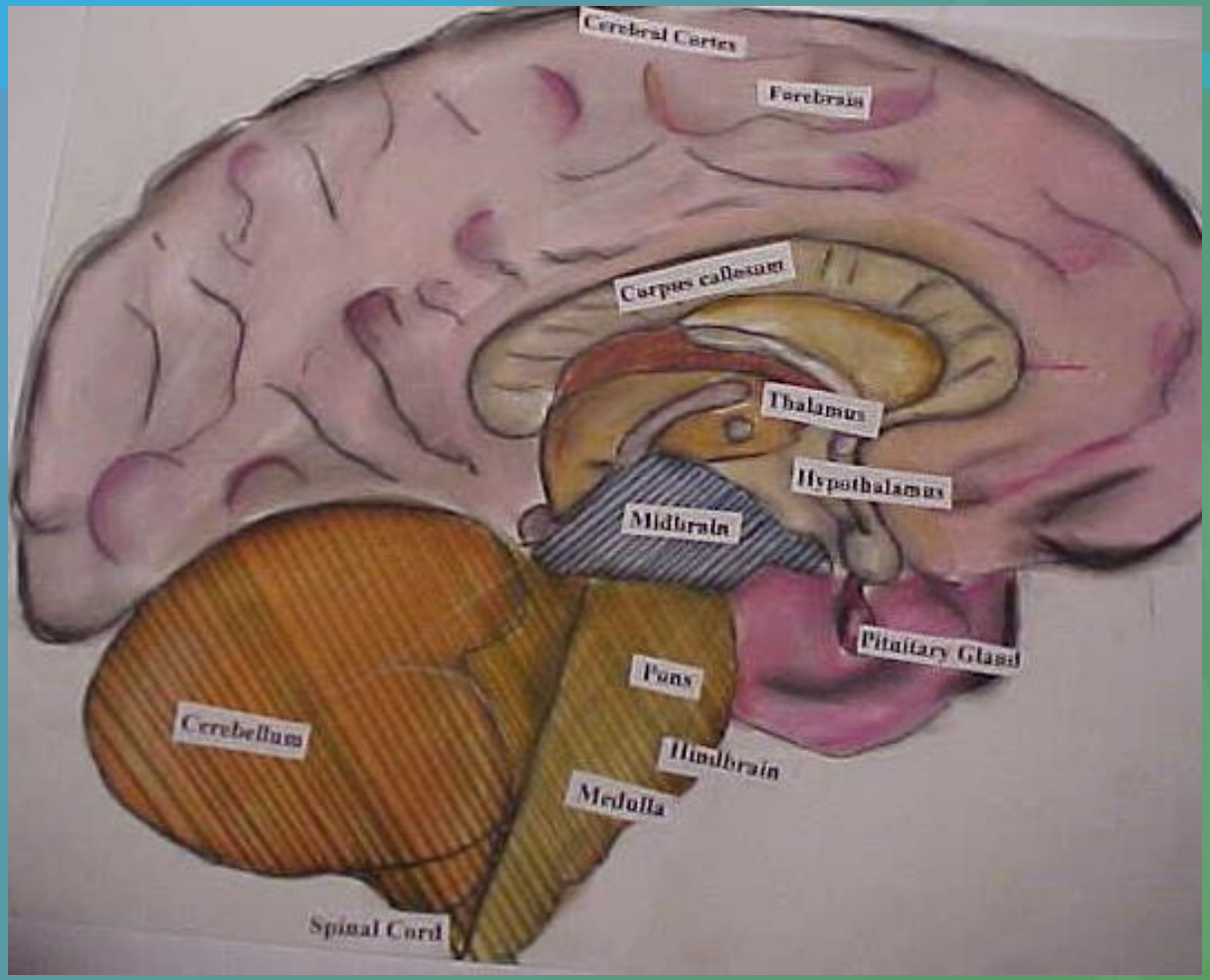
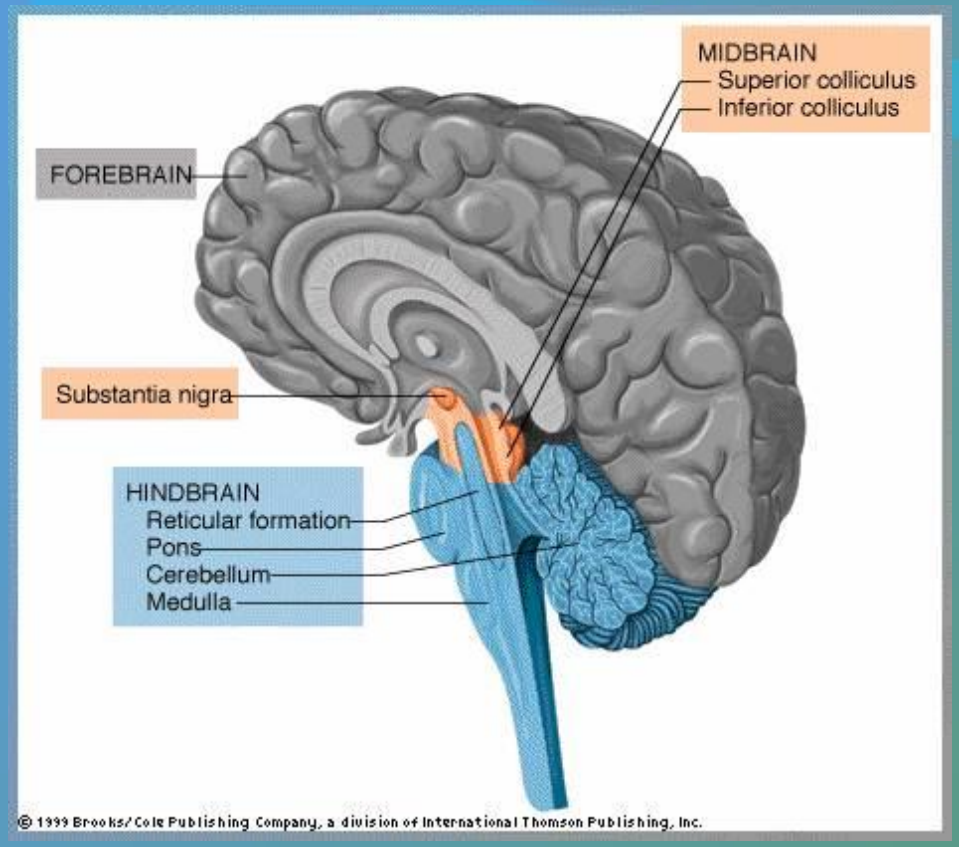
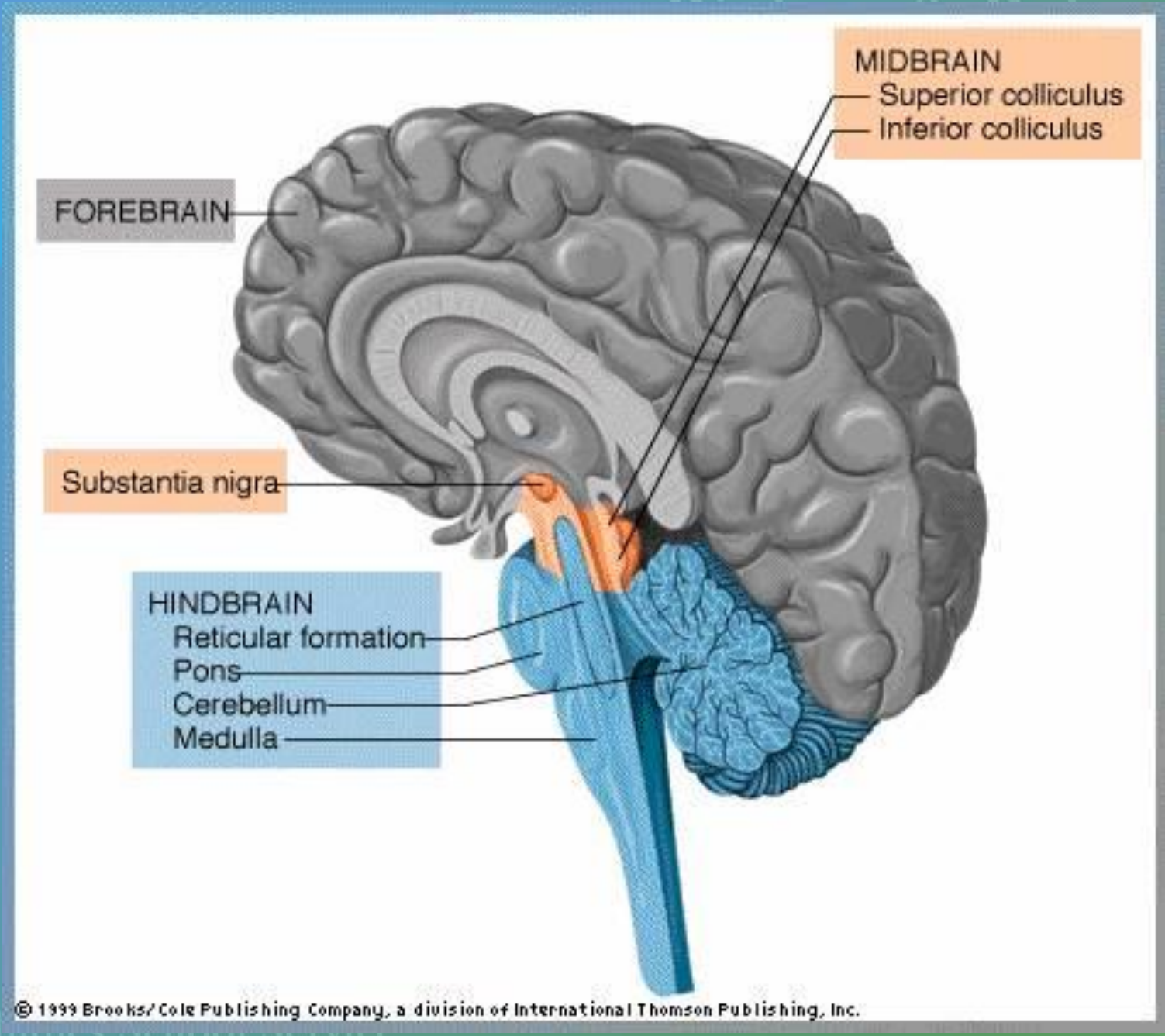
IV. The Divisions of the Brain



The Hindbrain



- Hindbrain, located at the rear base of the skull, controlling automatic functions
- Contains:
  - Cerebellum
    (balance & coordination)
  - Medulla
    (heartbeat, breathing…)
  - Pons
    (puts us to sleep & wakes us up)


MIDBRAIN
Superior colliculus
Inferior colliculus
FOREBRAIN
Substantia nigra
HINDBRAIN
Reticular formation
Pons
Cerebellum
Medulla
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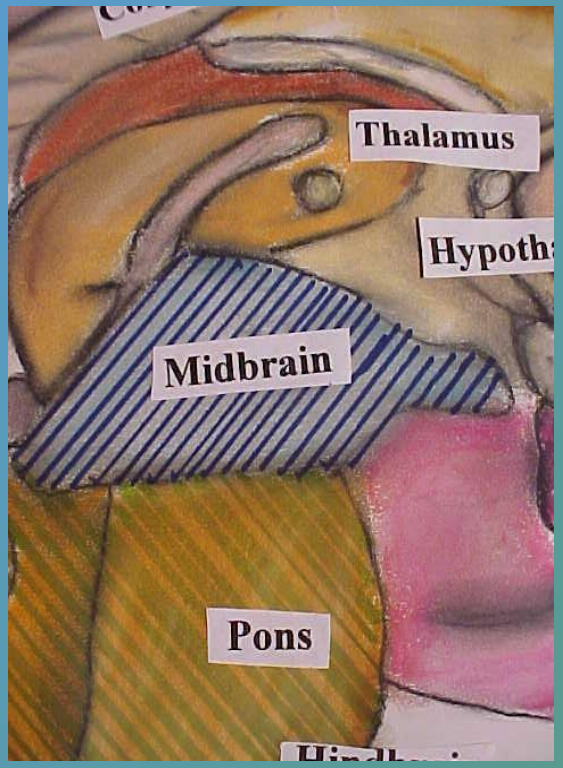
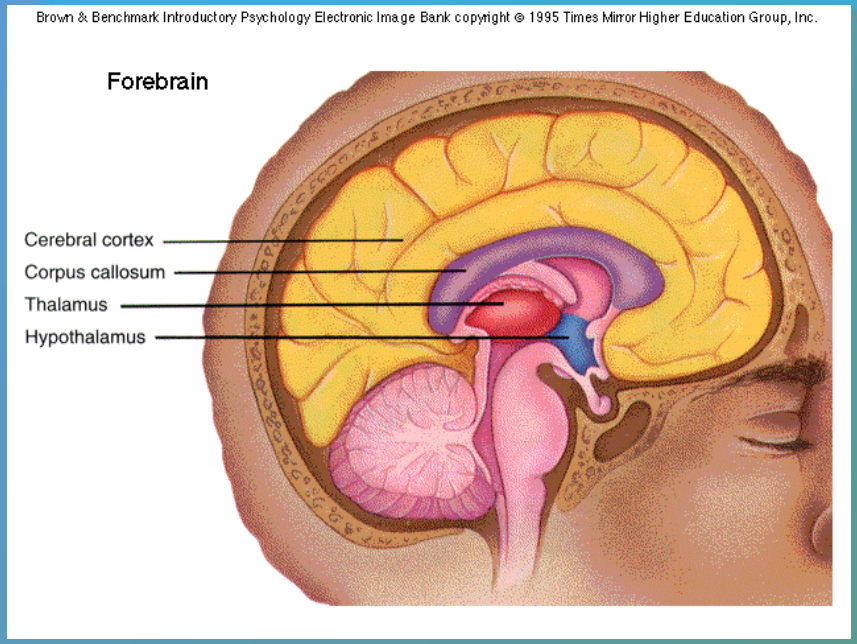
The Midbrain



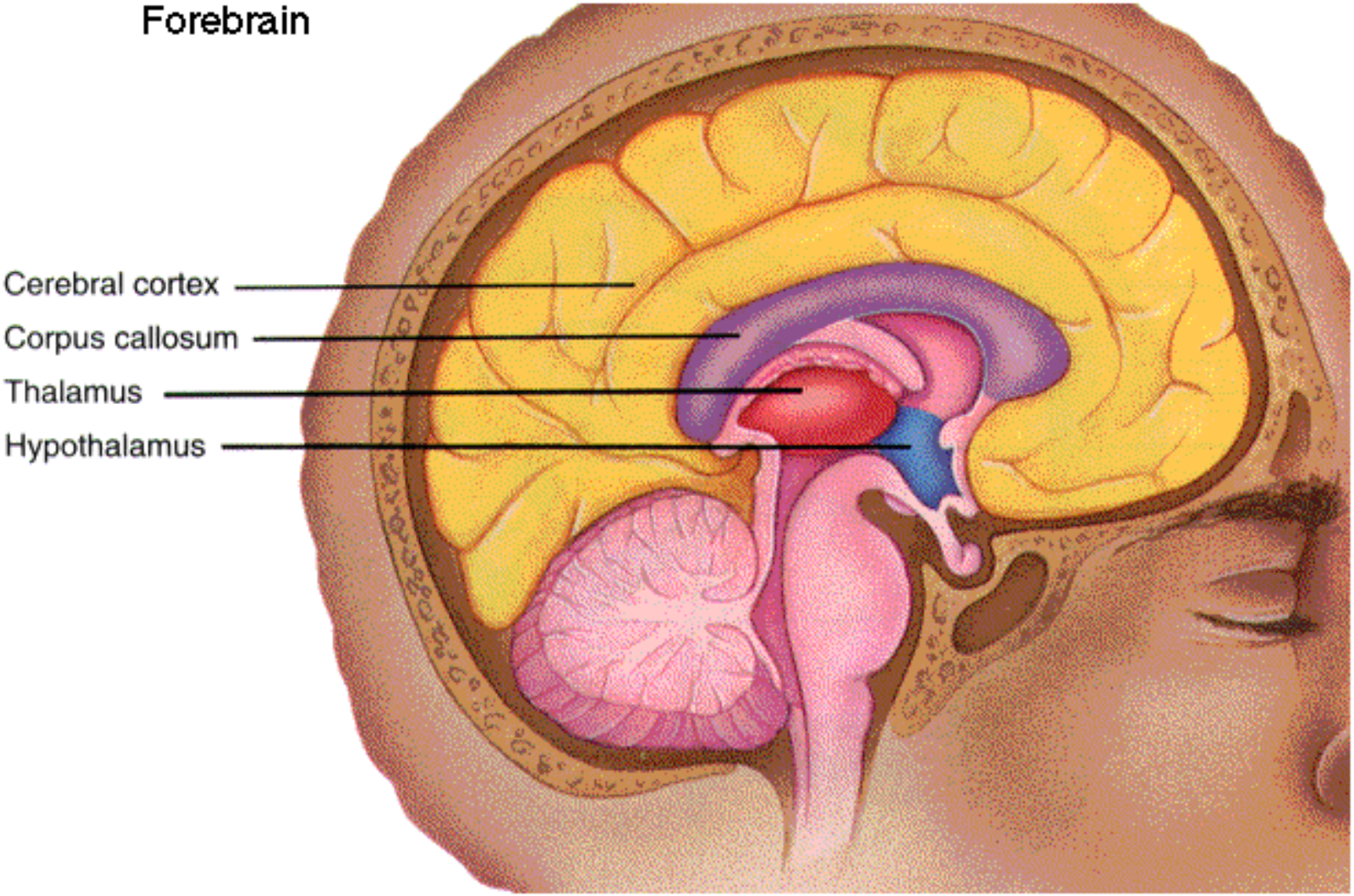
- Located just above the pons
- Function: relays sensory information
- Reticular activating system (RAS) spans hind and midbrain and helps alert brain to incoming signals

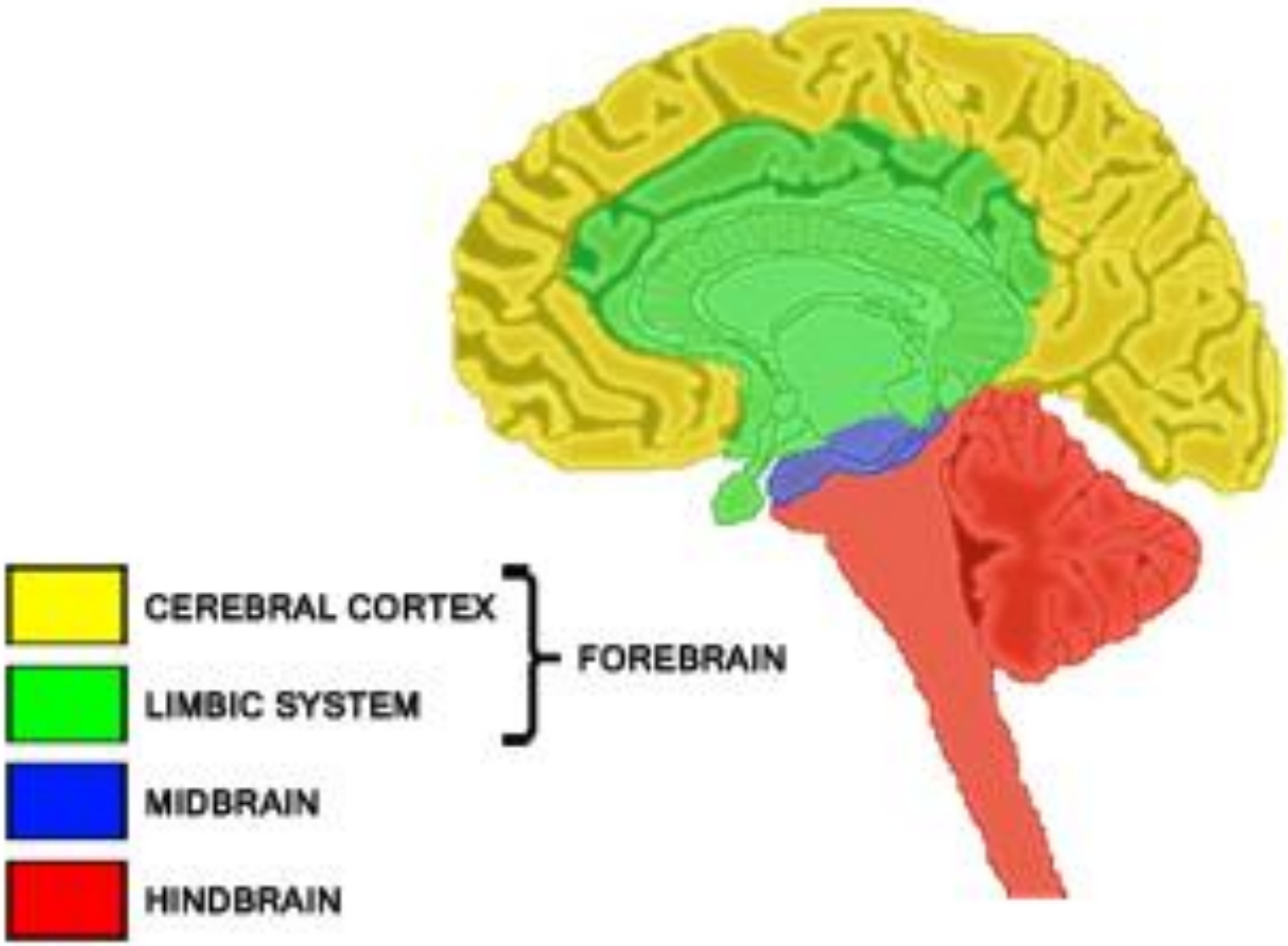
The Forebrain



- Thalamus (information relay for info from all senses except smell)
- Hypothalamus (motivation, emotion)
- (The thalamus & hypothal. can be counted as lower brain as well)
- Higher-thinking processes
  - Cerebrum (biggest part of brain)
  - Cerebral cortex (outer layer of cerebrum)

Forebrain





V. Higher-Thinking Processes

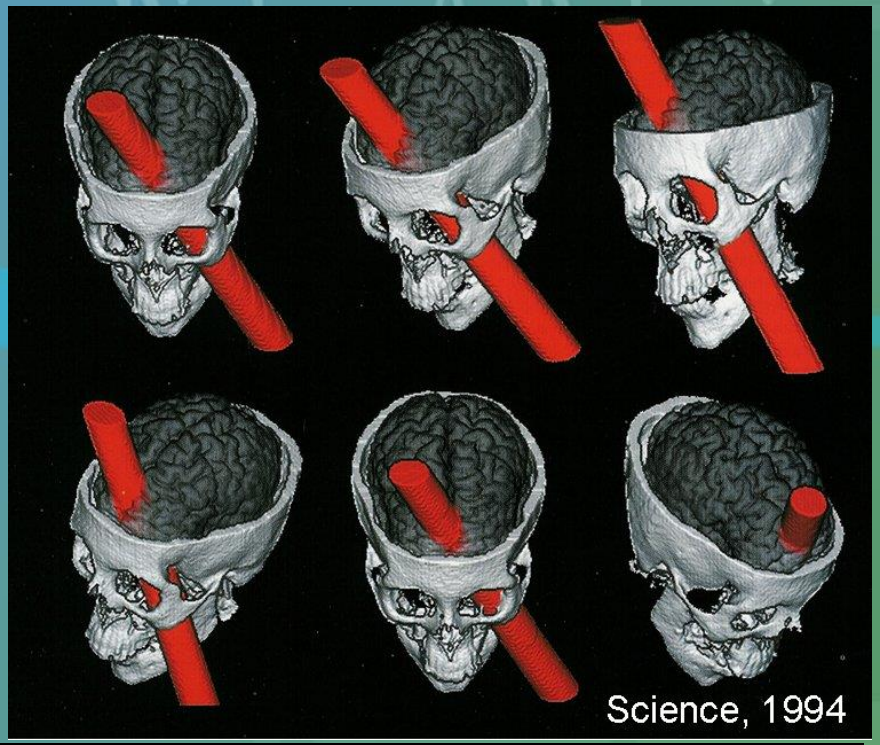
- Thoughts that require conscious effort
- Occur in cerebrum and cerebral cortex

Brain injuries

The Story of Phineas Gage

- Because the rod didn't pass through his hindbrain, he was fine, except for an altered personality*

- You can also be born without half of your brain and be relatively ok
- The younger, the better for brain injuries

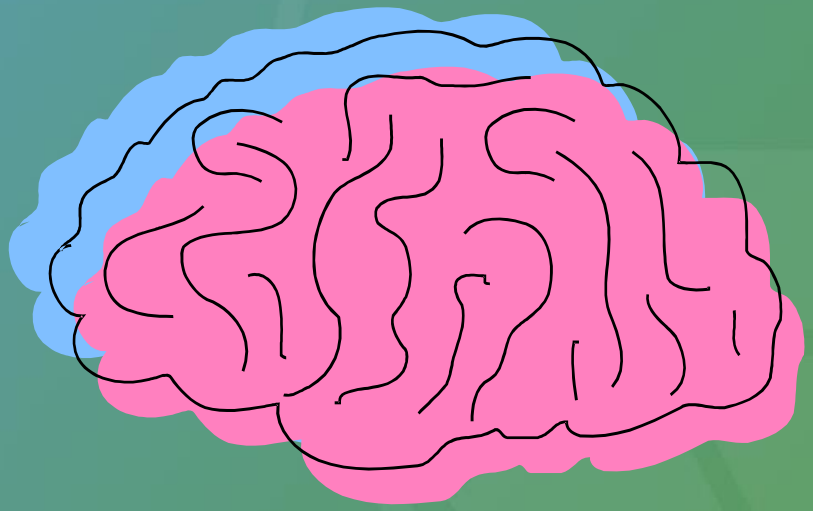


Other example

*He became a real jerkwad

Hemispheres of the Brain

- The cerebrum has two hemispheres
- They are connected by the corpus callosum, a small band of fibers in the center of the brain



Righthanded vs. Lefthanded

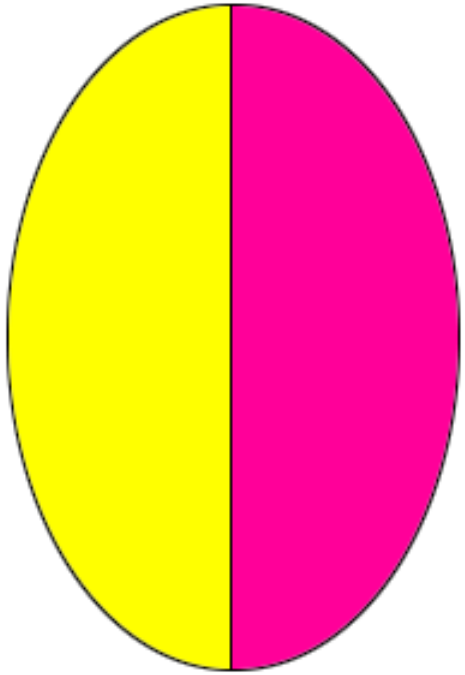
- Your left hemisphere controls the right half of your body, and vice versa
- 90% of people in the U.S. are righthanded
- Theories: environmental vs. genetic

Problems Associated With Being a Lefty

- Autism and dyslexia
- Schizophrenia
- Mental retardation
- Alcoholism
- Life expectancy
  - (Out of 5000 people, **age 10** – 15% are left-handed, **50** – 5%, **80** – <1%)

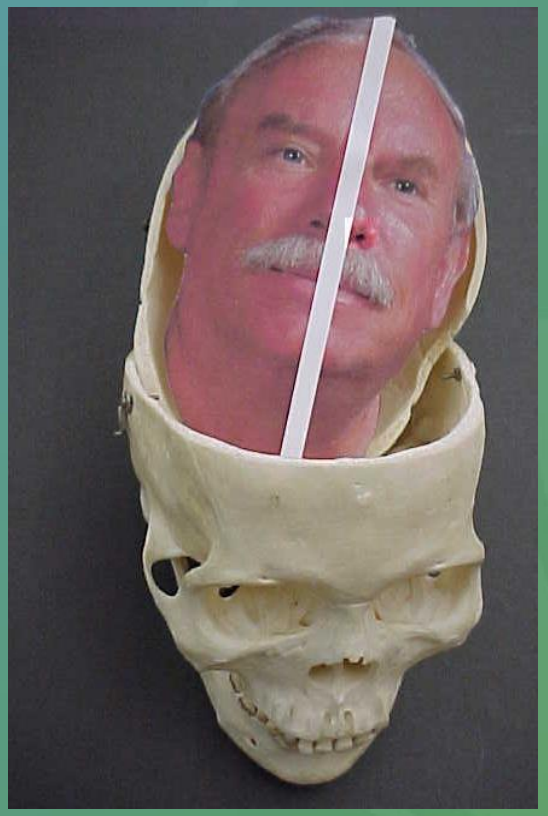
Two Hemispheres

left	right
verbal	nonverbal
mathematical	spatial
analytical	holistic
rational	emotional
logical	intuitive

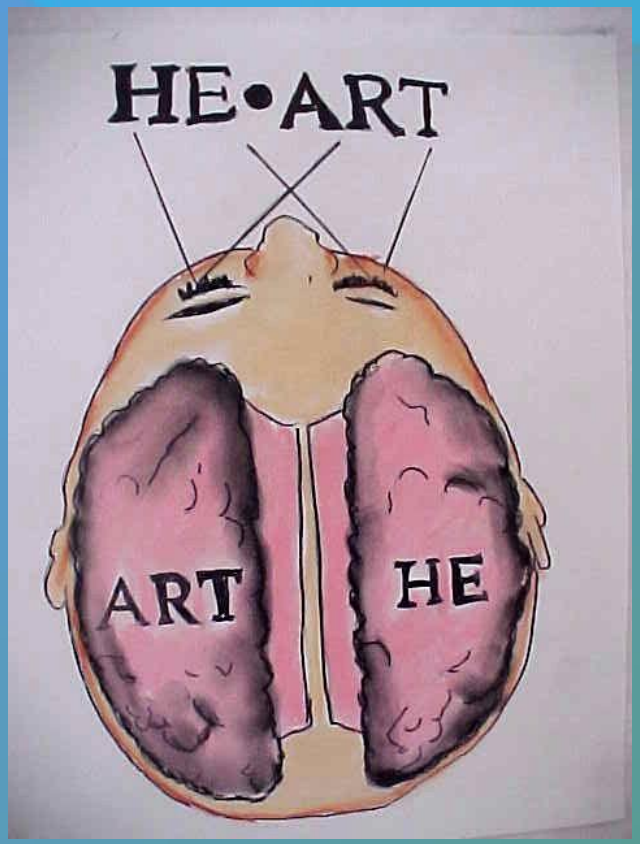


Split-Brain Surgery

- Pioneered by Roger Sperry
- Cut corpus callosum
- Used to correct epileptic seizures

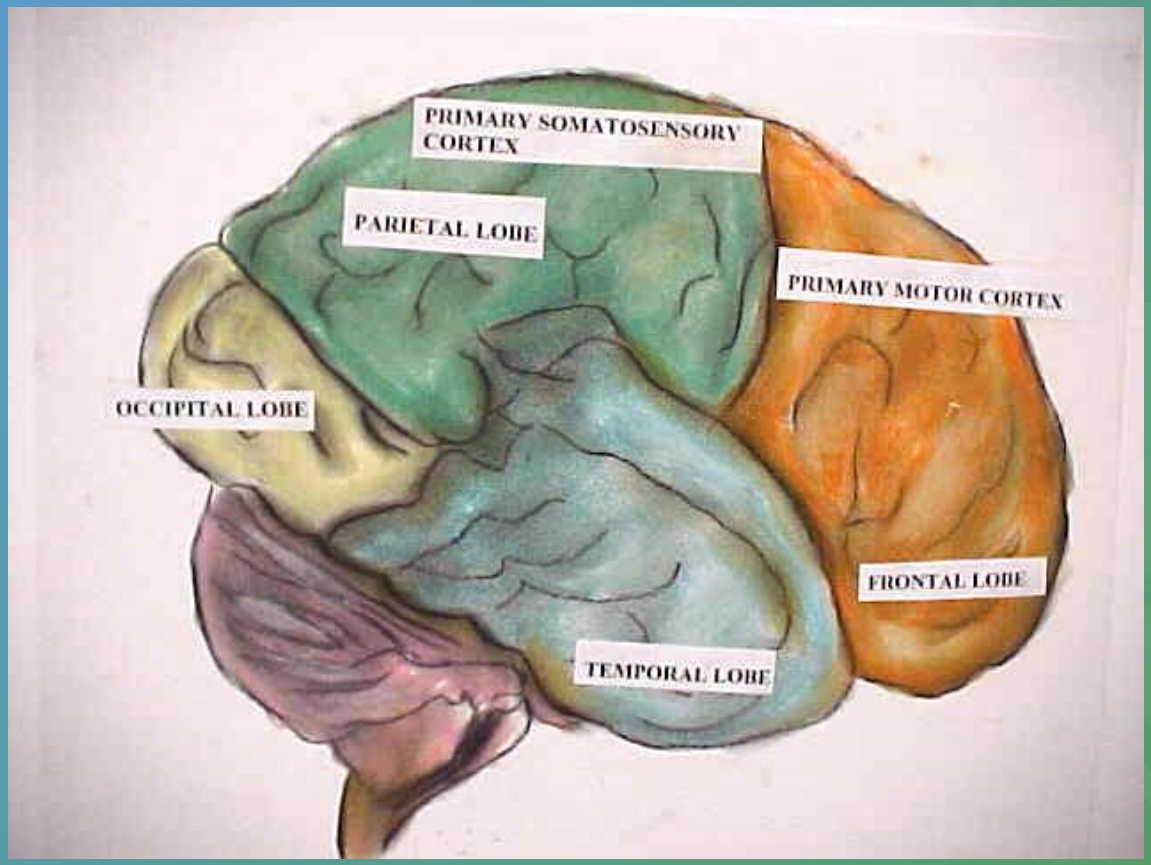


Side Effects



1. Someone with a split brain will SEE both images, but only be aware of seeing one – the one seen by the right eye, in the left hemisphere, because the left hemisphere deals with language.
2. However, if asked to point to which word was seen w/their left hand, they would point to "he" and be unsure why they were pointing at it
3. Split brain surgery video

Lobes of the Brain



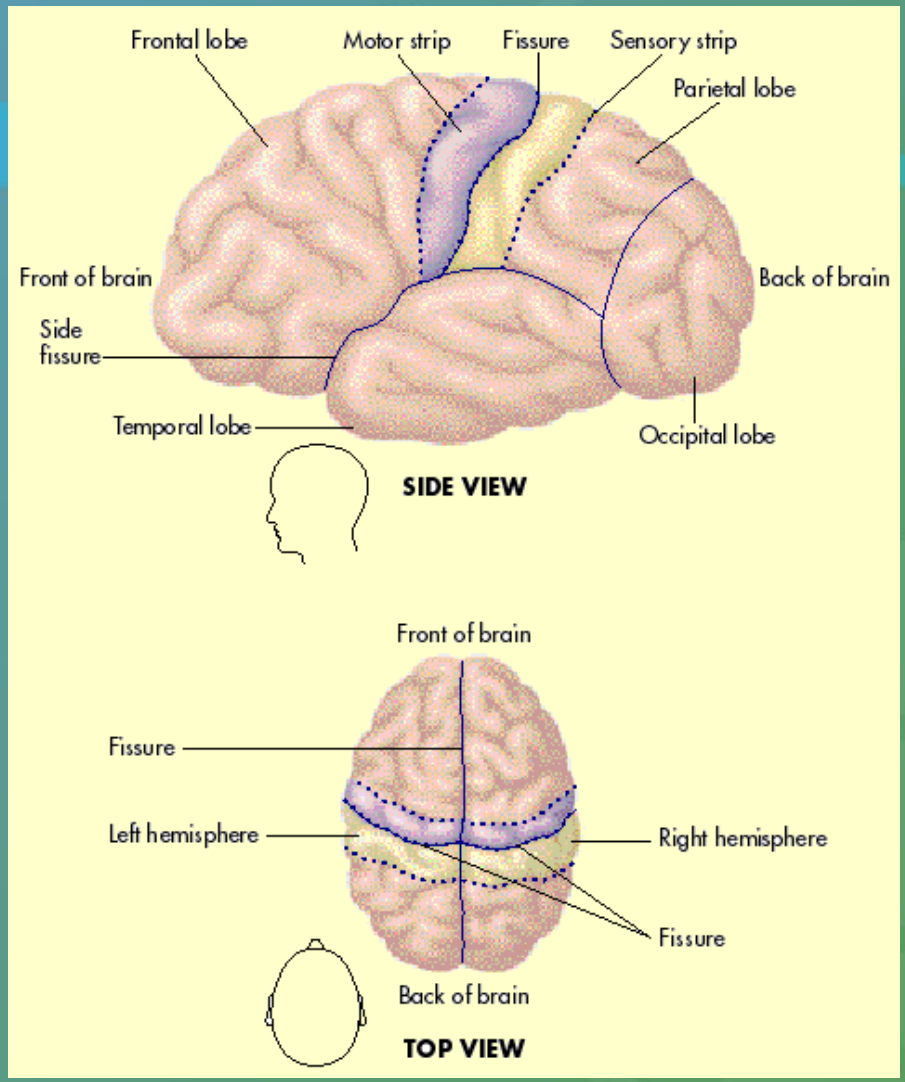
Lobes and their Functions

- Frontal: planning of movements, working memory
- Temporal: hearing, advanced visual processing, memory
- Occipital: vision
- Parietal: body sensations

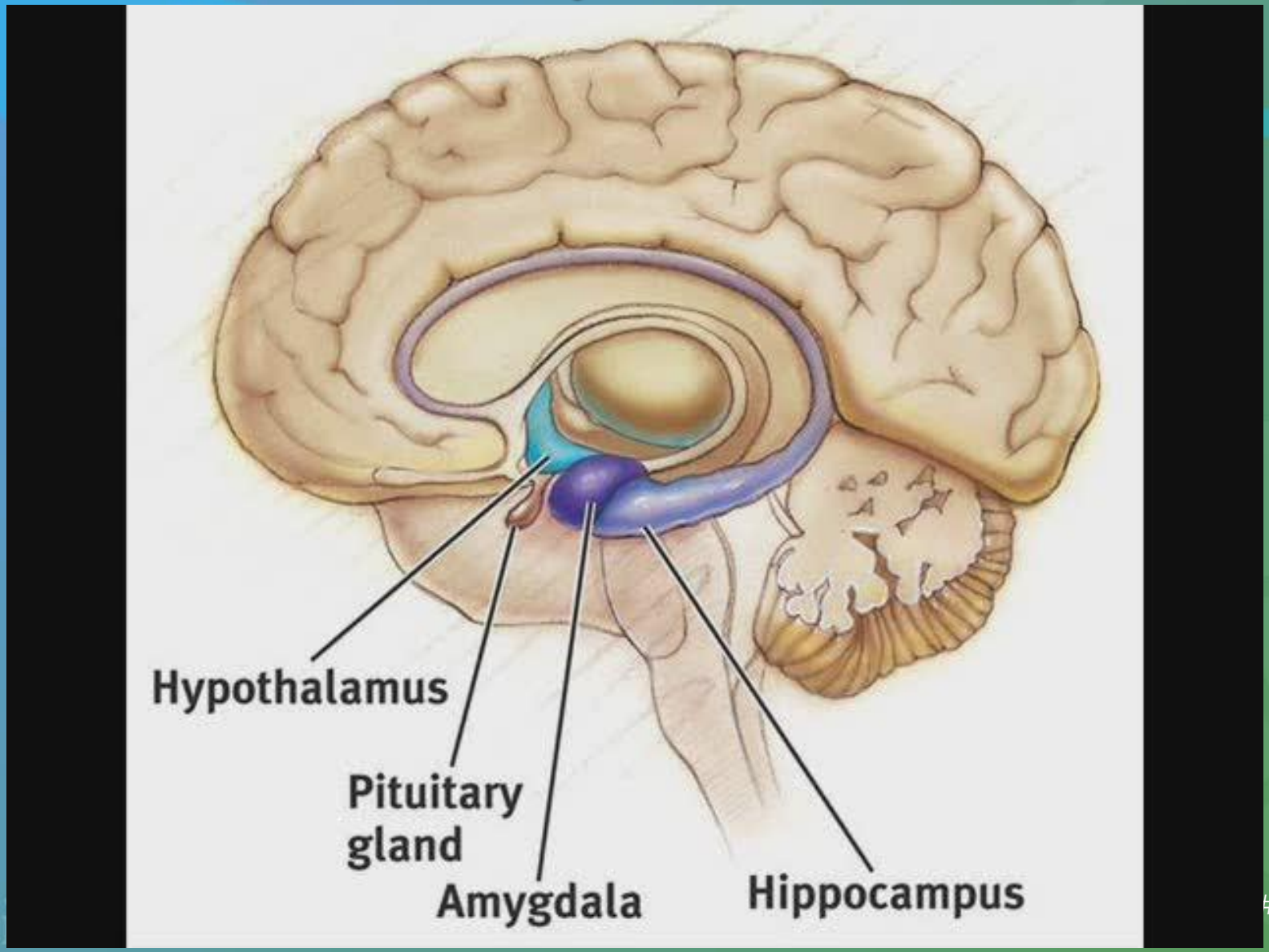
- Primary motor cortex: strip of frontal lobe that controls voluntary mvmnts.
- Sensory cortex: strip in parietal that registers & processes body sensations
  - If lose a finger or sight, that area branches out & makes others more sensitive
- Visual cortex: back of occipital lobe – can "see" things if stimulated w/electrode
- Auditory cortex: in temporal lobe – can "hear" sounds if stimulated w/electrode
- The rest of the brain? Integrates sensory info w/memories
  - Myth: we only use 10% of our brains

Cerebral Cortex

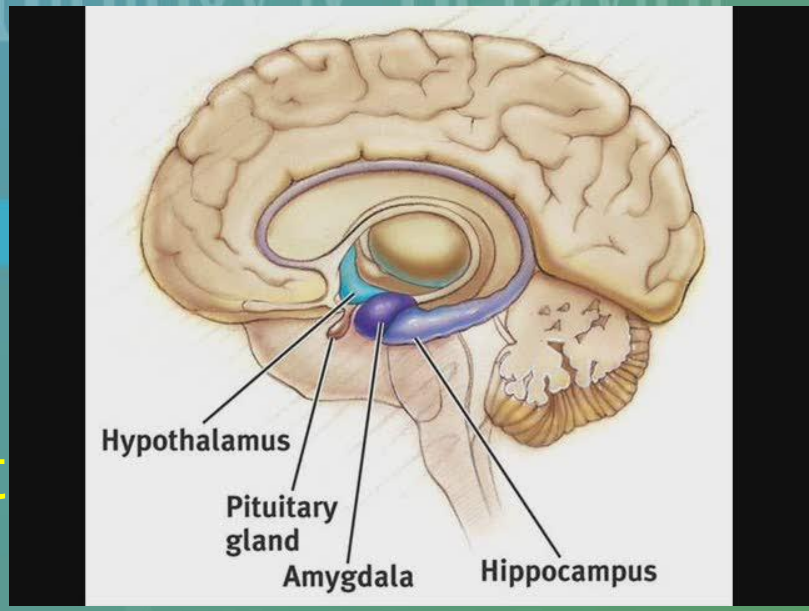
- The cerebral cortex is a thin surface layer on the cerebrum.
- allows for info-processing
- animals have a smaller & smoother c.c., so their behavior is less flexible or advanced



The Limbic System



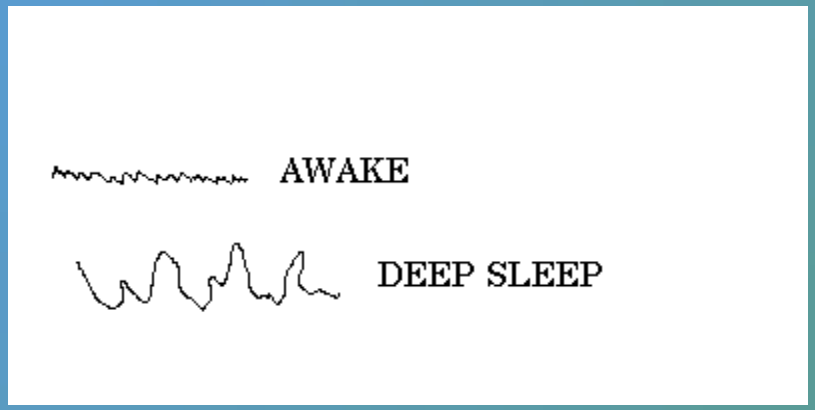
- Assoc. w/ motiv. & emot. like fear, aggression, hunger, sex
- Found in the core of the forebrain
  - It has a number of different parts:
    - Hypothalamus – controls pituitary gland, directs eating, drinking, body temp., sex
    - Amygdala – related to emotion
    - Hippocampus – *creates* memories



III. Brain Imaging Techniques

- EEG (electro-encephalograph)
- CT (computerized tomography) scans
- PET (positron emission tomography) scans
- MRI (magnetic resonance imaging) scans

A. Electrical Recordings – the EEG



- Electro-encephalograph (EEG)
- Brainwave patterns

B. The CT Scan (CAT scan)

- Computerized tomography (CT) scan: a computer-enhanced x-ray of brain structure
- Can show cross-sections & 3-D image of body
- CT/CAT least expensive procedure
- Can diagnose cancer, hemorrhages…
- Risks: low cancer risk

Images of a CT Scan

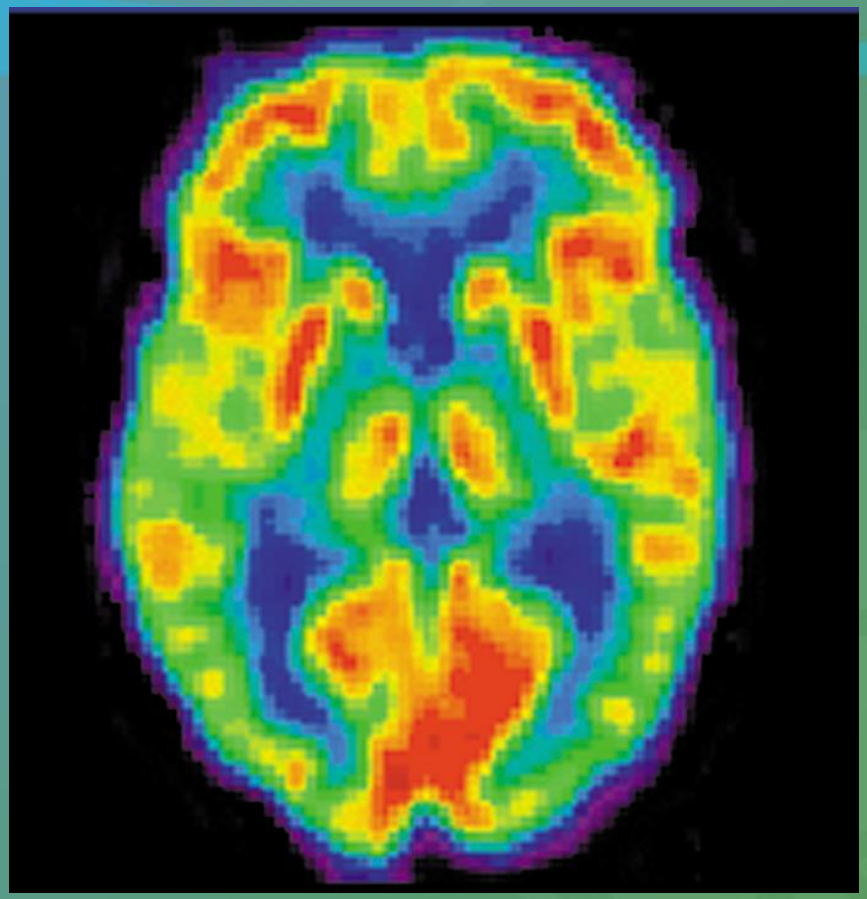
Cat scan?

CAT SCAN?

CAT SCAN.

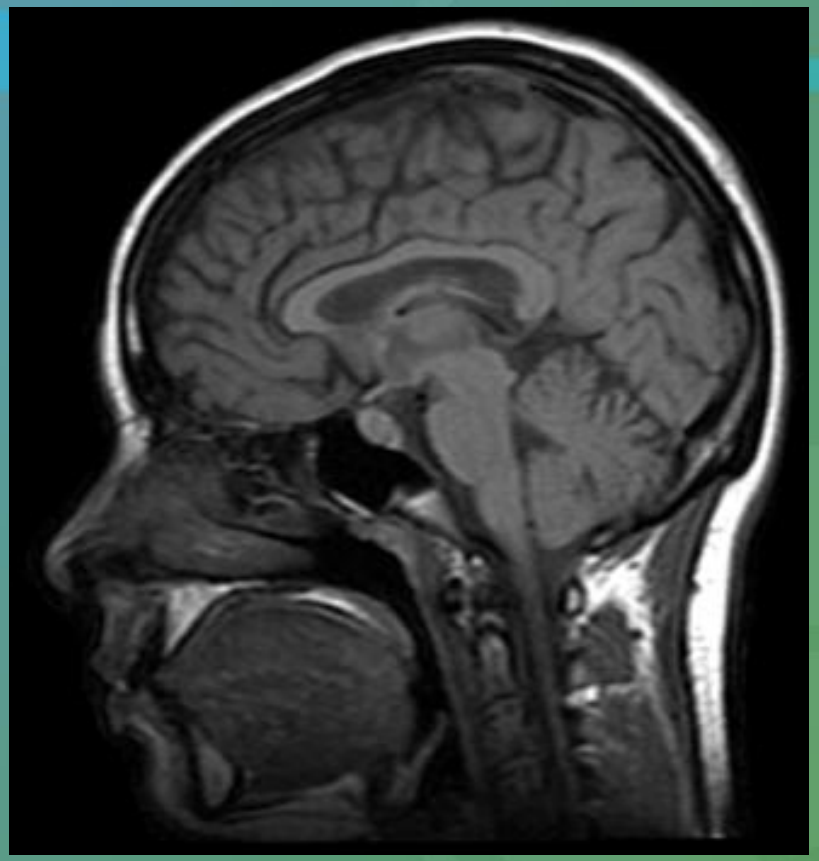
C. PET Scans

- Positron emission tomography (PET) scan
- Radioactive chemicals are used as markers
- Provides a color-coded map of the brain



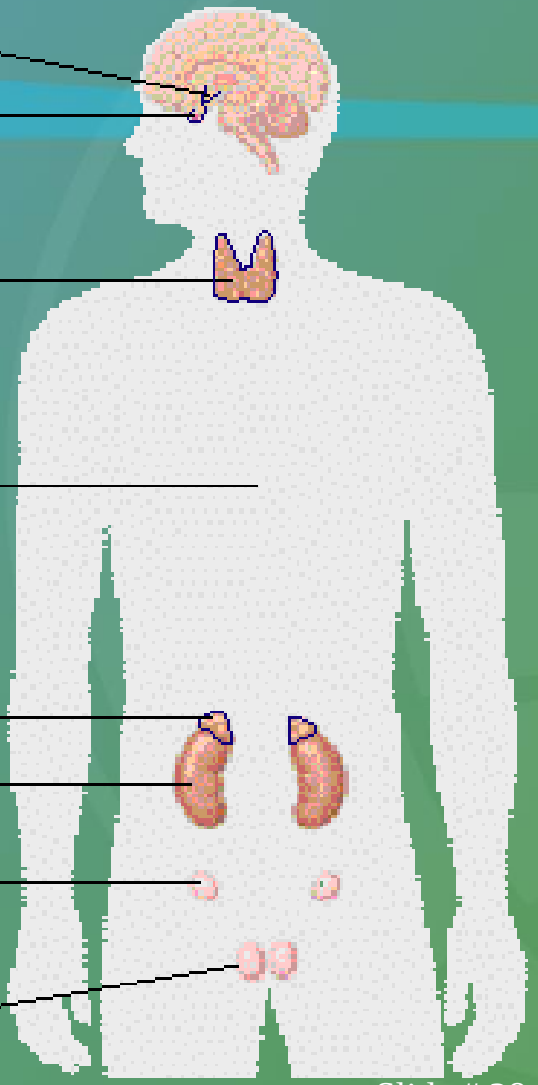
D. MRI Scans

- Magnetic resonance imaging (MRI) scan uses magnetic fields, radio waves, and computerized enhancement
- Aligns brain atoms (magnet), interrupts them (radio wave), detects changes
- Much more detailed than a CT scan



VI. The Endocrine System

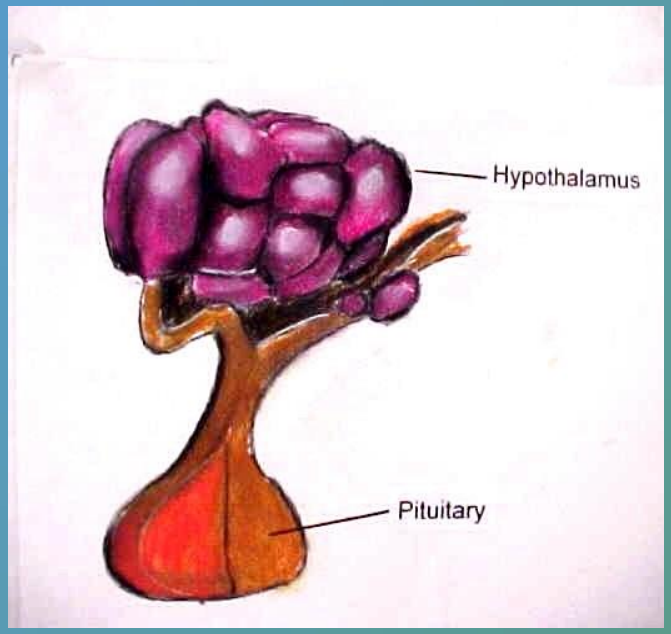
- Pituitary gland
- Thyroid
- Creepy hermaphroditic person
- Adrenal gland
- Female gonads (ovaries)
- Male gonads (testes)



How does it work?

- Brain (hypothalamus) → pituitary gland → other glands → hormones → brain
- Hormones are secreted into blood
- Much slower acting than neurotrans., but longer lasting
- Control body's physical and sexual arousal, growth, energy

The Pituitary Gland



- Controlled by and located under hypothalamus
- Master gland – does many things, including regulating other glands
- Mostly deals with growth rates

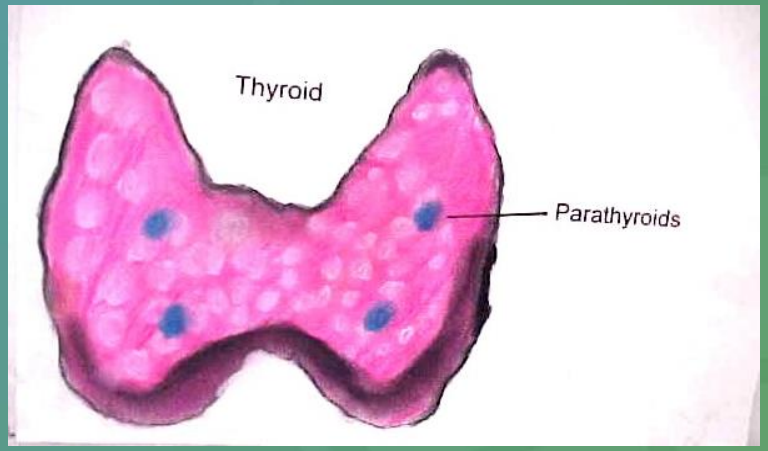
Pituitary under/overactivity

- Somatotrophic hormones ("trophic" = nutrition"
  - Little people (proportional)
  - Dwarf (disproportionate arms & legs)
  - Giant (called acromegaly)

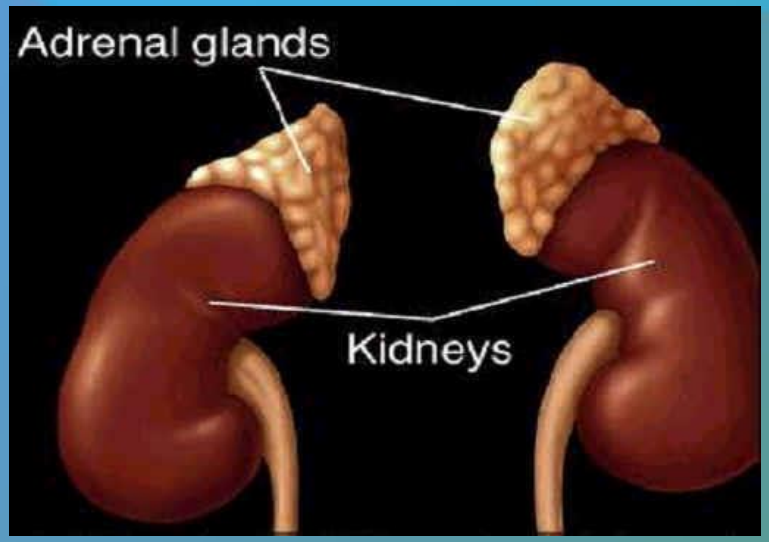
Andre the Giant - 7'4", 520 lbs., 100% playa

The Thyroid Gland

- Largest gland
- Located by trachea and larynx
- Regulates metabolism (your energy level and usage)
- Under/overactivity?



The Adrenal Gland



- Located on top of each kidney
- Secrete adrenaline (epinephrine) into bloodstream
- Fight/flight response
- Also secrete hormones related to salt balance, and use of fat, carbs, & proteins
- Overactivity: high blood pressure & sugar, obesity, weakness, excessive body hair, sexual dysfunction
- Underactivity: high sodium & potassium, low sugar, decreased immune sys. & healing abilities