

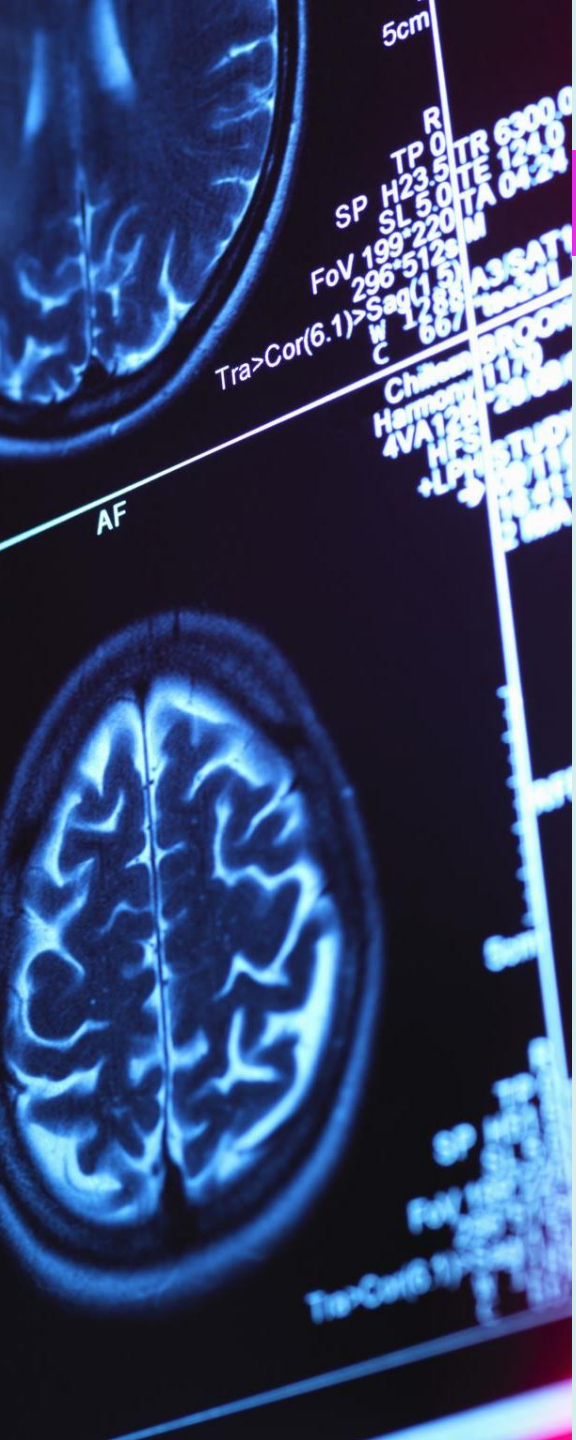


Week 2: The Biological Approach in Psychology

What is the Biological Approach?

- ✖ The Biological Approach combines Psychology and Biology to provide physiological explanations for human behaviour.
- ✖ Biological psychology tries to explain how we think, feel and behave in terms of physical factors within the body.





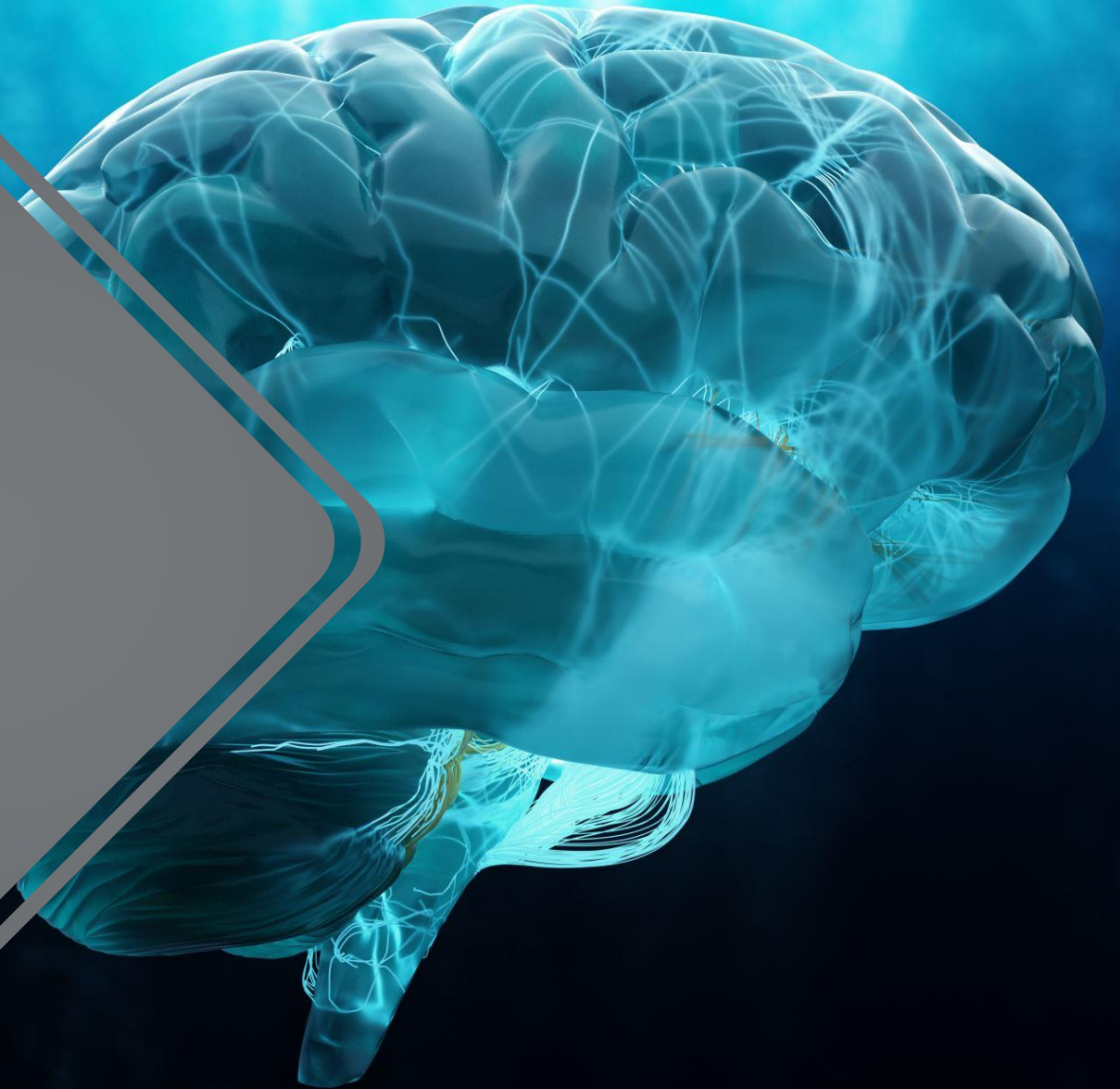
The Biological Approach

- Psychology should be seen as a science, to be studied in a scientific manner (usually in a laboratory).
- Behaviour can be largely explained in terms of biology (e.g. genes/hormones).
- Additionally, behaviour can arise from the structure and functions of the brain.
- Left or right brained
- Brain damage, head injuries and impairments can lead to changes in behaviour.
- Charles Whitman
- Human genes have evolved over millions of years to adapt behaviour to the environment. Therefore, most behaviour will have an adaptive / evolutionary purpose.

3 Assumptions of the Biological Approach

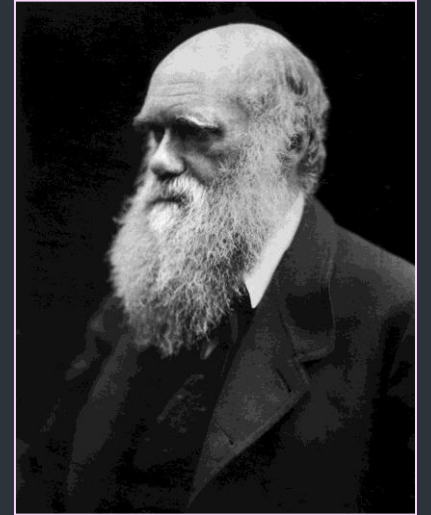
1. *Evolutionary influences*
2. *Localization of Brain function*
3. *Neurotransmitters and hormones*

► These three things all have an effect on our personality and our psychology



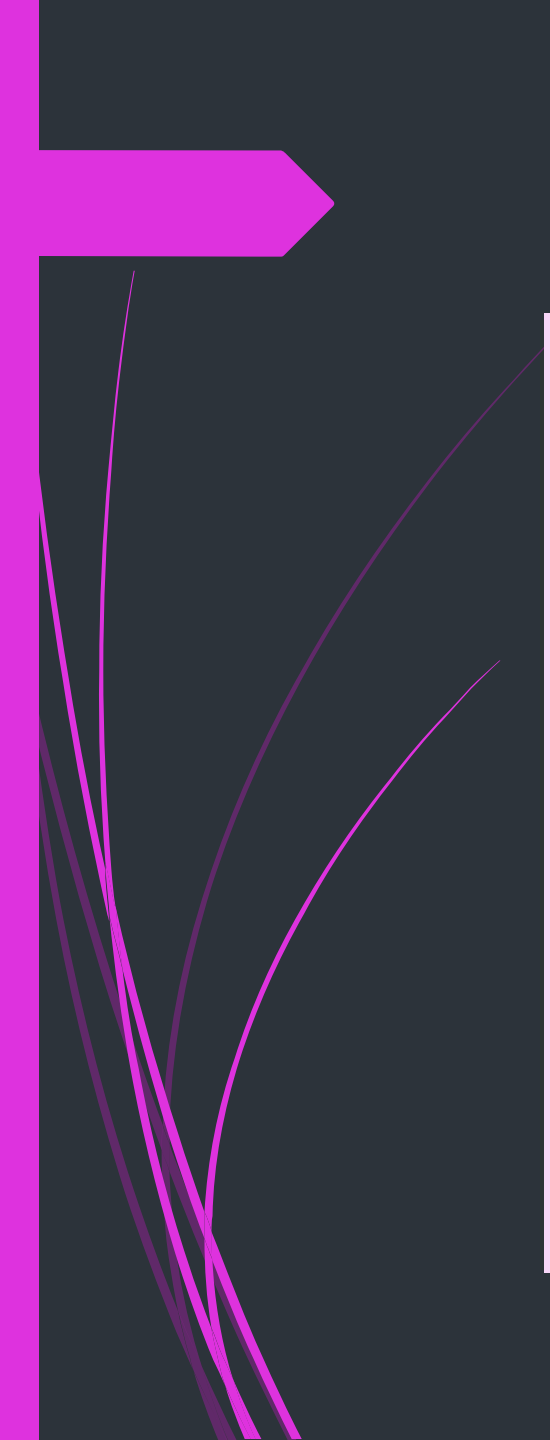
Assumption 1: Evolutionary Influences

- *What do you know about Evolution?*
 - *Have you come across it before?*
 - *Do you think human behaviour has evolved?*
 - *How would we know?*
-
- Evolution is the change of a species over time and is associated with the writings of Charles Darwin



Assumption 1: Evolutionary Influences

- Darwin's theory of **Natural Selection** is based on three main assumptions.
 - Only a small proportion of each generation survives to reproduce.
 - Offspring are not identical to their parents, and so each generation has a degree of variation, and that at least some of this variation is heritable (can be passed on through genes).
 - Some characteristics give the animal an advantage over others in the ability to survive and reproduce.



Assumption 1: Evolutionary Influences

Characteristics which give the animal a greater chance of survival and reproduction are **adaptive**.

- This is natural selection. If a characteristic has survived and been passed down through the generations, it must have been adaptive and have given the animal a survival advantage.

Assumption 1: Evolutionary Influences



- ▶ How could evolution explain a possible biological predisposition to fear snakes and spiders?

Assumption 1: Evolutionary Influences

- In practically every culture in the world, men prefer young rather than old women, women with wide hips and narrow waists, and women with full lips and large eyes.
- What could be the evolutionary explanation for this?

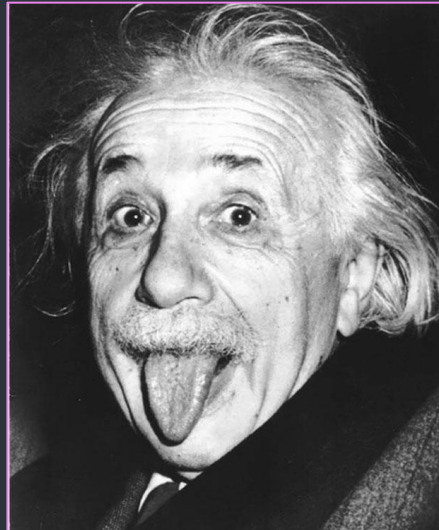


Assumption 1: Evolutionary Influences

- ▶ Can you think of any other human behaviours that we could argue are “adaptive”



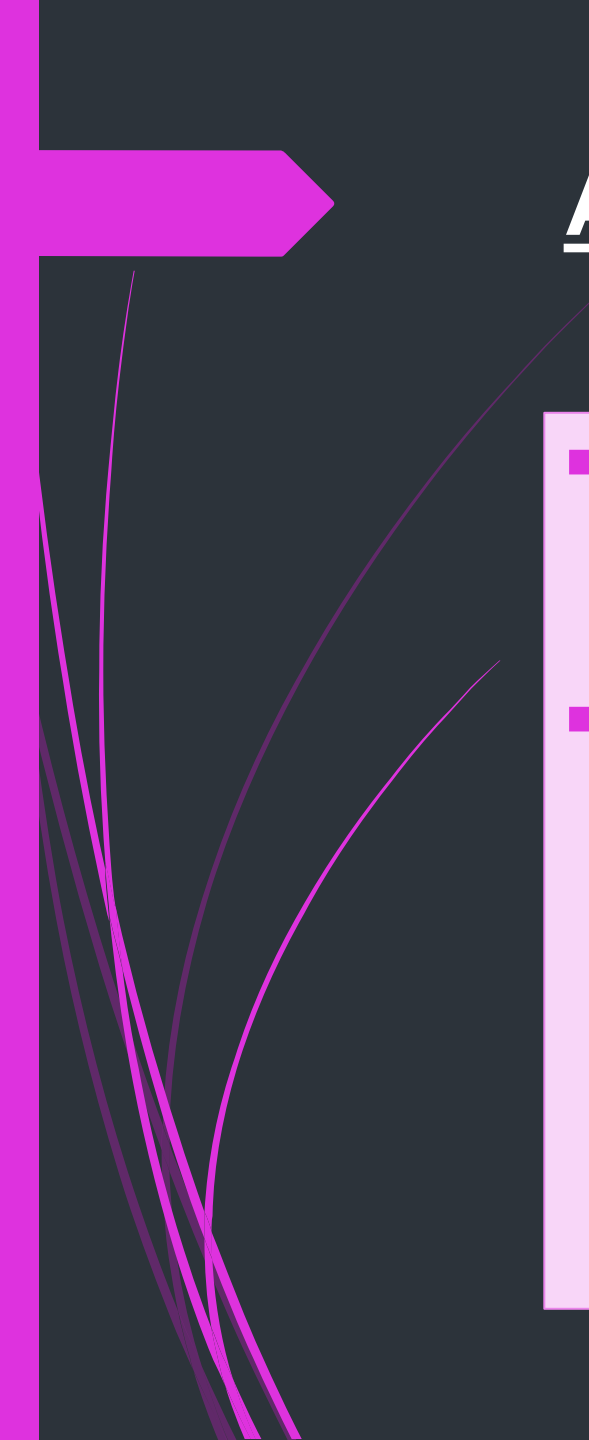
Aggression?



Intelligence?



Love?



Assumption 1: Evolutionary Influences

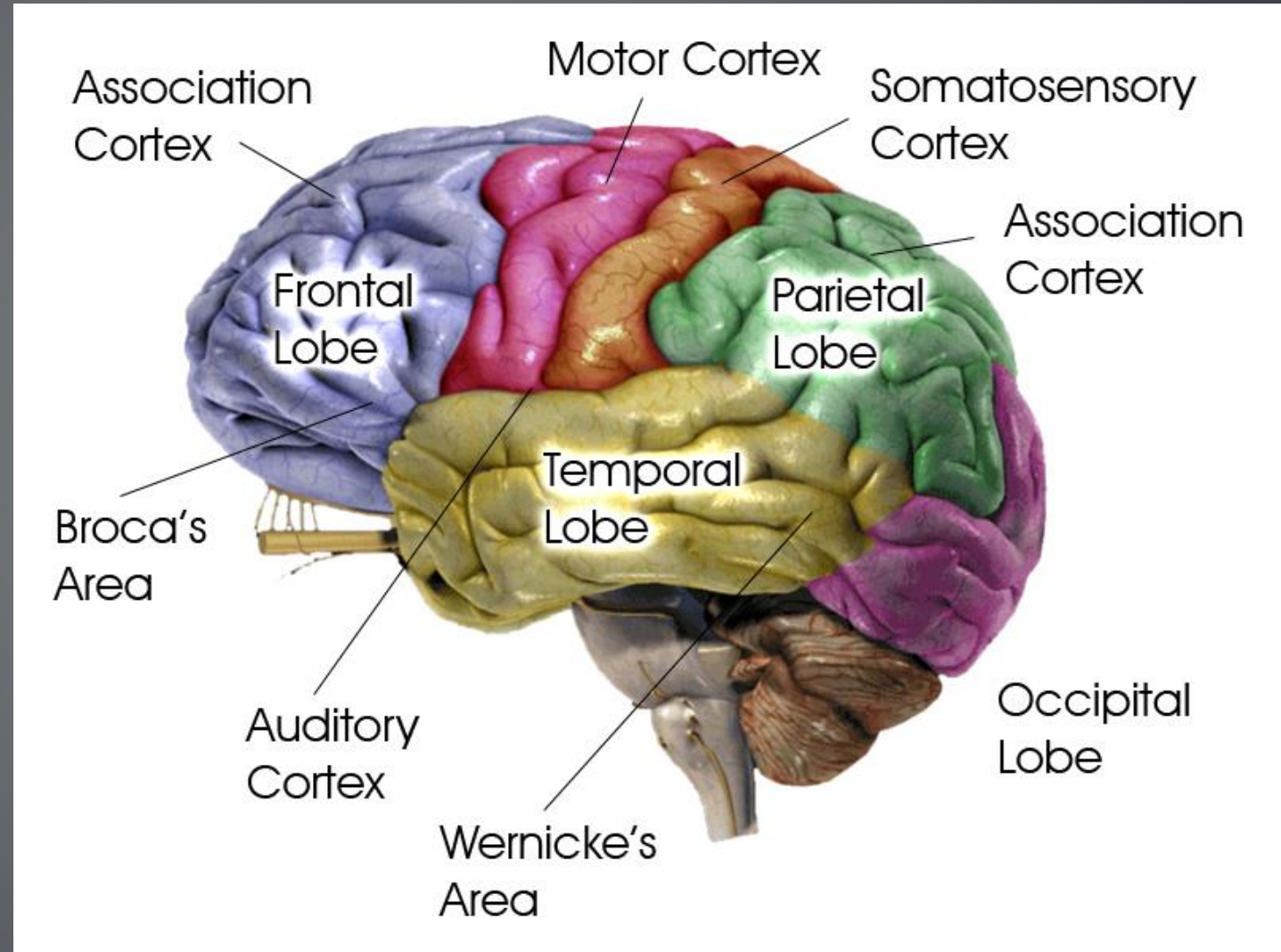
- To understand the functions of the brain, we must understand the environment in which the brain evolved.
- **Environment of evolutionary adaptation (EEA).**
 - Humans began evolving around 2 million years to around 100,000 years ago.
 - Evolutionary psychologists argue that humans are adapted to the environment that our ancestors would have faced.

Assumption 2: Localisation of Brain Function

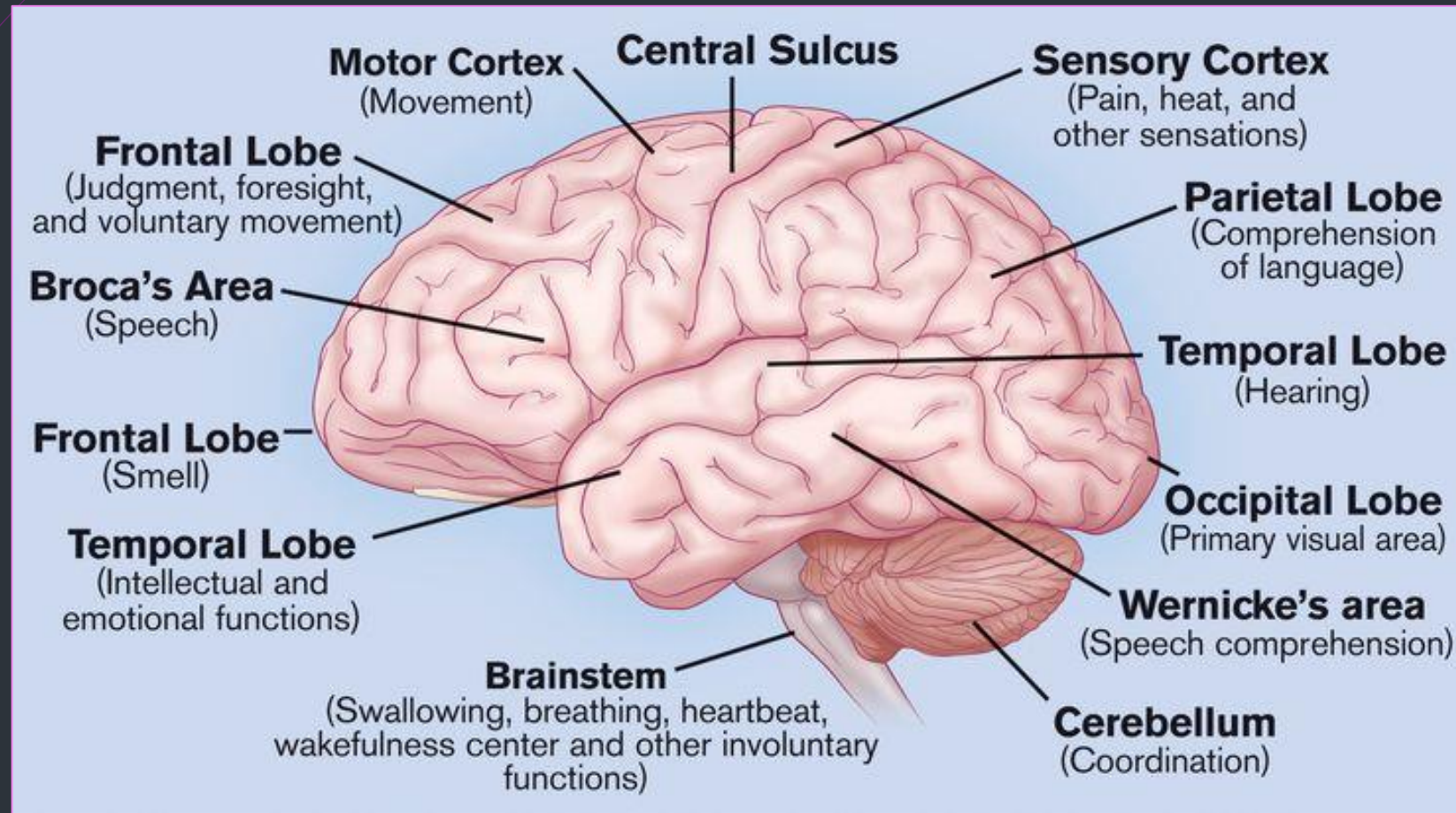
- ▶ The two halves of the brain are called hemispheres.
- ▶ The brain is divided into four lobes.
- ▶ The corpus callosum connects the two hemispheres together.
- ▶ Assigning areas of the brain to specific functions is referred to as localisation of function.
- ▶ There are roughly 86 billion neurons in the brain and spinal cord.
- ▶ There are approximately 10 trillion synapses.



Assumption 2: Localisation of Brain Function

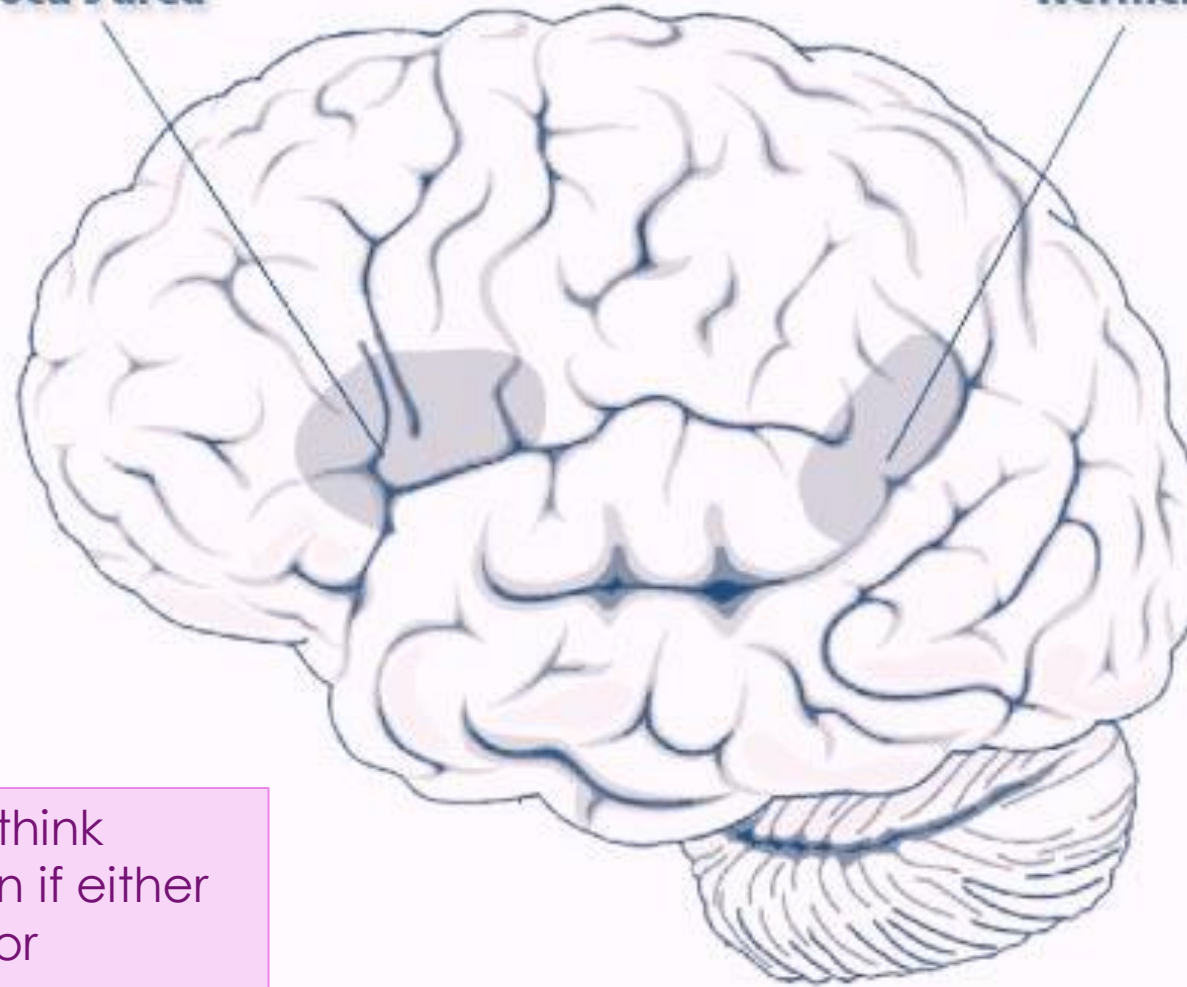


Assumption 2: Localisation of Brain Function



Broca's area

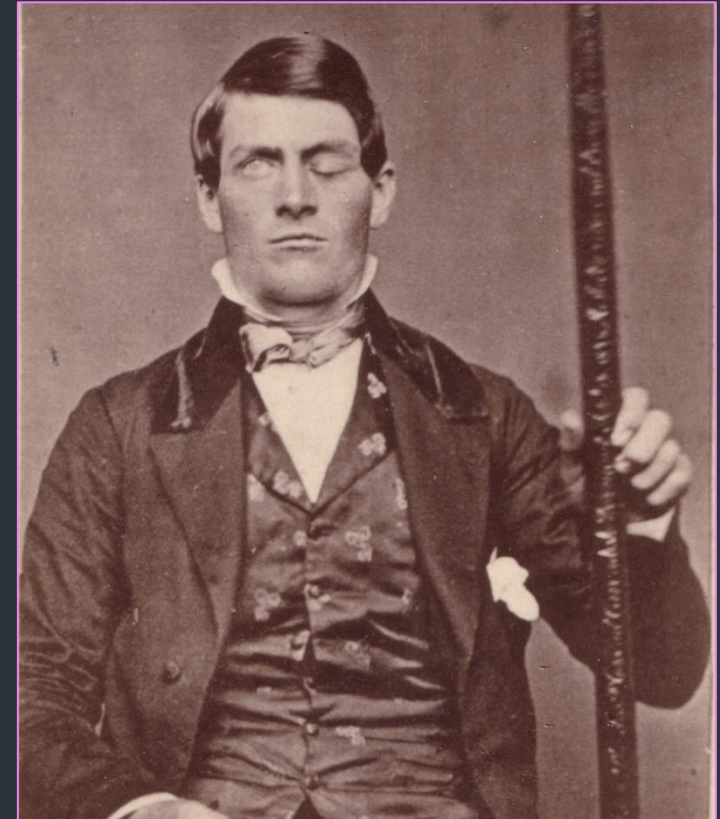
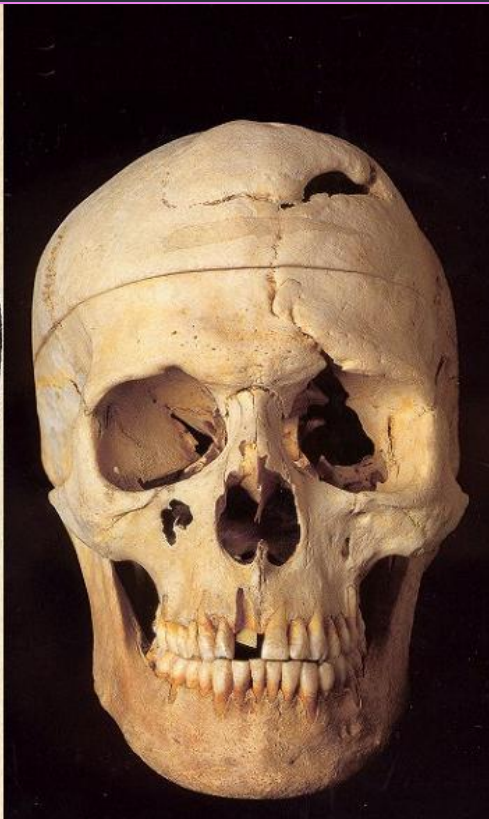
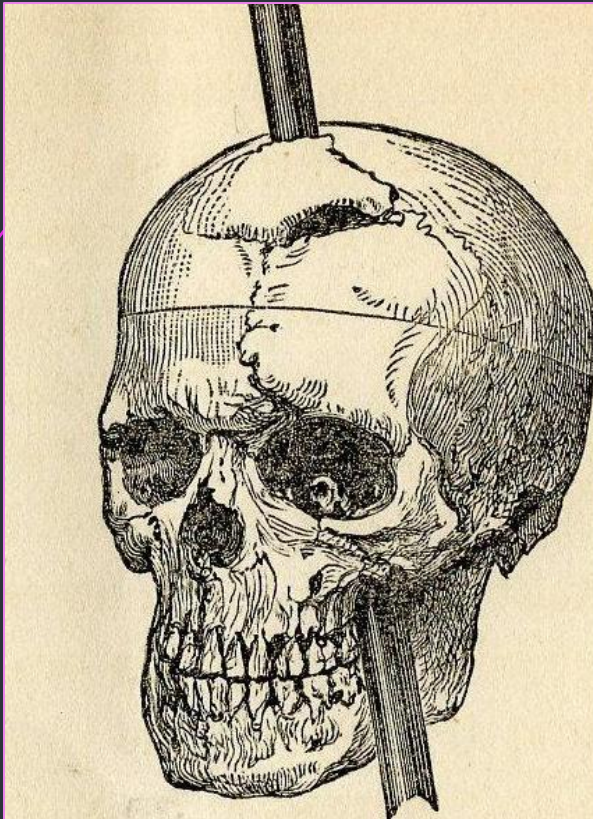
Wernicke's area



What do you think would happen if either Broca's area or Wernicke's area were damaged?

Assumption 2: Localisation of Brain Function

- ▶ The case of Phineas Gage. What happened to him?
- ▶ How does this link to brain localisation?

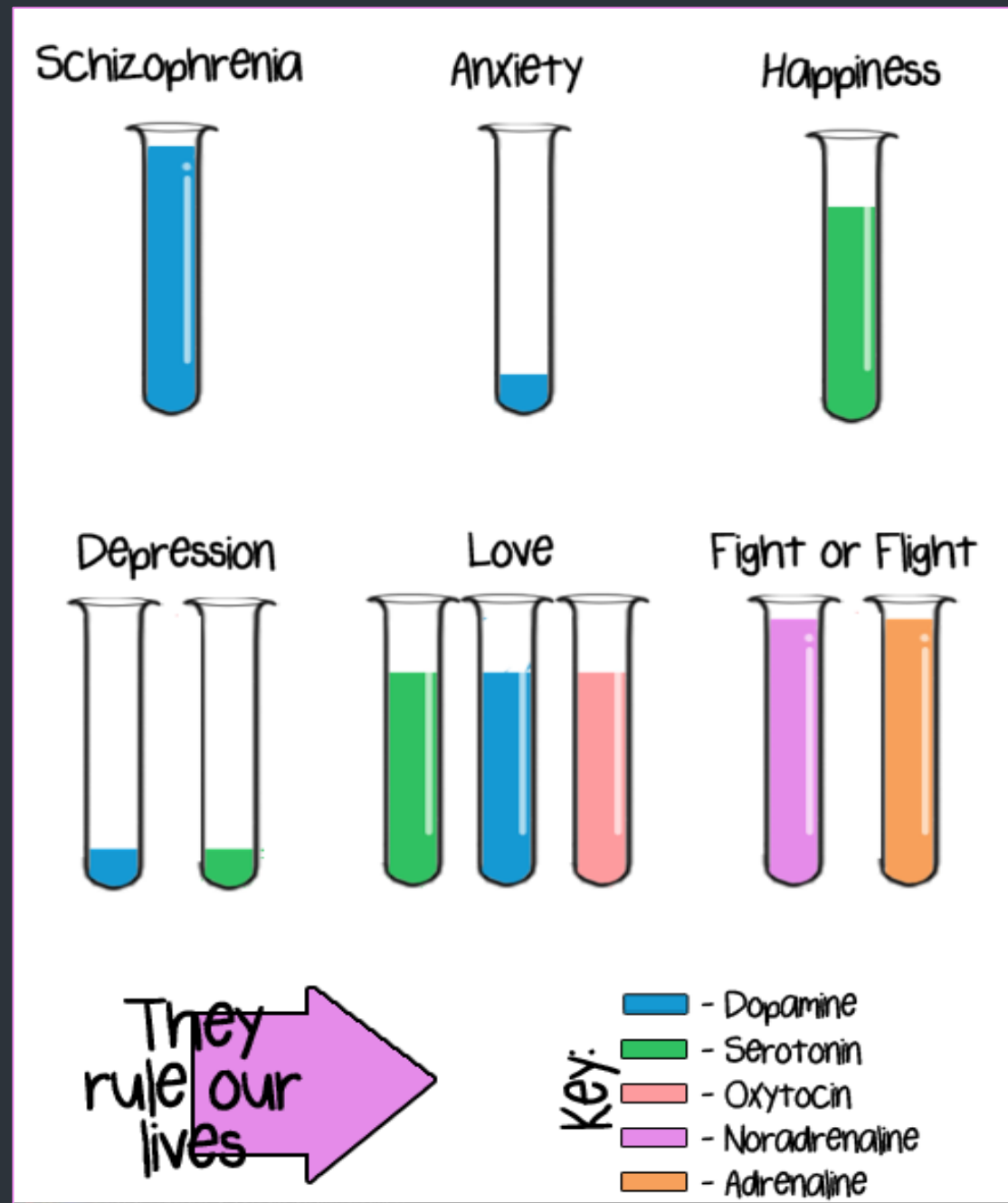


Assumption 3: Neurotransmitters and Hormones

- ▶ Neurons are the cells which are found in the brain and nervous system
- ▶ They work by sending chemical and electrical messages to each other

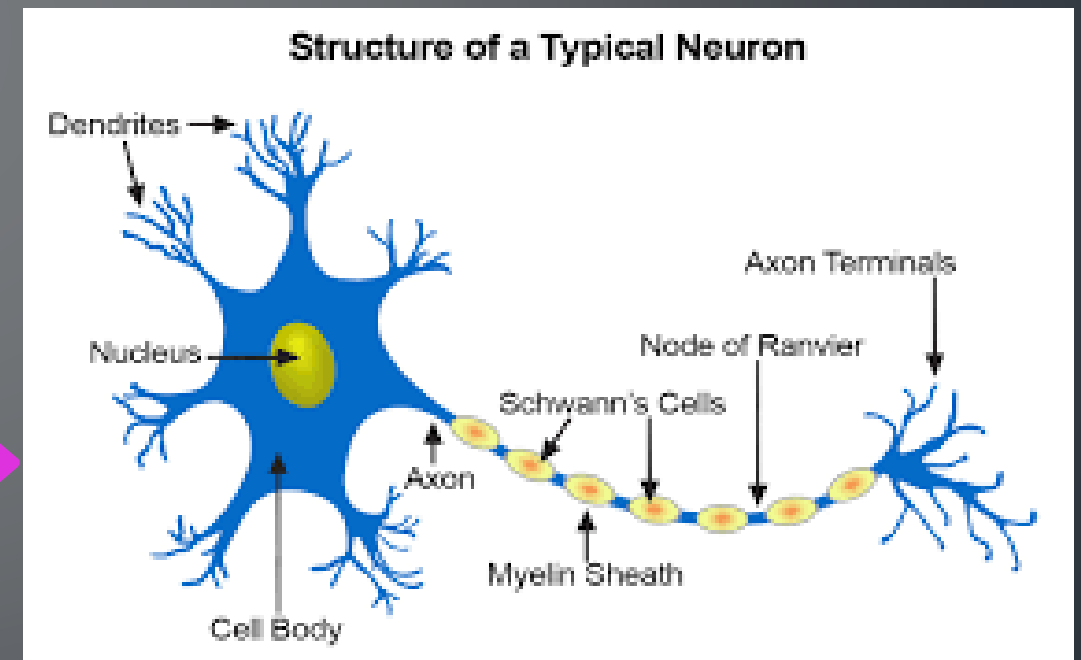
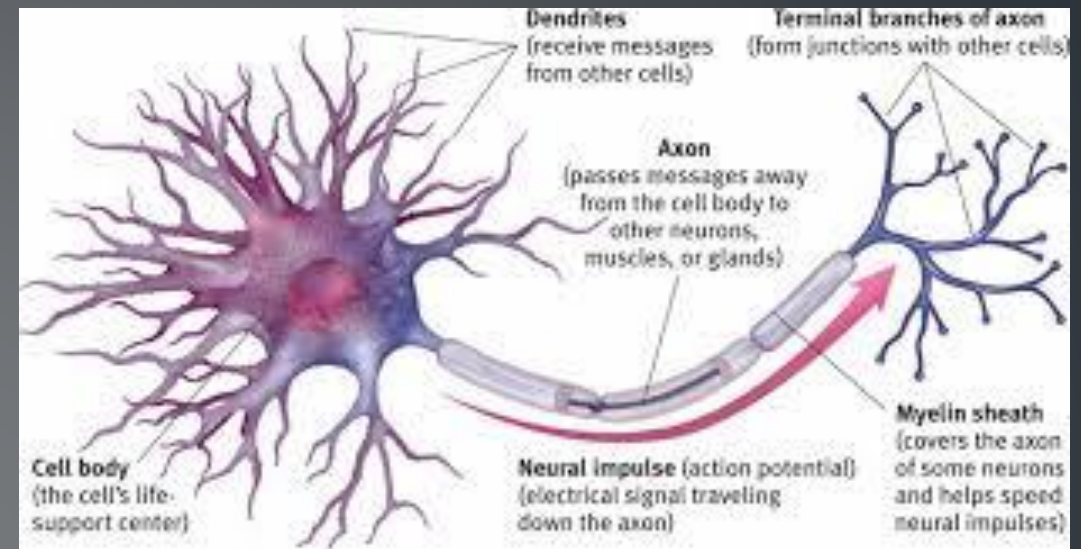


- Different neurotransmitters have very different effects.

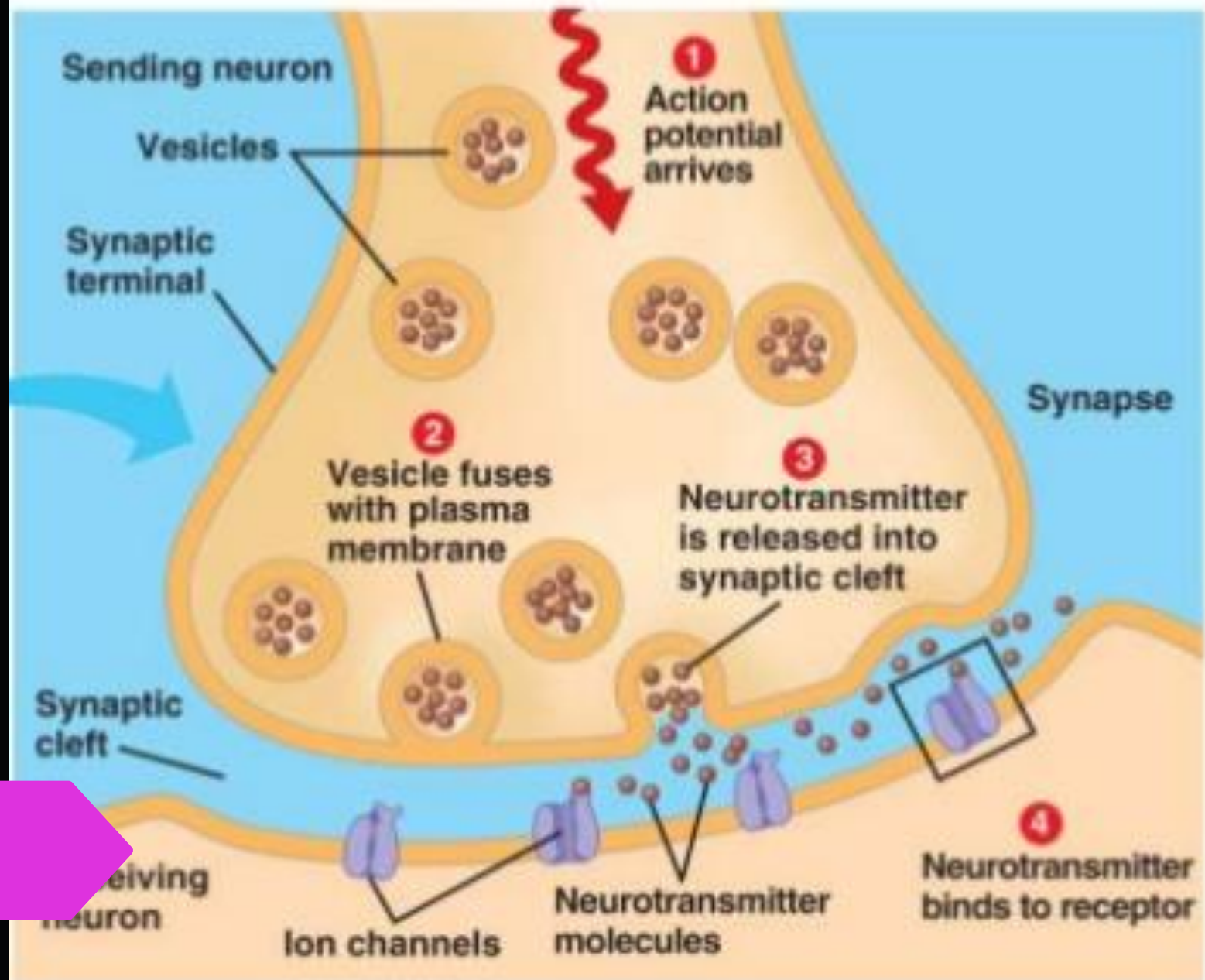




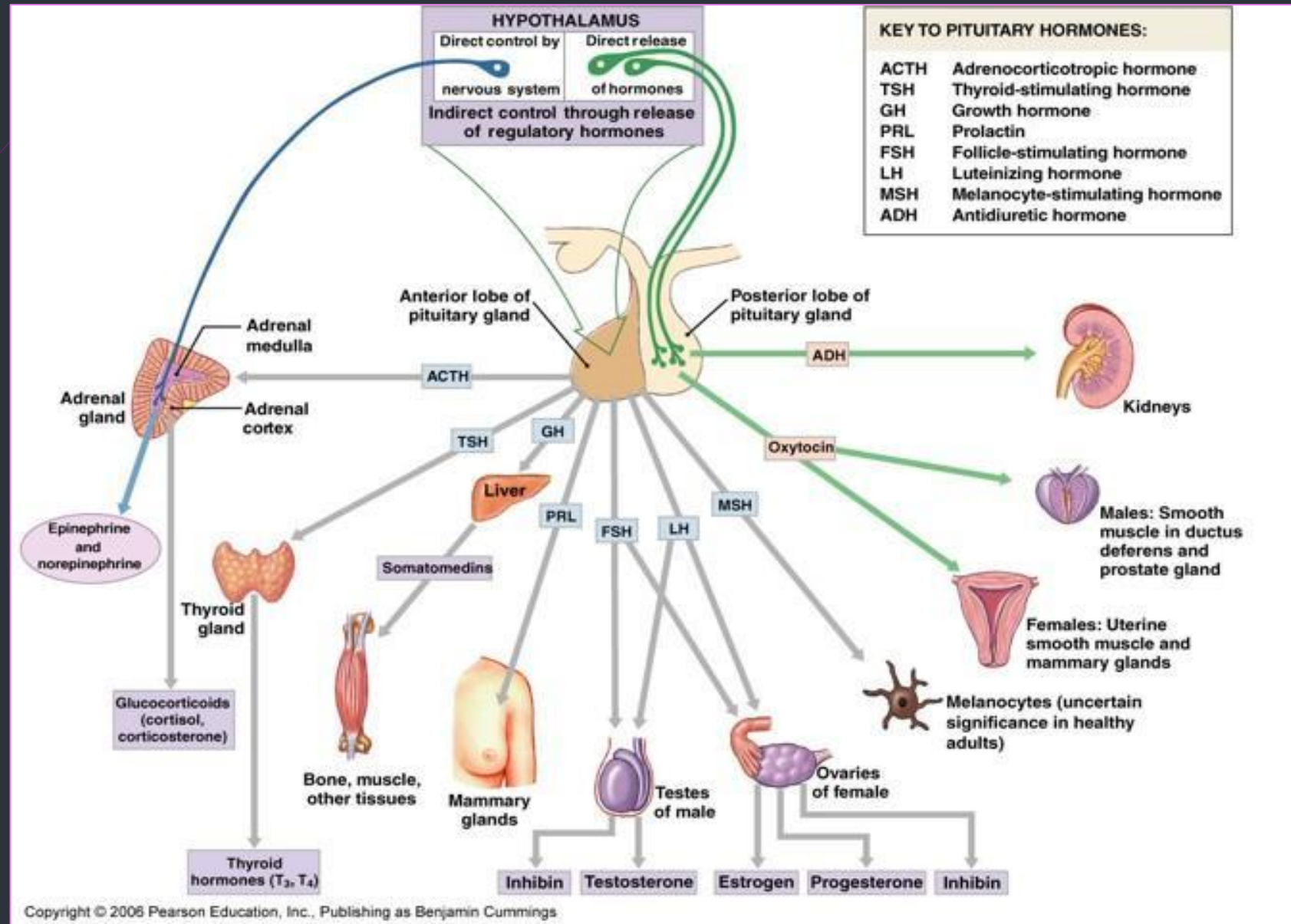
Structure of a Neuron



The Synapse – up close



Hormones



Hormones versus Neurotransmitters

	HORMONES	NEUROTRANSMITTERS
ORIGIN	glands of the endocrine system	neurons of the nervous system
TRANSPORT MEDIUM	blood	neurons
TARGET	distal and local organs	local receptors on nerve cells
ACTION	slow (up to few days)	fast (up to few milliseconds)
DURATION OF EFFECT	short and long lived	short lived
RESPONSE	involuntary	voluntary or involuntary

However, many hormones are also neurotransmitters!
E.g. Serotonin – 10% is found in your brain as a NT and 90% in your gut as a hormone.



The link between the Brain and the Body: Explaining the Stress Response

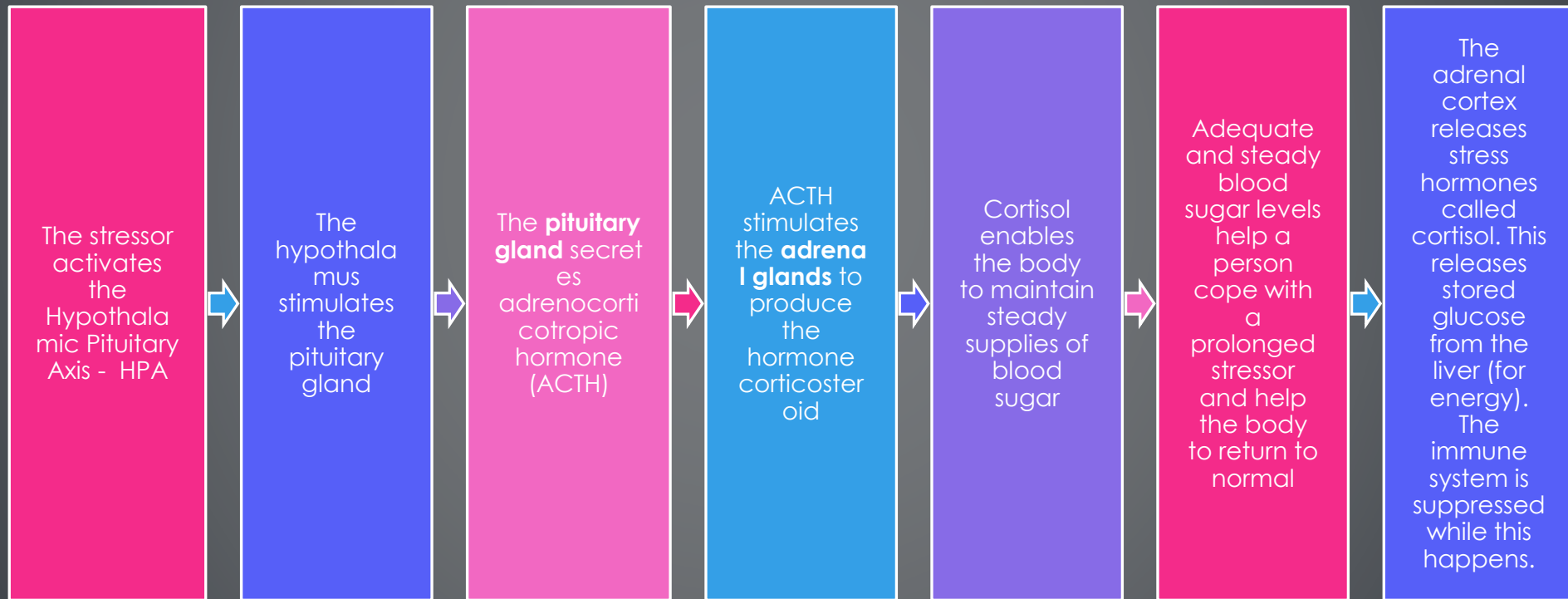
Stress is a biological and psychological response experienced upon encountering a threat that we feel we do not have the resources to deal with.

If the situation is judged as being stressful, the hypothalamus is activated as it is responsible for the stress response.

When a stress response is triggered, it sends signals to two other structures: the **pituitary gland** and the **adrenal medulla**.

These short-term responses are produced by **The Fight or Flight Response** via the Sympathomedullary Pathway (SAM). Long-term stress is regulated by the Hypothalamic-Pituitary-Adrenal (HPA) system.

The stress response





Sympathetic medullary Pathway (SAM)

The hypothalamus also activates the adrenal medulla. The adrenal medulla is part of the autonomic nervous system (ANS).

The ANS is the part of the peripheral nervous system that acts as a control system, maintaining homeostasis in the body. These activities are generally performed without conscious control.

The adrenal medulla secretes the hormone adrenaline. This hormone gets the body ready for a fight or flight response. The physiological reaction includes an increased heart rate.

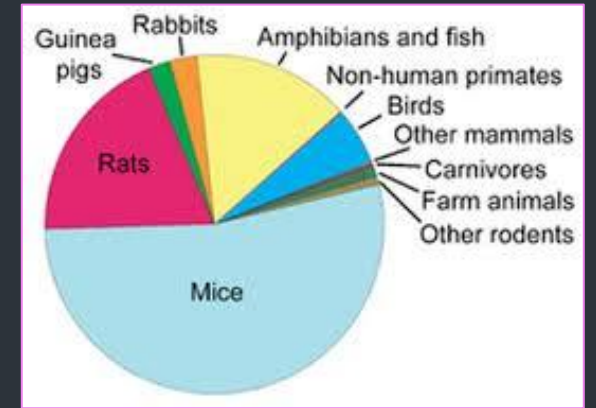
Adrenaline leads to the arousal of the sympathetic nervous system and reduced activity in the parasympathetic nervous system.

Adrenaline creates changes in the body, such as decreases (indigestion) and increased sweating, increased pulse, and blood pressure.

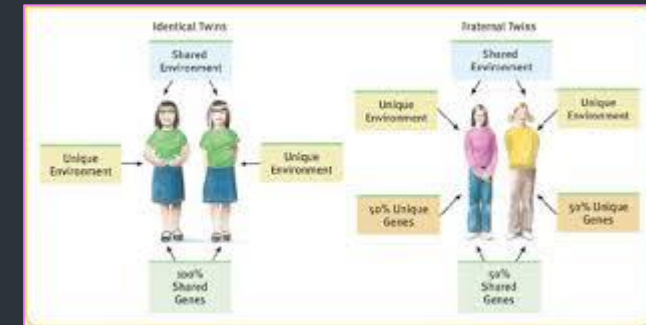
Once the 'threat' is over, the parasympathetic branch takes control and brings the body back into a balanced state.

Methodology of the Biological Approach

➤ Animal studies



➤ Twin studies, Family and Adoption studies



➤ Neuroimaging



Jouvet (1967)

Aim: To examine the effects of REM sleep deprivation on a domestic cat

Method: The cat was placed on a small island surrounded by cold water. Whenever the cat fell asleep, it would fall into the water and instantly wake up. This was continued for 75 days.

Results: The cat became progressively more disturbed and eventually died.

Animal Studies

E.g. Biological Rhythms – Sleep.

What does this tell us about sleep (in cats anyway?)

What about in humans?

ADOPTION STUDIES

- Adoption studies tend to compare the adopted child with the biological mother and the adoptive mother to determine which has the higher concordance rate for a given behavior.
- Why might adoption studies at times be preferable to twin studies?



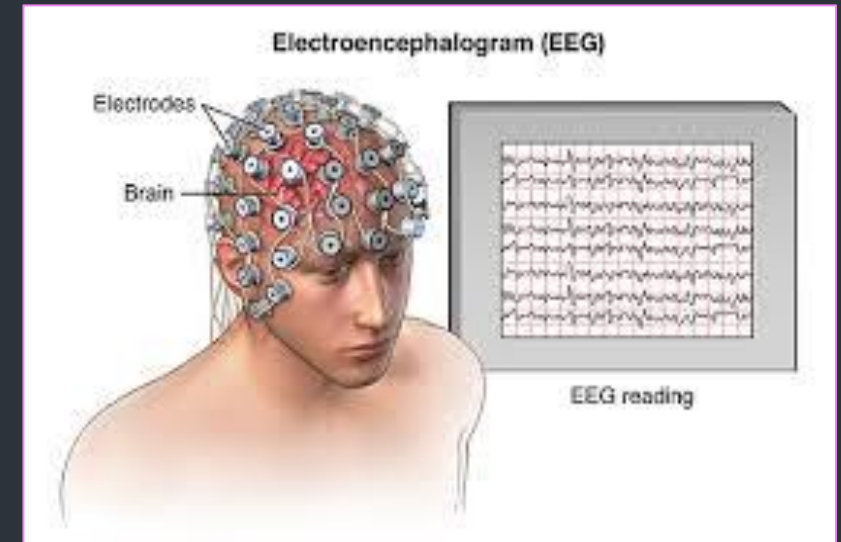
Twin studies, Adoption and Family studies

- We look for concordance rates between monozygotic twins.
- We also look at adoption studies and of twins raised apart.

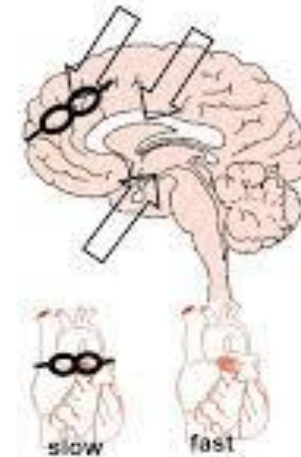
Neuroimaging

➤ EEG

➤ CT scan, MRI, fMRI, MEG, PET



physiological – Raine 1997



PET scan:

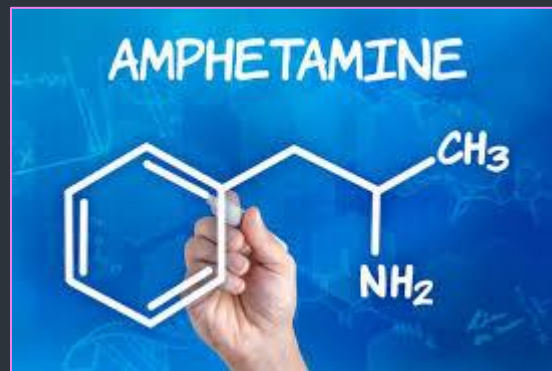
- less active: forebrain and corpus callosum (executive control, puts 'brakes' on behaviour)
- Asymmetric differences Amygdala, hippocampus, thalamus (emotion/fear)

Raine 2: boys' physiology

- Low heart rate and skin resistance @ 14
- = good predictor of criminal record @ 21

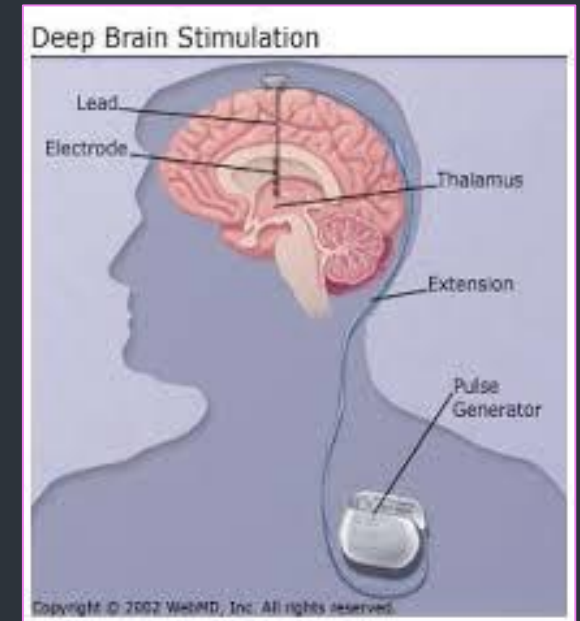
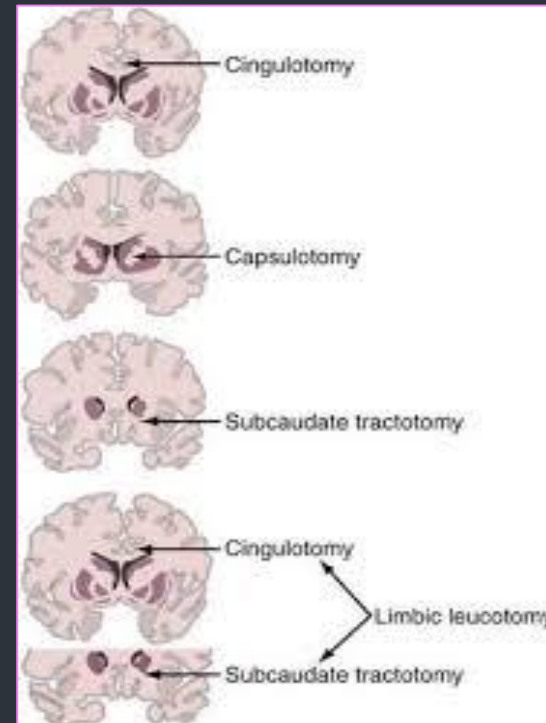
Treatments from the Biological Approach

- ▶ Psychopharmacology (Chemotherapy)
 - ▶ Antidepressants, e.g. SSRI's
 - ▶ Antipsychotics
 - ▶ Anti-manic drugs
 - ▶ Anti-anxiety medication
 - ▶ Stimulants



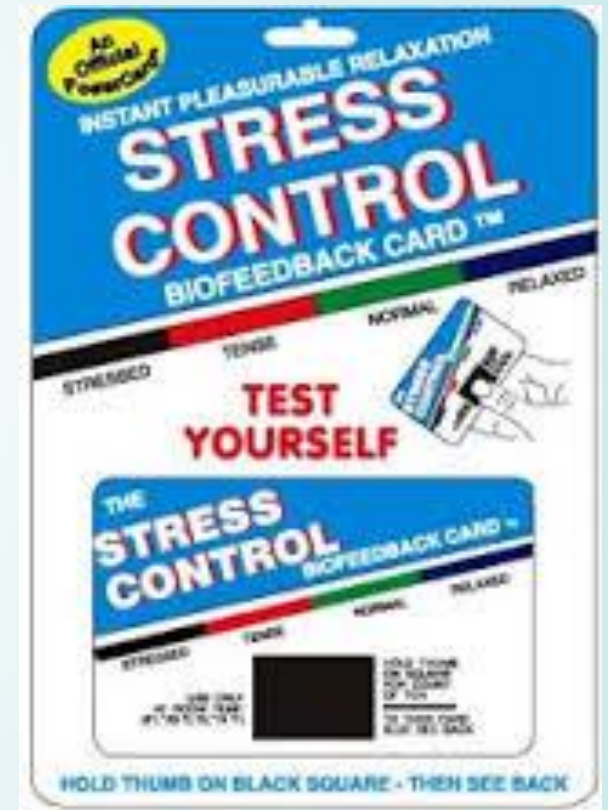
Invasive treatment

- ▶ ECT
- ▶ Hemispherectomy
- ▶ Brain Surgery- Prefrontal lobotomy, Craniotomy, Stereotactic psychosurgery, cingulotomy, capsulotomy, DBS.



Strengths of the biological approach

- Scientific approach- removal of parts of the brain, animal research, drug therapy etc.
- A deterministic approach- all behaviour has a physical cause and knowing this enables us to predict and treat undesirable behaviours.
- Successful application to real life- e.g. drug therapy, psychosurgery, stress reduction.





Weaknesses of the Biological Approach

- Reductionist approach- reducing complex behaviours such as stress into simple explanations, which minimises or ignores the **experience** of stress.
- Nature as opposed to nurture is important.
- Ignores individual differences between people.



Finally...

► Some interesting brain facts!