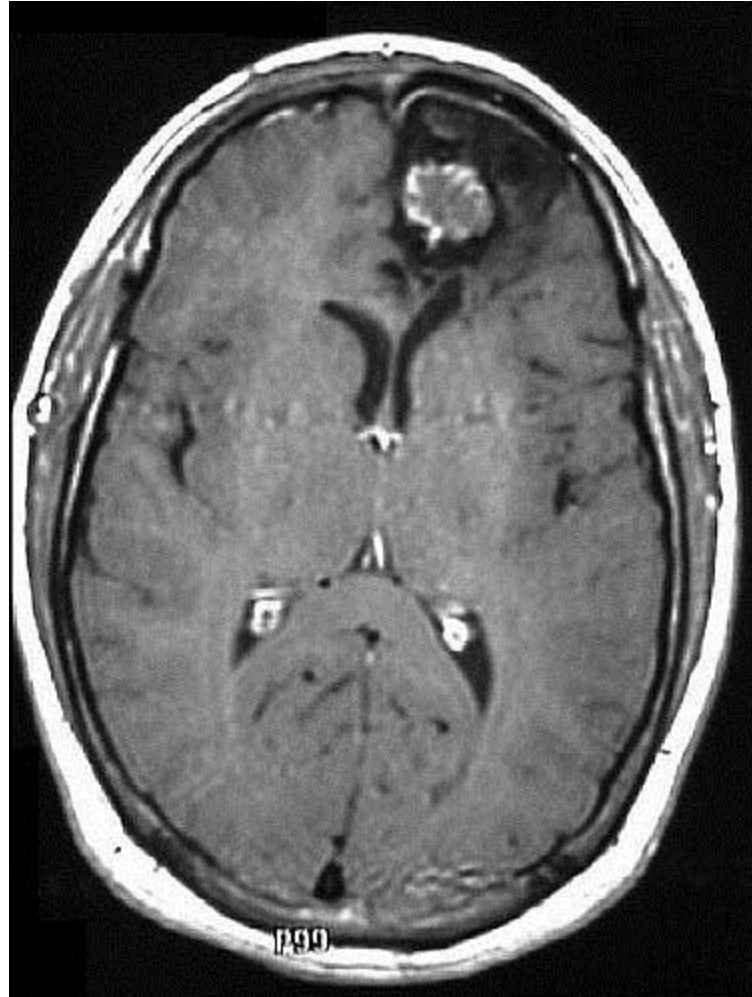
Computed tomography
(CT or CAT scan) of the brain





More CAT Scans

[Outline](#)





Not a CAT Scan

[Outline](#)

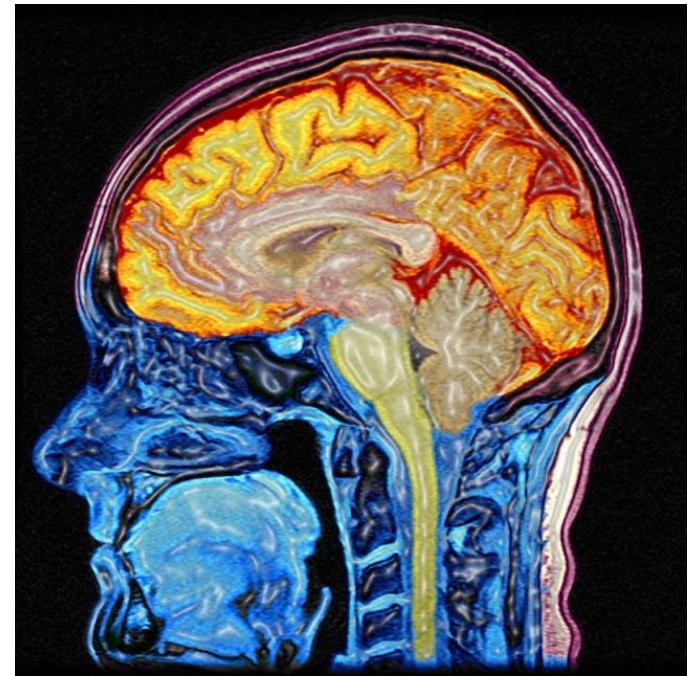
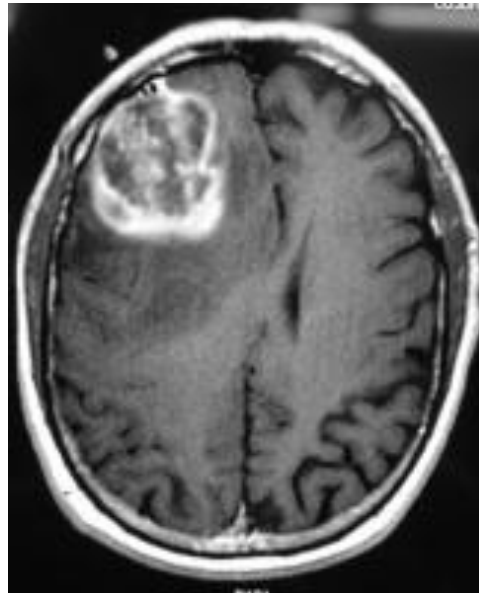




MRI – Magnetic Resonance Imaging

[Outline](#)

- **Magnetic Resonance Imaging (MRI)**
 - Uses a **magnetic field and radio waves** to produce computer-generated images
 - They distinguish among different types of brain tissue.



[Outline](#)



CAT scan vs. MRI

[Outline](#)

CAT scan

- Less expensive than MRI
- Less sensitive to patient movement
- CT can be performed if you have an implanted medical device of any kind

MRI

- MRI contrast materials used for image enhancement have very low incidence of side effects
- More sensitive to patient movement

Give you the structure of the brain

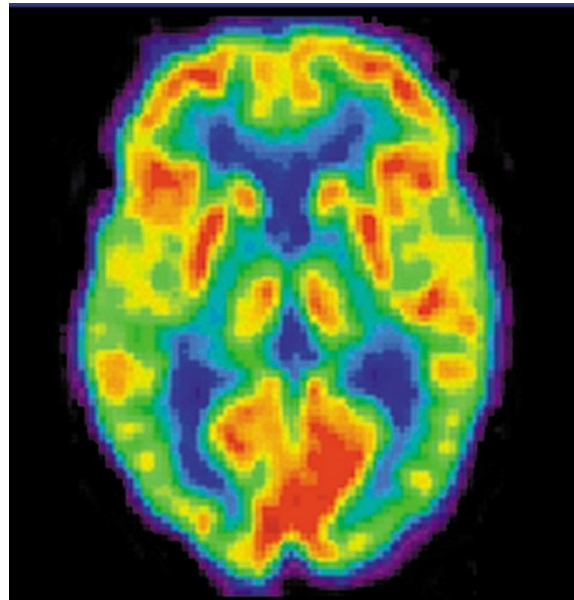


PET Scans

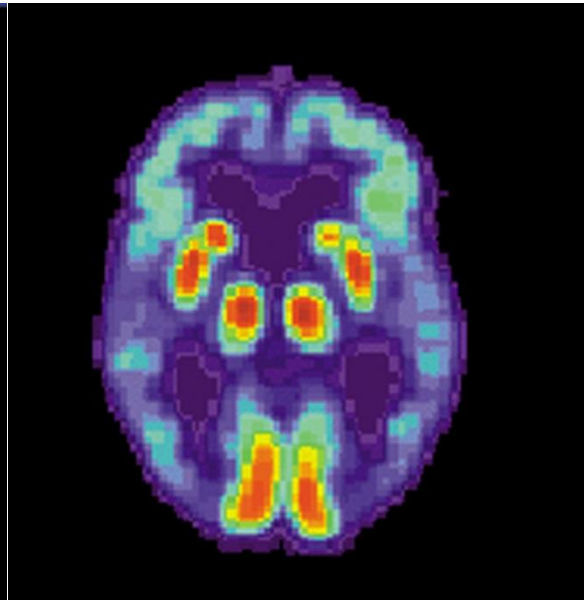
Outline

- Positron Emission Tomography (PET)
- Use **radioactive glucose** to determine location of greatest brain activity

PET Scan of
Normal Brain



PET Scan of
Alzheimer's Disease





fMRIs

[Outline](#)

- Functional Magnetic Resonance Imaging (fMRI)
 - Shows function and structure by measuring **movement of blood molecules within the brain**



Anticipation of doing math causes pain in some people.

[Outline](#)



UChicago researchers have found that the higher a person's anxiety about math, the more anticipating math activated areas of the brain related to experiencing pain.

posterior insula -- a fold of tissue located deep inside the brain just above the ear that is associated with registering direct threats to the body as well as the experience of pain.

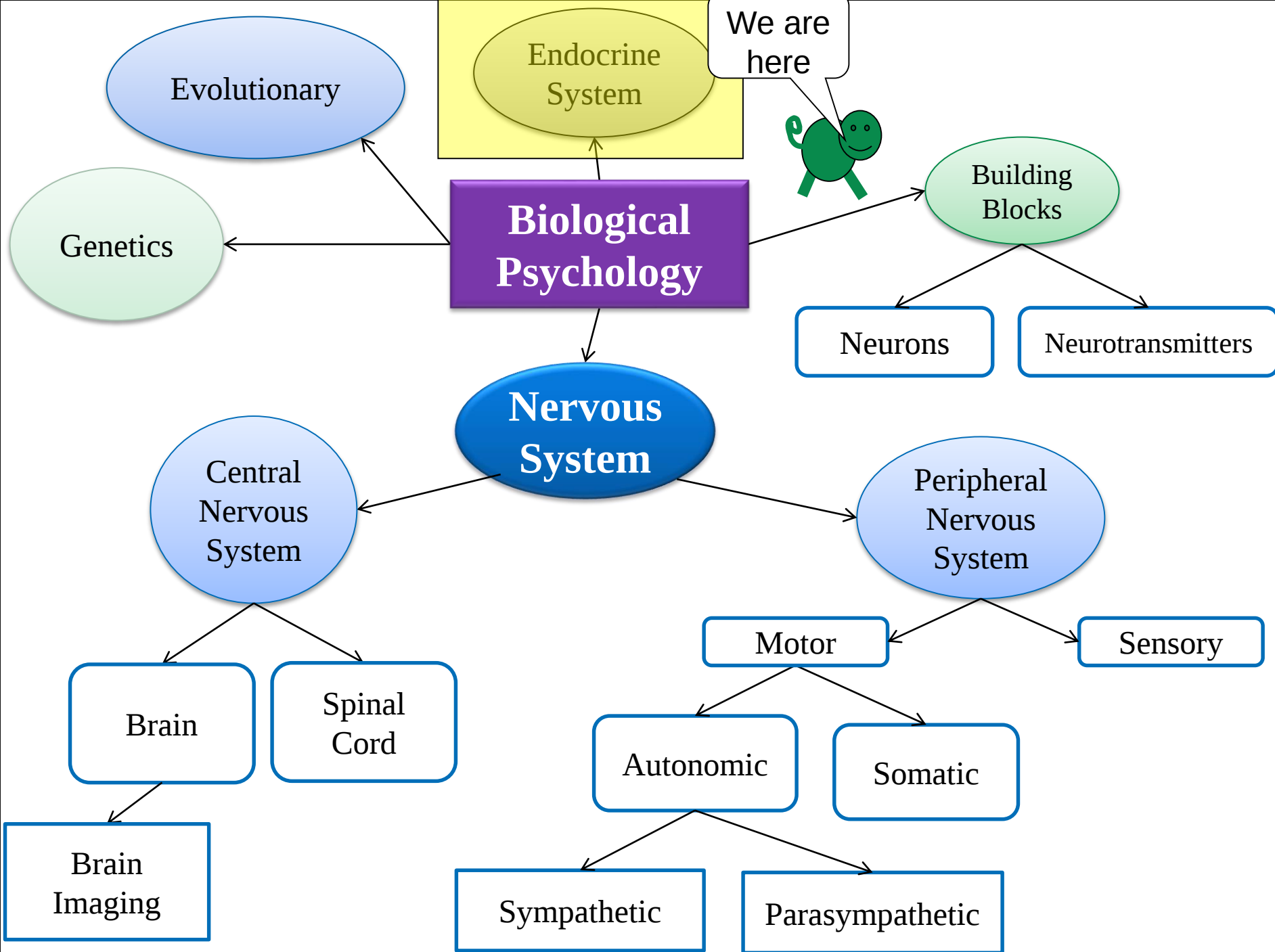


WHS AP Psychology



Unit 3: Biological Psychology

Essential Task 3-7: Identify key glands of the endocrine system and describe their effects on behavior





Essential Task 3-:

[Outline](#)

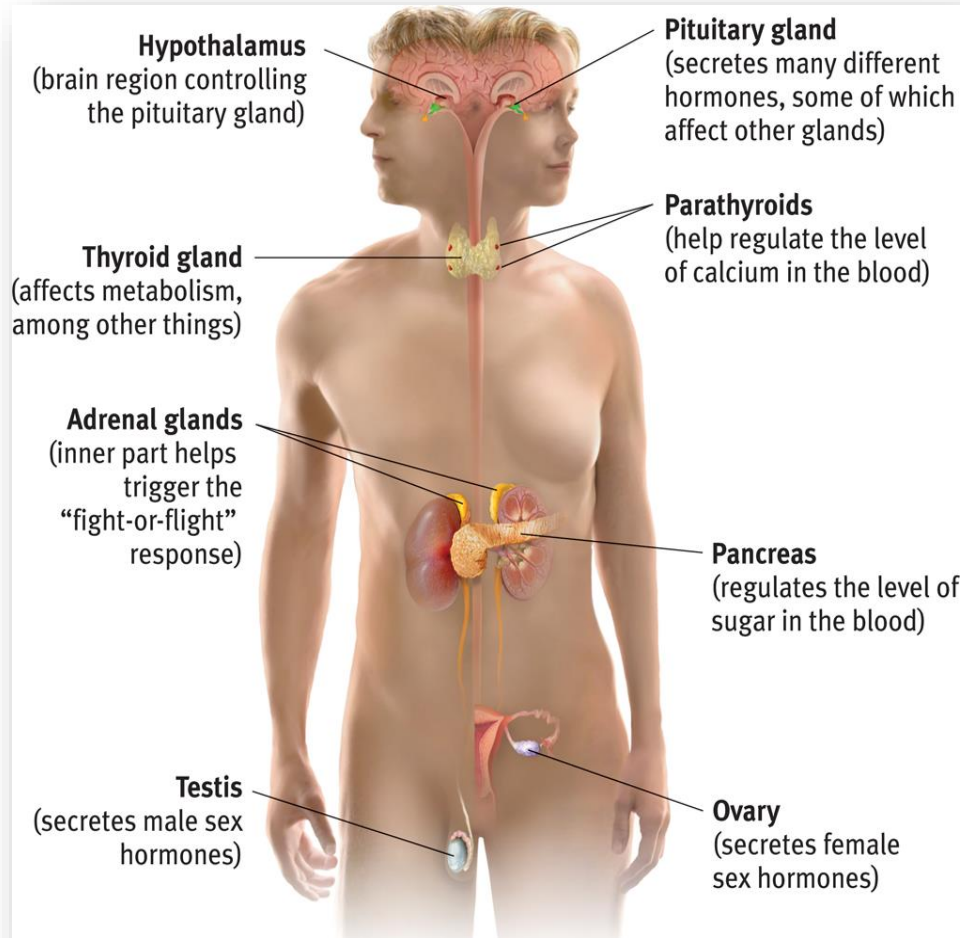
- Key glands of the endocrine system and their impact on behavior
 - [Pituitary](#)
 - [Pineal](#)
 - [Thyroid](#)
 - [Pancreas](#)
 - [Adrenal](#)
 - [Gonads](#)



Endocrine System

Outline

- The endocrine system sends molecules as **messages**, just like the nervous system, but it sends them **through the bloodstream** instead of across synapses.
- These molecules, called **hormones**, are produced in various **glands** around the body.
- The messages go to the brain and other tissues.

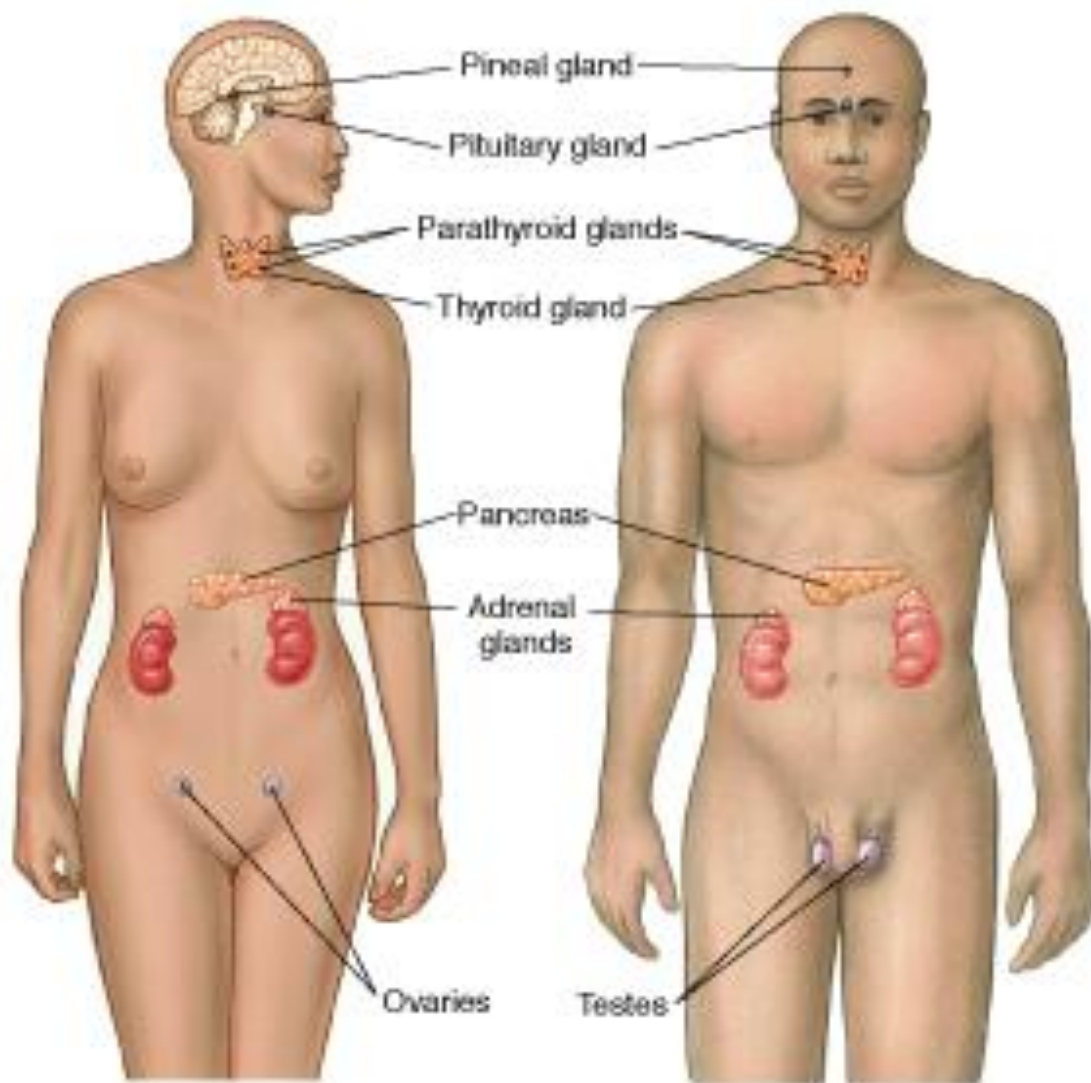


The endocrine system refers to a set of glands that produce chemical messengers called hormones.



The Endocrine System

[Outline](#)





The Endocrine System

Outline

- Controlled by the **Hypothalamus**
- **Endocrine glands secrete hormones** into the bloodstream. It is much slower than the nervous system.
- Hormones are chemical substances (similar in function to neurotransmitters) that **help regulate bodily activities.**



Differences

- Neurotransmitters: chemicals that are sent between **neurons** in the brain
- Hormones: Chemicals that are released into the **blood stream**.

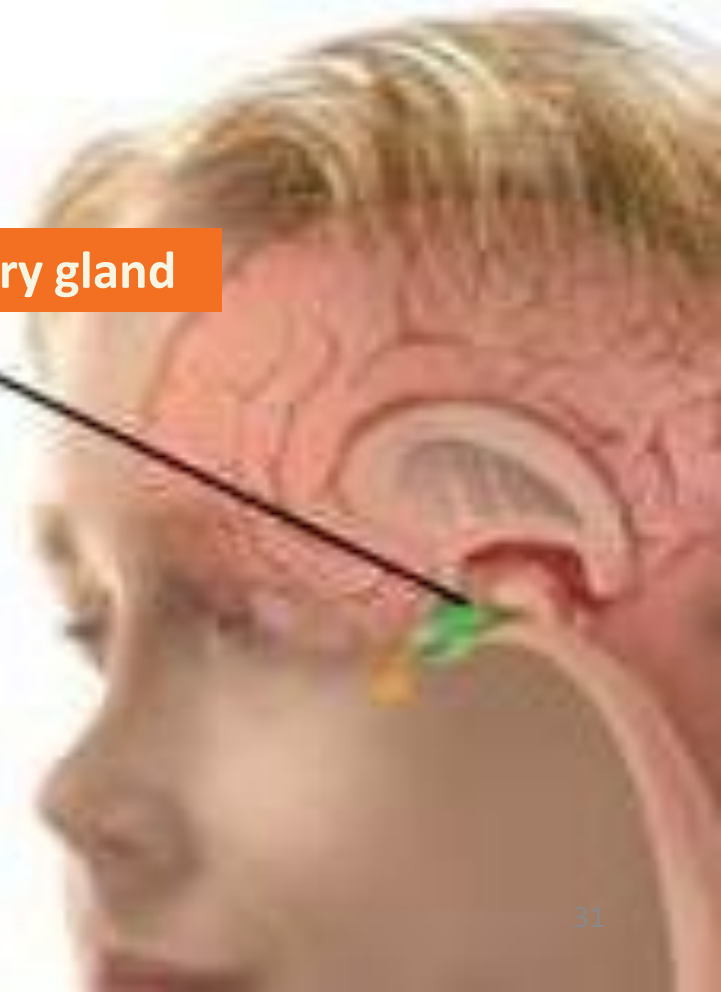


Pituitary gland

[Outline](#)

- The **pituitary gland** is the “**master gland**” of the endocrine system.
- It is controlled through the nervous system by the nearby brain area--the **hypothalamus**.
- The pituitary gland produces hormones that regulate other glands such as the thyroid.

Pituitary gland





Pituitary Gland

Outline

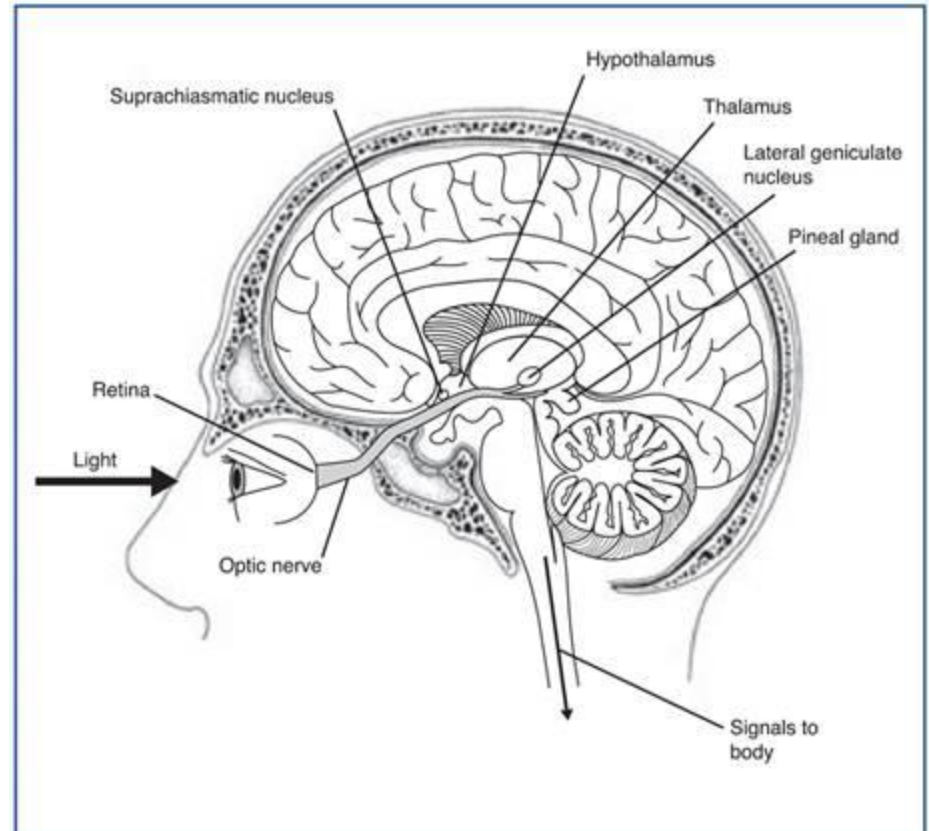
- Influences **blood pressure, thirst**, contractions of the uterus during childbirth, **sexual behavior and interest, body growth** etc.
- It also produces **growth hormone** (especially during sleep) and **oxytocin**, the “bonding” hormone.



Pineal gland

Outline

- **Secretes melatonin** which regulates the **sleep-wake cycle**
- Disturbances in melatonin are responsible for “jet lag”

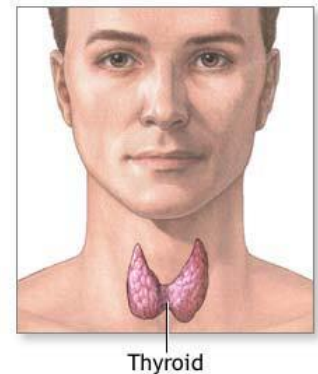




Thyroid gland

Outline

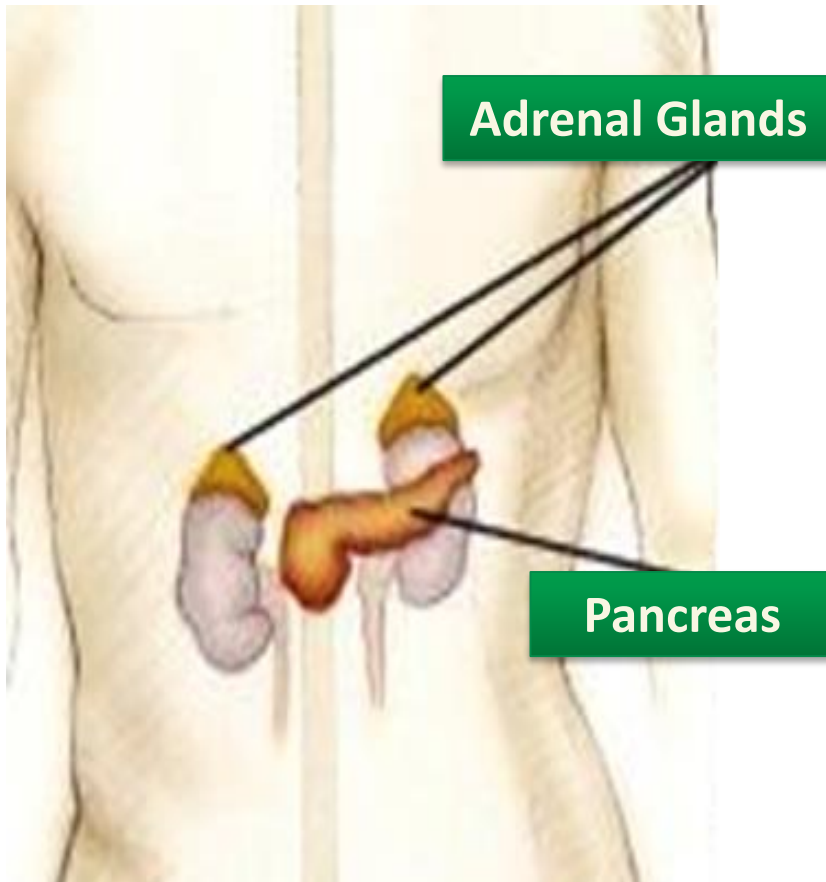
- Secretes hormones (primarily thyroxine) that control **metabolism**
 - How alert and energetic and how fat and thin you are
 - Overactive Thyroid can mean insomnia, reduced attention span, agitation
 - Too little thyroxine can mean feeling constantly tired



Adrenal Glands

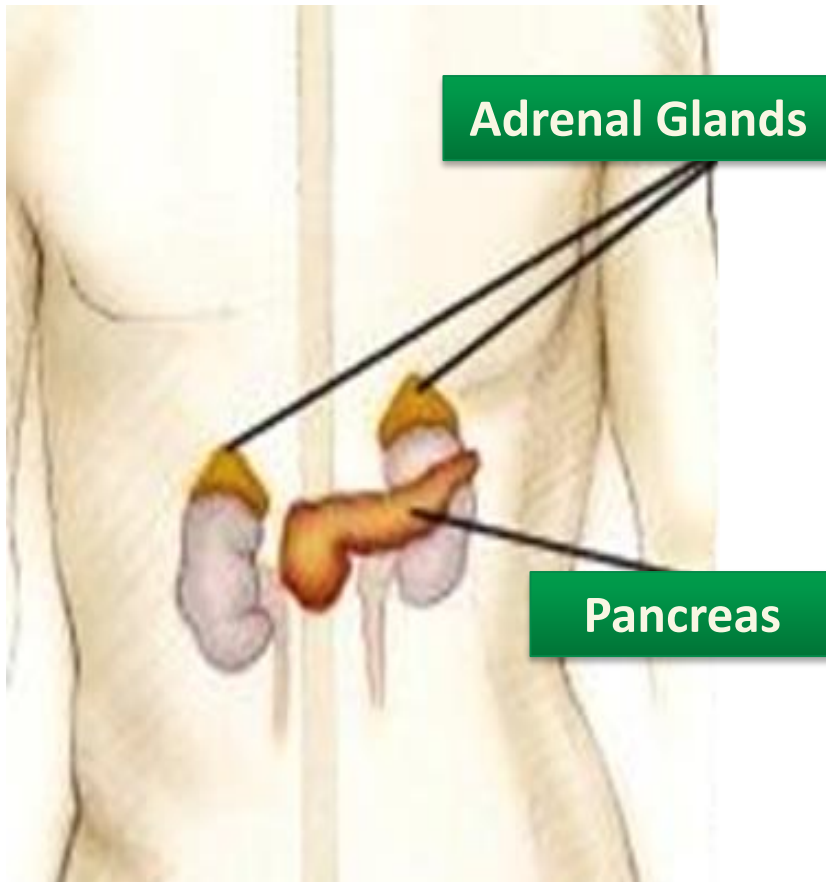
produce hormones such as adrenaline/epinephrine, noradrenaline/norepinephrine, and cortisol.

Outline



The sympathetic nervous system responds to “fight or flight” situations.

- responds to stress by sending a message to adrenal glands to release the hormones listed above.
- Effect: **increased heart rate, blood pressure, and blood sugar. These provide ENERGY for the fight or flight!**



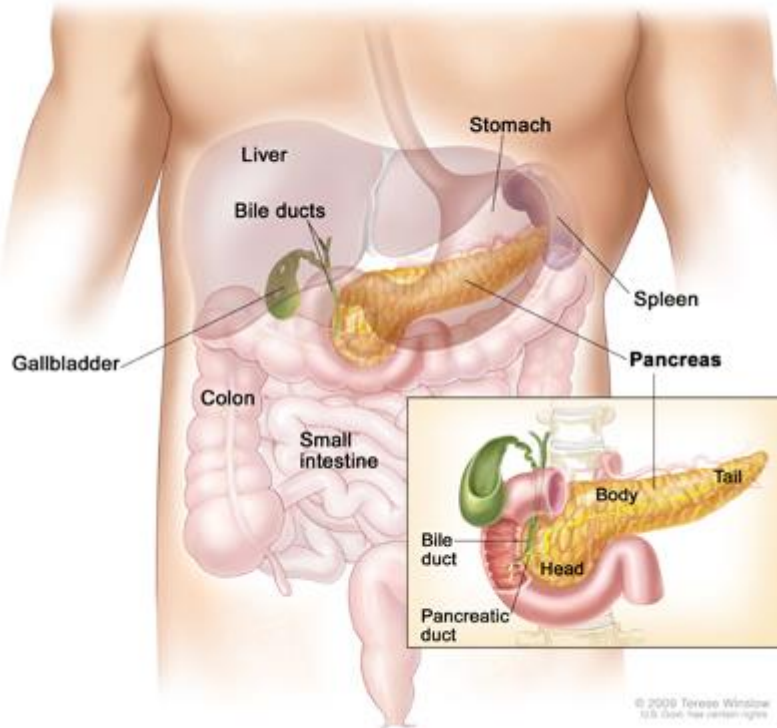
The parasympathetic nervous system

- Effect: slows down heart rate, blood pressure, and blood sugar
- These provide ENERGY for the fight or flight!



Pancreas

Outline



- Regulates blood-sugar levels
- Secretes insulin and glucagon
- Husbands and wives reported being most unhappy with their spouses when their blood-sugar levels were lowest, usually at night, according to research released today in the [Proceedings of the National Academy of Sciences](#). Missing a meal, dieting or just being hungry may be the reason, researchers said.



Gonads

Outline

- Glands that produce sex hormones
- Ovaries and testes secrete estrogens and androgens (testosterone)
- We know they play a role in development, **aggression and sexual drive** but we don't have the whole story.
- Play a role in brain growth during pre-natal development