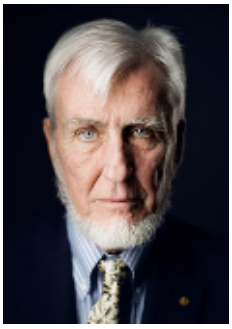
Lecture 1

Konrad Lorenz – Imprinting


Prize motivation: "for their discoveries concerning organization and elicitation of individual and social behaviour patterns"

- **Imprinting**
- Newly hatched geese will **imprint** on the first thing they see when they hatch
- There is a **critical period** following birth during which imprinting will occur

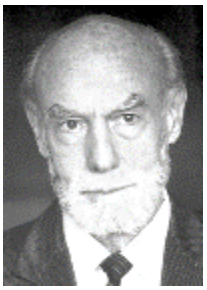
John O'Keefe – Place cells



Prize motivation: "for their discoveries of cells that constitute a positioning system in the brain"

Place cells are **neurons** in the **hippocampus** that fire when the animal occupies a specific location within its environment. As different place cells have different place fields (locations where they fire), they are thought to provide a **cognitive map** for the rat.

Roger Sperry – split brain



Prize motivation: "for his discoveries concerning the functional specialization of the cerebral hemispheres"

Lateralisation of brain function
"split-brain patients" – patients who had undergone a transection of the **corpus callosum**
Alleviating epileptic seizures

When split-brain patients are shown an image only in their left visual field, they cannot vocally name what they have seen.

1. Processing of visual fields by the contralateral hemisphere
2. Language processing localised to the left hemisphere

Daniel Kahneman – framing

Prize motivation: "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty".

People are influenced by the way we ask questions.

"Framing" Effects
Participants were asked to choose between two treatments for 600 people affected by a deadly disease.

Treatment A
"33% chance of saving all 600, 66% saving no-one"
Treatment B

- Positive framing "Saves 200 lives"
- Negative framing "400 people will die"

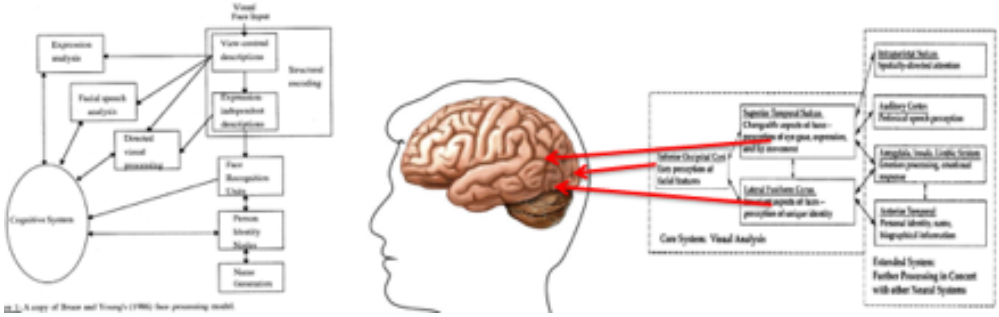
Treatment B was chosen by 72% of participants when it was presented with positive framing ("saves 200 lives") dropping to only 22% when the same choice was presented with negative framing ("400 people will die").

Build a cognitive agent

- Behaviour - In order to act and communicate in the world
- Mind - A cognitive agent needs to be able to perceive, recognise, understand, remember, think, plan, decide etc.
- Brain - And it needs machinery/hardware capable of supporting these processes

Behaviourism Early 20th century	*Ivan Pavlov - Classical* Classical Conditioning. E.g. dog salivating over a bell *John B. Watson – little Albert* • "Behaviourist Manifesto" • Association • "Little Albert" *B. F. Skinner - Operant* Instrumental/Operant Conditioning - emphasises **reward** and **punishment** as instrumenting behavioural change

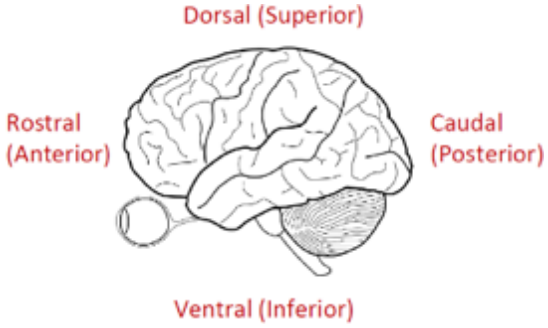
Cognitive Revolution
 	
1960s-1990s Cognitivism
	Thought as symbolic representation and manipulation – MIND as a set of "programs"
	
	Allan Newell and Herb Simon (1959) - computer
	the **General Problem Solver**
	(computer program), computer can solve problem
	
	*Noam Chomsky (1959) – language (**linguistic competence** and the **generative richness**)*
	stimulus response contingencies cannot account for **linguistic competence** and the **generative richness** of language use – innate capacity for acquiring language grammars
	new and inventive way of saying things.
	behaviour is based on learning the language.
	cognitive is based on new and inventive way of saying things.
	Study language can understand human's thought process.
	
	Jerry Fodor (1983) - the language of thought and the modularity of mind
	- Language of thought: complex idea/concept
	  ○ a view in linguistics, philosophy of mind and cognitive science
	  ○ It describes the nature of thought as possessing "language-like" or compositional structure (sometimes known as mentalese).
	  ○ On this view, simple concepts combine in systematic ways (akin to the rules of grammar in language) to build thoughts. In its most basic form, the theory states that thought, like language, has syntax.
	- Modularity
	  ○ degree to which a system's components may be separated and recombined
	  ○ the mind is composed of "processing modules" that do different jobs. Decompose the problem into sub-problems, then solve the problem in isolation. Then connect back the output.

Cognitive neuroscience	Cognitive neuroscience seeks to explicitly map cognitive modules onto brain substrates that support them. Cognition is subserved by - distributed (sub-symbolic) processes that are embedded in the brain and, - are constrained by brain connectivity and neural function. 

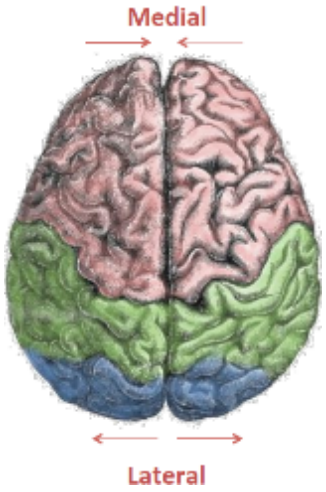
Tutorial 1

Navigating the brain

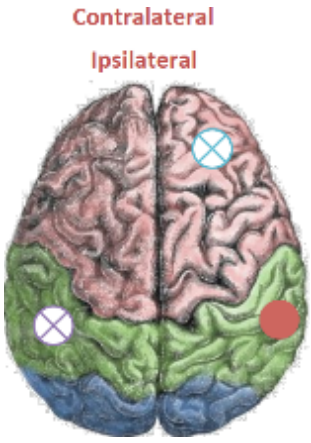
Rostral / Anterior / Front
Caudal / Posterior / Back
Dorsal (dolphin's fin) / Superior / Top
Ventral / Inferior / Bottom



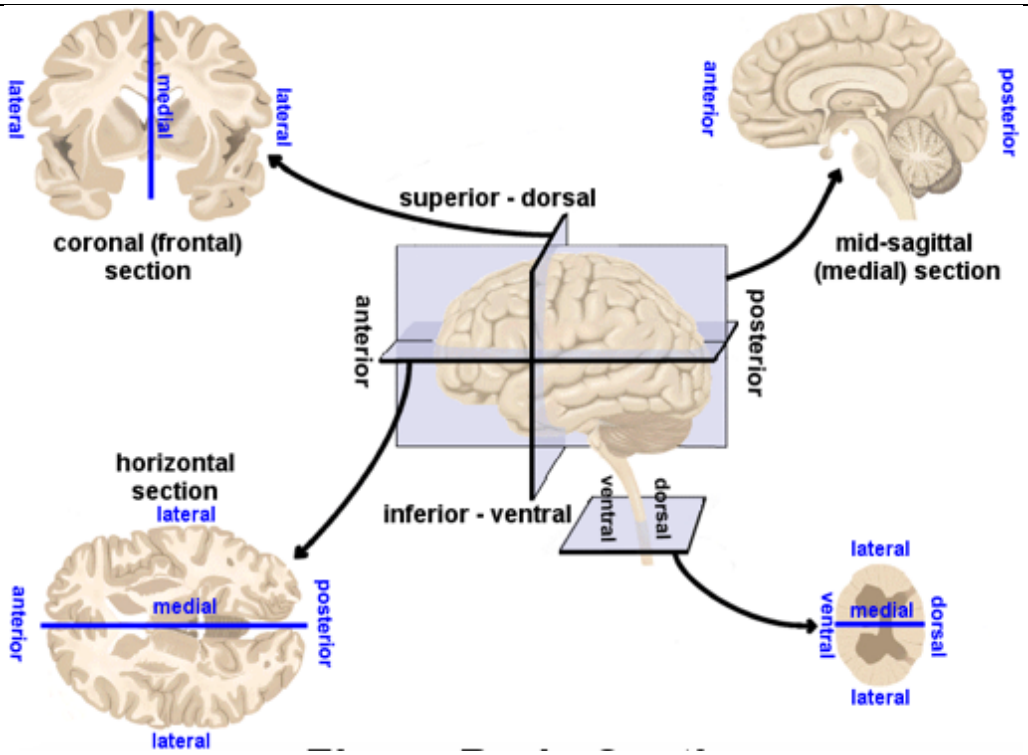
Medial to the first region (moving to the middle)
Lateral (moving away from the middle)



Ipsilateral (same side)
Contralateral (opposite side)



- Coronal (frontal) section
- Mid-sagittal (medial) section: view of the brain in half
- Horizontal section

	 http://homepage.smc.edu/russell_richard/Psych2/Graphics/human_brain_directions.htm
Gyri	Hills of the brain
Sulci	Valley of the brain Deep sulci: **Fissure**
	Tips to remember: • Gyri: Gyrate (Stan up and dance) • Sulci: Sulking, Sit down. Go down in the valley.

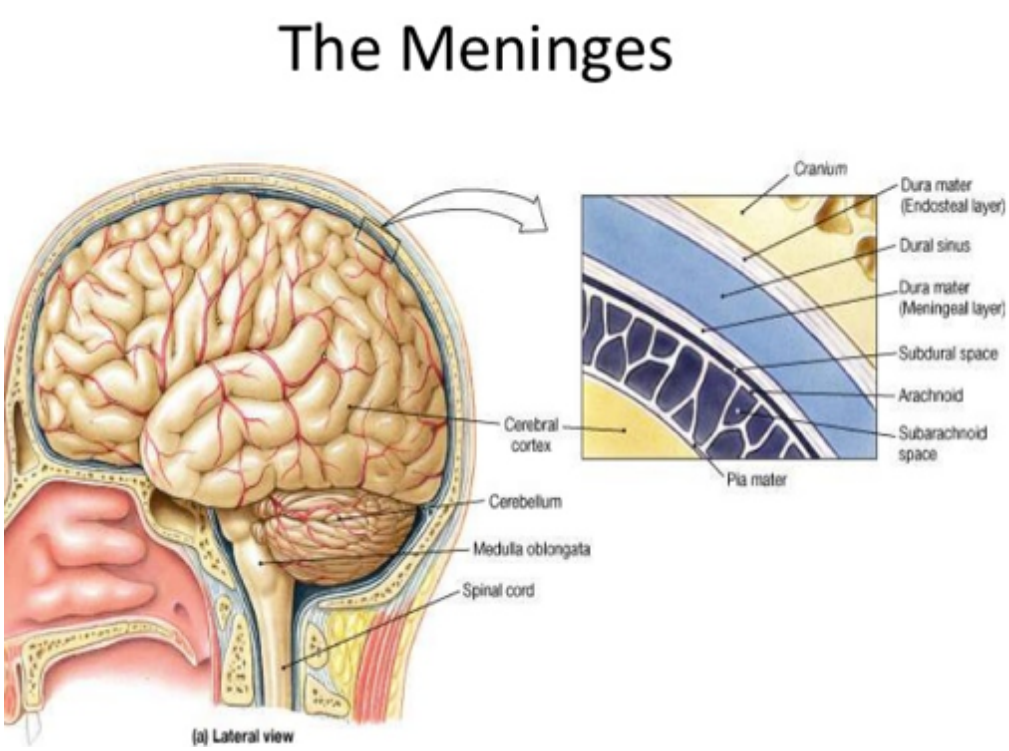
Lecture 2: An introduction to the Brain

Brain support systems: the Meninges

Meninges: protective sheaths around the brain and the spinal cord

The meninges consist of three layers:

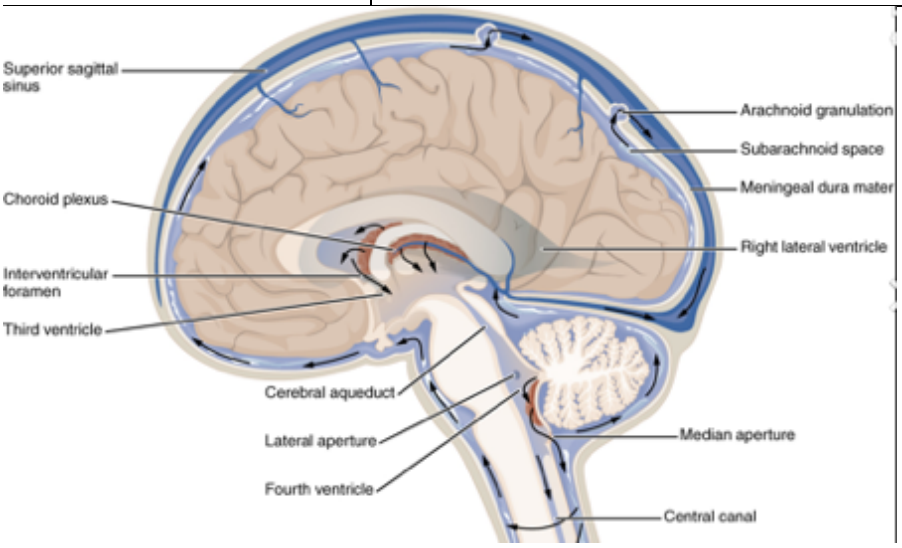
- dura mater
- arachnoid membrane
- pia mater



CSF (Cerebrospinal fluid)

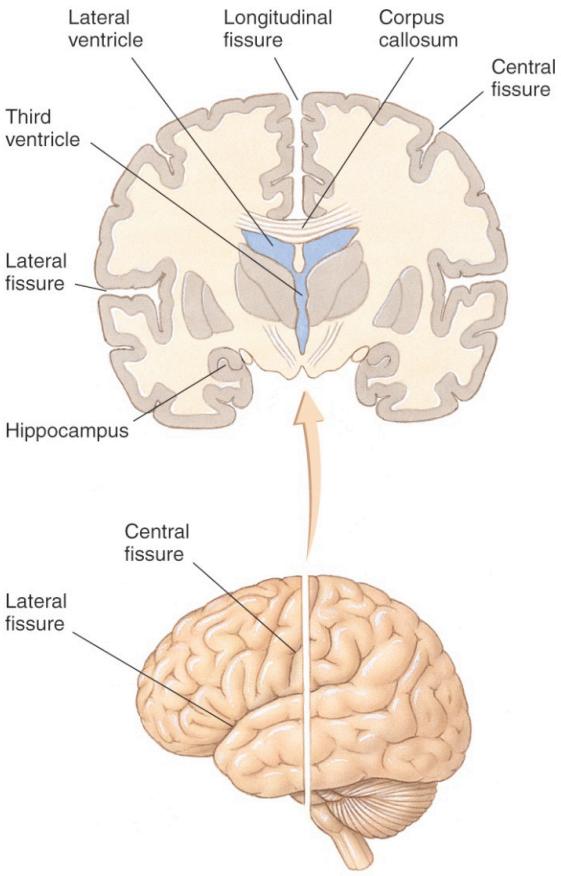
Between the pia mater and the arachnoid membrane is a gap called the **subarachnoid space**. This space is filled with **CSF (Cerebrospinal fluid**)

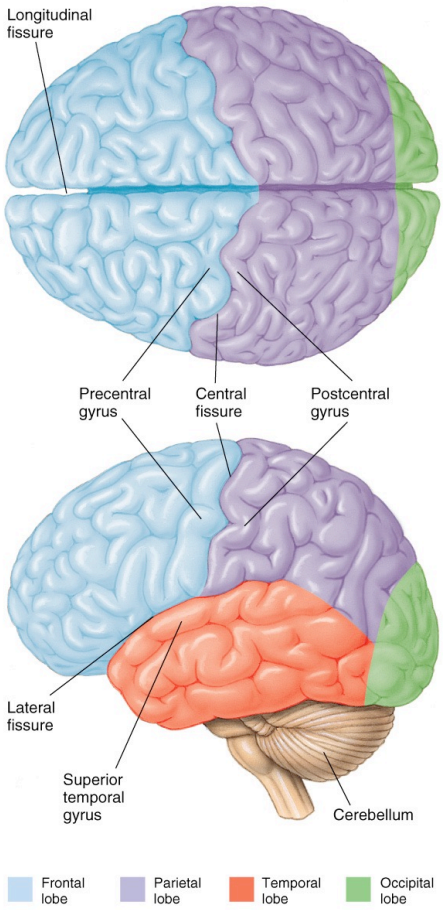
- clear, colorless body fluid found in the brain and spine.
- produced in the choroid plexuses of the ventricles of the brain.
- acts as a cushion or buffer for the brain's cortex, providing basic mechanical and immunological protection to the brain inside the skull
- circulates in the subarachnoid space around the brain and spinal cord



Left image: Coronal (frontal) section

- Cortex
- Grey matter
- White matter

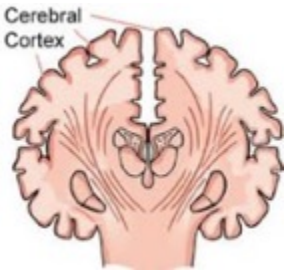

Lateral ventricle
Longitudinal fissure
Corpus callosum
Central fissure
Third ventricle
Lateral fissure
Hippocampus
Central fissure
Lateral fissure


Longitudinal fissure
Precentral gyrus
Central fissure
Postcentral gyrus
Lateral fissure
Superior temporal gyrus
Cerebellum
Frontal lobe
Parietal lobe
Temporal lobe
Occipital lobe

Brain support systems: the Cerebral Ventricles

- Inside the brain is a series of chambers filled with cerebrospinal fluid (CSF). These cavities form what is known as the **ventricular system**.
- The CSF circulating through the ventricular system has at least two main functions:
    1. One is as a mechanical **shock absorber**. Floating in CSF, brain is protected from sudden movements that would otherwise cause contact with the inside of the skull.
    2. The second is as a **medium for the exchange of materials**, including nutrients, between blood vessels and brain tissue.

Cerebral cortex



Cortex means the outer layer. Cortex of the tree is like the bark of the tree. It is very thin.

- Grey matter: cell bodies. runs around the outside. The thin layer.
- White matter: Myelinated axons. large part of the brain

The cerebral cortex is composed of **gray matter**, consisting mainly of cell bodies (with astrocytes being the most abundant cell type in the cortex as well as the human brain in general) and capillaries. It contrasts with the underlying **white matter**, consisting mainly of the white myelinated sheaths of neuronal axons.

Functions of cerebral cortex:

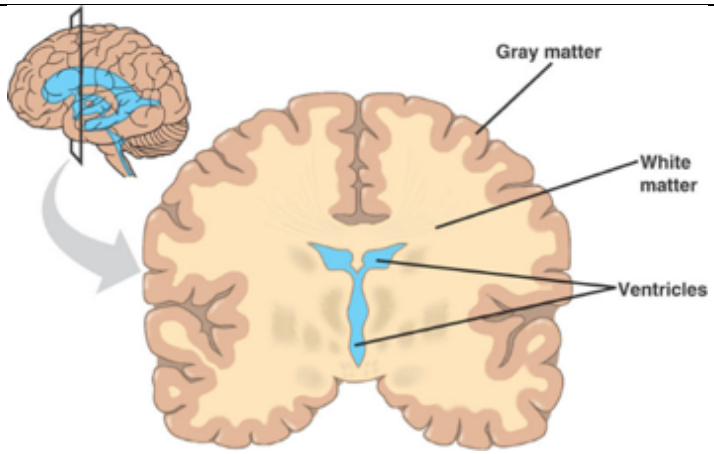
- Provides for flexible control of patterns of movement
- Permits subtle discrimination among complex sensory patterns (top level where we can discriminate between sensory stimuli, we need to do that process up in the cortex)
- Makes language and symbolic thinking possible

Functional organization of cortex:

- Primary areas
- Association areas

Meaning, e.g. visual information comes in occipital lobe first, then the associated areas will process further complex information

Info from website



The cortex is gray matter (cell bodies), while the cerebrum is both gray and white matter (axons and dendrites).
As in much of neuroscience, these are two words for practically the same thing. There is a slight difference in emphasis:

- the cerebrum would include the whole top part of the brain, including the white matter that are the axons (wires) connecting the surface to the rest of the brain.
- The cerebral cortex technically means only the outer surface (1-2 mm thick, the gray matter) which is where all the neurons are.

The cerebral cortex is the cerebrum's (brain) outer layer of neural tissue in humans and other mammals. It is divided into two cortices, along the sagittal plane: the left and right cerebral hemispheres divided by the medial longitudinal fissure. The cerebral cortex plays a key role in memory, attention, perception, awareness, thought, language, and consciousness. The human cerebral cortex is 2 to 4 millimetres (0.079 to 0.157 in) thick. (Wiki)

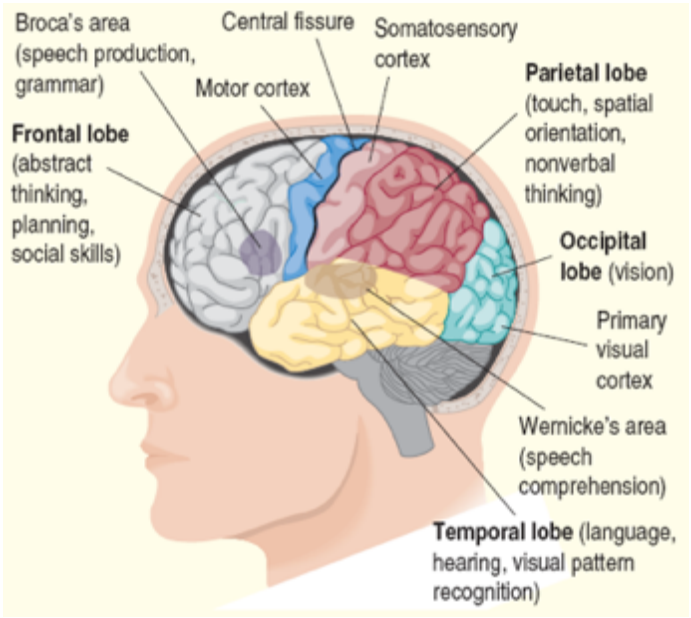
In large mammals, the cerebral cortex is folded, giving a much greater surface area in the confined volume of the skull. A fold or ridge in the cortex is termed a gyrus (plural gyri) and a groove or fissure is termed a sulcus (plural sulci). In the human brain more than two-thirds of the

	cerebral cortex is buried in the sulci.

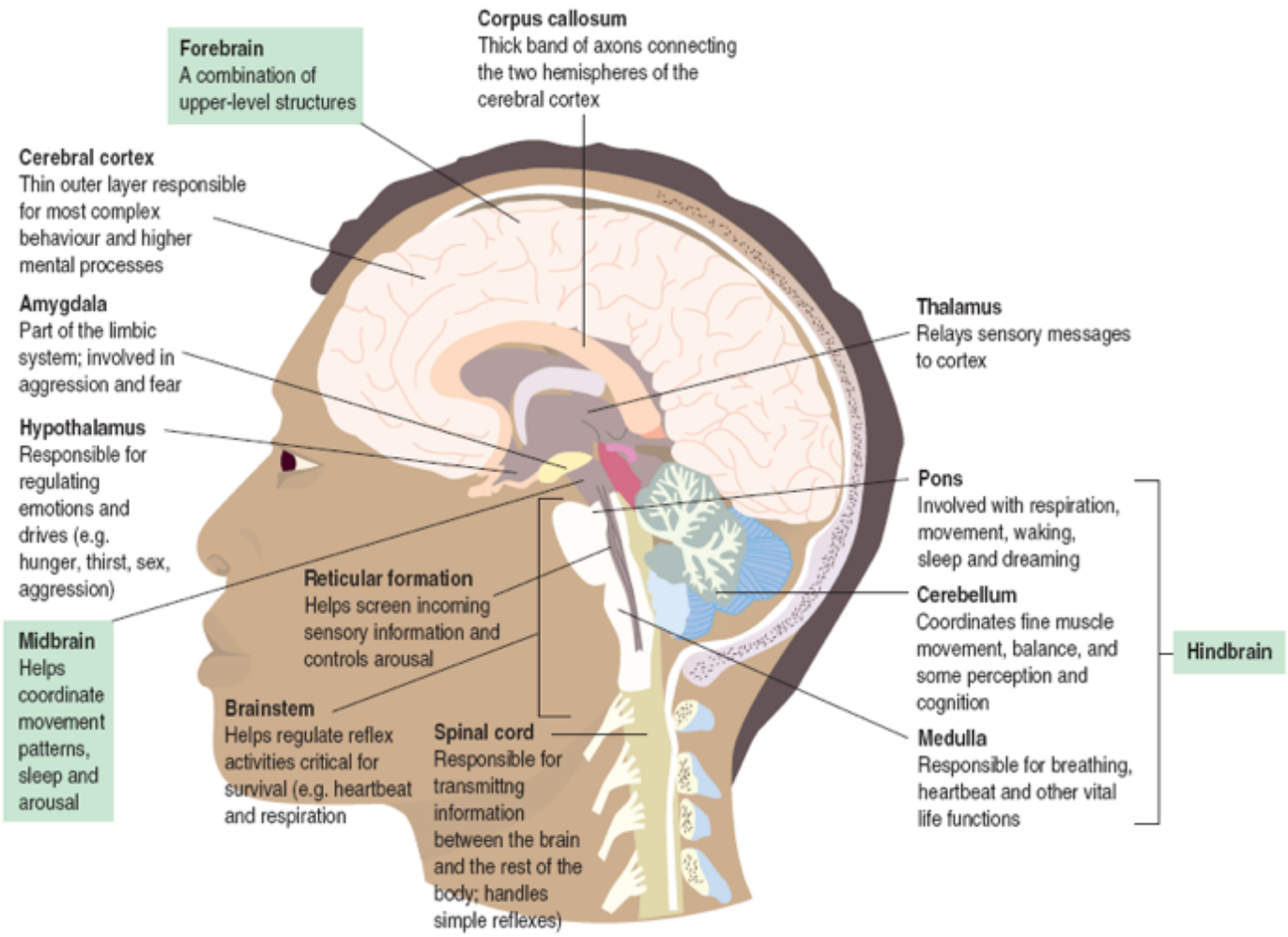
Frontal lobe	• Higher cognitive function, thinking/intelligence • Attention, thought, voluntary movement, decision-making, language • Broca's area: speech production • Executive function
Temporal lobe	• Emotional reaction • Perception, sensory, face recognition, object recognition, memory • Understand/processing language • Auditory, sound • Wernicke's area • Damage: "agnosia" inability to recognize specific categories (e.g. colours)
Parietal lobe	• Coordinate movement • Sensory/visual info • Ventral/dorsal: integrate together to understand • Spatial info
Occipital lobe	• Visual
Motor Cortex	• In pre-central gyrus • Initiating/driving motor movement
Somatosensory cortex	• In postcentral gyrus • Receives tactile info from the body • Sensory info (touch/feel) relating to or denoting a sensation (such as pressure, pain, or warmth) which can occur anywhere in the body, in contrast to one localized at a sense organ (such as sight, balance, or taste).

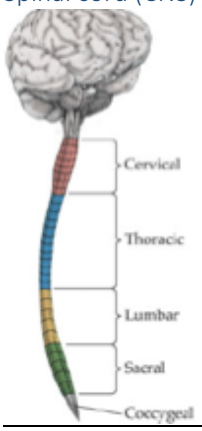
Major divisions of cerebral cortex

Able to work out the areas of damage by, e.g. if a person is having difficulty in speech comprehension or production.

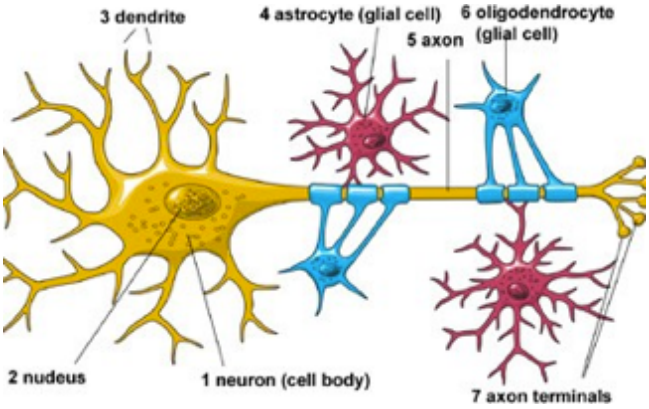


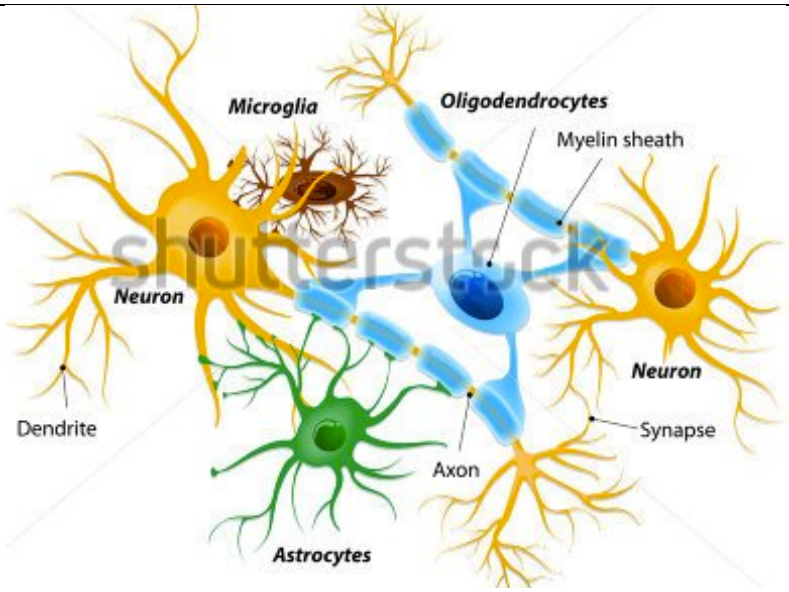
Major subcortical (below cortex) divisions of the brain


Forebrain
A combination of upper-level structures
Corpus callosum
Thick band of axons connecting the two hemispheres of the cerebral cortex
Cerebral cortex
Thin outer layer responsible for most complex behaviour and higher mental processes
Amygdala
Part of the limbic system; involved in aggression and fear
Hypothalamus
Responsible for regulating emotions and drives (e.g. hunger, thirst, sex, aggression)
Midbrain
Helps coordinate movement patterns, sleep and arousal
Thalamus
Relays sensory messages to cortex
Pons
Involved with respiration, movement, waking, sleep and dreaming
Cerebellum
Coordinates fine muscle movement, balance, and some perception and cognition
Medulla
Responsible for breathing, heartbeat and other vital life functions
Hindbrain
Reticular formation
Helps screen incoming sensory information and controls arousal
Brainstem
Helps regulate reflex activities critical for survival (e.g. heartbeat and respiration
Spinal cord
Responsible for transmittng information between the brain and the rest of the body; handles simple reflexes)

Amygdala	• Deeper into temporal lobe • Comes a lot in psychology • Associate with emotions, sad, scare, happy • Link to fear
Hypothalamus	• Below thalamus • Regulation of emotions • Basic drive: 4 Fs Amygdala and hypothalamus are well connected.
Thalamus	• Relation station: sensory info to corresponding part of cortex • Begin to process information
Hindbrain	
Cerebellum	• Smoothing out the movement • Mini brain • More neurons than the rest of the brain • Cerebellar ataxia: too much alcohol • Also plays role in cognition: Smoothing out thoughts. Schizophrenia may have damage to this area.
Pons	• Respiration • Waking / sleep / dreaming
Medulla	• Breathing, heart beat and life vital functions • Other part of brain is damaged, rest of the brain may pick up the functionality. If medulla is damaged, struggle to live.
Midbrain	• Dopamine neuron • Motor control, Parkinson disease
Spinal cord (CNS) 	• Cervical • Thoracic • Lumbar • Sacral • Coccygeal The principal function of the spinal cord is to distribute motor connections to the muscles and glands and to collect somatosensory information. The spinal cord is protected by the vertebral column and passes through a hole in each of the vertebrae. Note that the spinal cord is only about two-thirds of the length of the vertebral column. The rest of the space is filled by a mass of spinal nerves composing the **cauda equina**.
Sensation and Perception	**Sensation** (sensory/visual cortex) is the process by which the body gathers information about the environment and transmits the information to the brain for initial processing What we perceive is important is, **Perception** is an active process by which the brain selects, organises and interprets sensory information
Cells in the human nervous system	**Neurons** are the basic functional units of the nervous system. They take in information from other neurons (reception), integrate those signals (conduction), and pass signals to other neurons (transmission). Like a mini computer, when neurons get excited, the neurons will decide which signals to react to, which one is going to change to and which one is going to form the memory to. The spine will change as a result. Hence why neurons are computational device. Each neuron contains billions of protein. **Glial cells** nourish, protect, and physically support neurons and are thought to be particularly

	critical in brain development. One type of glial cell, the **oligodendrocyte**, covers the axons of neurons with myelin, a substance critical to the effective functioning of the brain. In multiple sclerosis (MS), the body's auto immune system attack the myelin sheath that protects the nerve fibers. This affects the function of neuron. The cerebral cortex is composed of **gray matter**, consisting mainly of cell bodies (with astrocytes being the most abundant cell type in the cortex as well as the human brain in general) and capillaries. It contrasts with the underlying **white matter**, consisting mainly of the white myelinated sheaths of neuronal axons.





Parts of the neuron

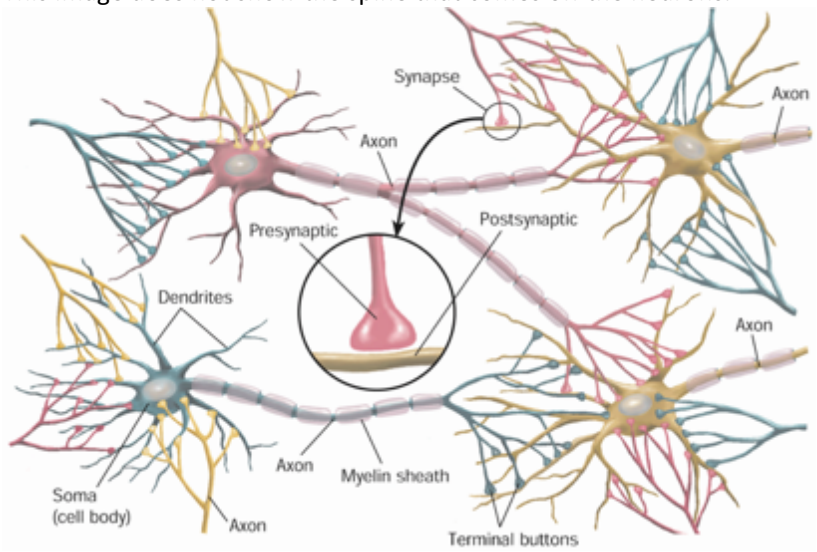
- **Dendrites** (Greek word, meaning from tree) function principally to receive messages from other neurons. They transmit the information they receive to the soma
- The **soma** (cell body) contains mechanisms that control the metabolism (chemical processes) and maintenance of the cell. It also collates 'messages' from other neurons.
- The **axon** carries 'messages' away from the soma towards the cells with which the neuron communicates; these messages are called action potentials.
- **Terminal buttons** (pronounce bu-tons) are located at the end of the 'twigs' that branch off the ends of axons; they secrete (produce and discharge) neurotransmitters (release) which affect the activity of other cells with which the neuron communicates.
- **Myelin** insulates some axons to promote efficient transmission of the action potential. It serves to increase the speed of **propagation** (generation) of the action potential along the axon

How brain works and how neuron work?

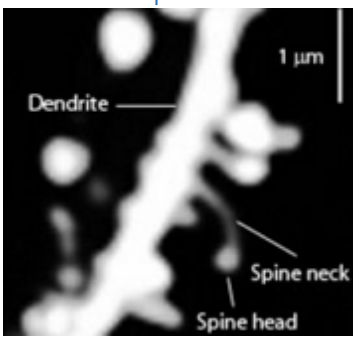
- It's an electrical chemical machine. It needs electricity, and it generates its own electricity
- It needs chemical, and **chemical are neurotransmitters**

Neuron Connections

This image does not show the spine that comes off the neurons.

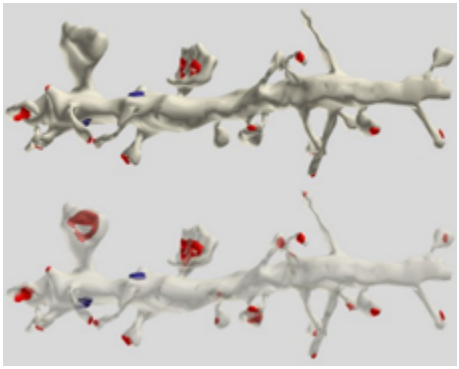


Dendritic spine



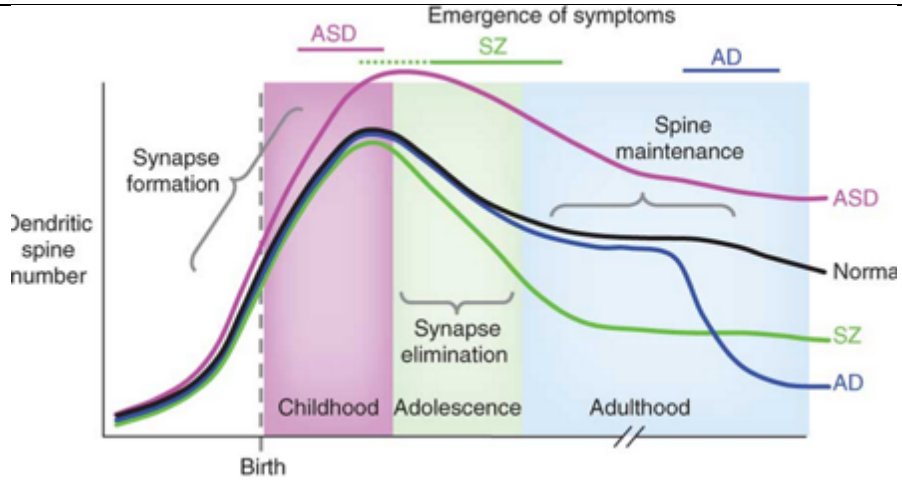
A dendritic spine (or spine) is a small membranous protrusion from a neuron's dendrite that typically receives input from a single axon at the synapse. Dendritic spines serve as a storage site for synaptic strength and help transmit electrical signals to the neuron's cell body. Most spines have a bulbous head (the spine head), and a thin neck that connects the head of the spine to the shaft of the dendrite. The dendrites of a single neuron can contain hundreds to thousands of spines. In addition to spines providing an anatomical substrate for memory storage and synaptic transmission, they may also serve to increase the number of possible contacts between neurons.

When you remember something, it changes the physical structure of the spine, in shape, size, disappear or not disappear.



Red: synaptic part, where receptors are.

Dendritic spine pruning (trim)



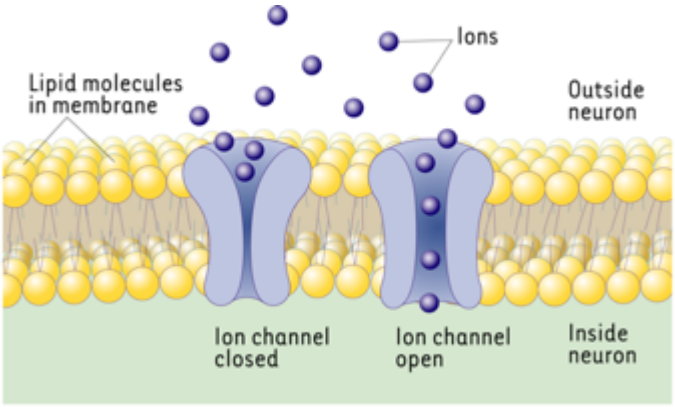
Bars across the top indicate the period of emergence of symptoms and diagnosis. In normal subjects, spine numbers increase before and after birth; spines are selectively eliminated during childhood and adolescence to adult levels.

- In ASD (Autism spectrum disorder), exaggerated spine formation or incomplete pruning may occur in childhood leading to increased spine numbers.
- In schizophrenia, exaggerated spine pruning during late childhood or adolescence may lead to the emergence of symptoms during these periods.
- In Alzheimer's disease, spines are rapidly lost in late adulthood, suggesting perturbed (unsettled) spine maintenance mechanisms that may underlie cognitive decline.

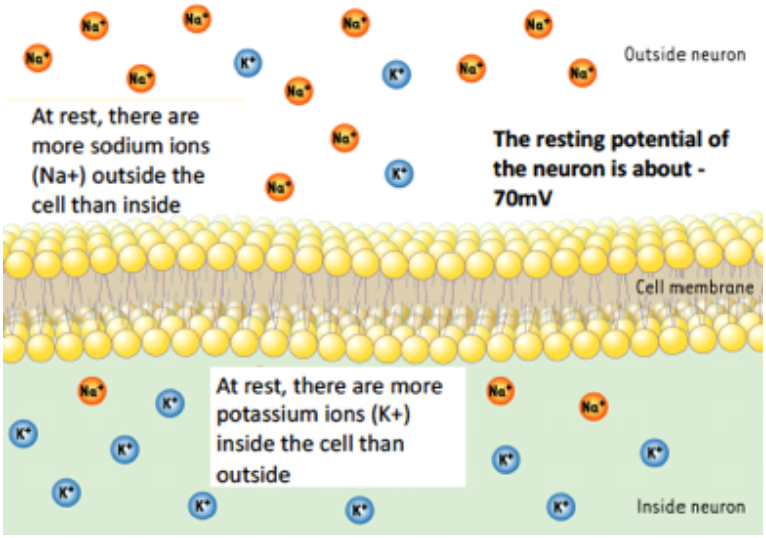
Cell membrane

- **Lipid bilayer**: two layers of fat (lipid) molecules.
  - One layer is hydrophobic: doesn't like water
  - One layer is hydrophilic: like water
  - As a result, they turn in space. They turn inside solution and form lipid layer. Cell and neuron are form like this due to strong chemical bond.
  - many types of specialized proteins 'float'
- Embedded protein molecules
  - Proteins <u>form pores or channels</u> that control movement of material into and out of cell.
- The cell membrane separates two different chemical solutions. These solutions interact via pores or channels. Typically these are protein molecules with a central passage
- At rest, pores are usually closed, to prevent interchange of inside (intracelluler) and outside (extracellular) materials

The cell membrane of the neuron



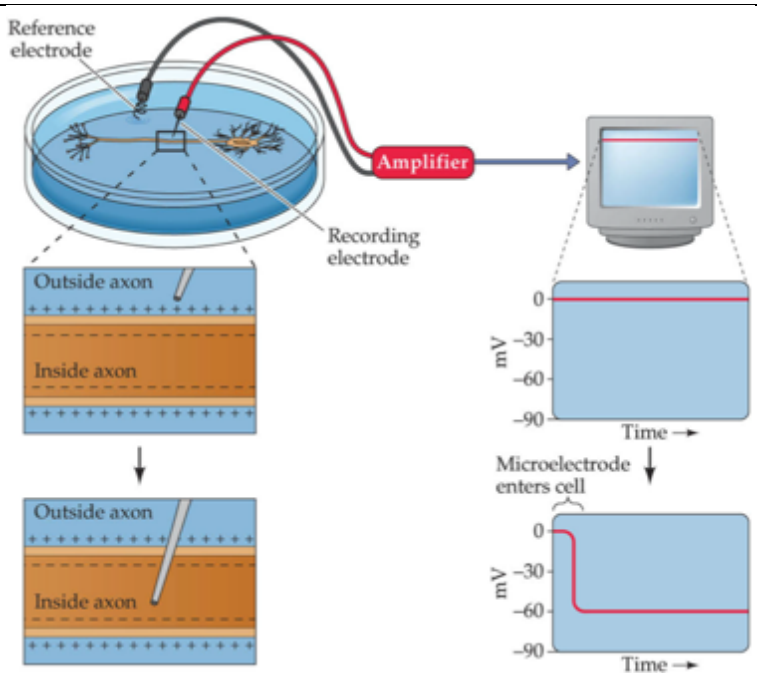
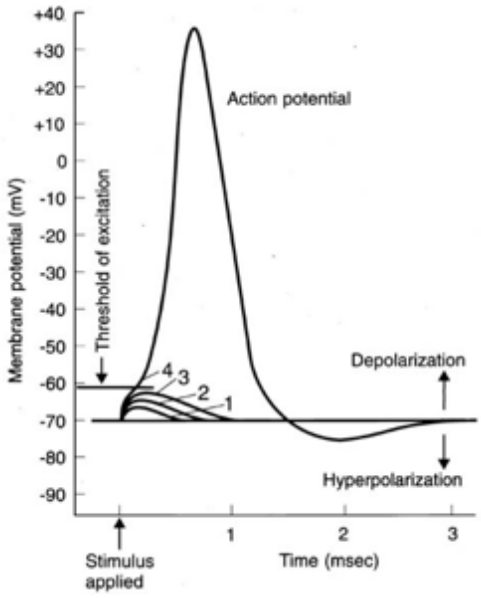
The neuron 'at rest'

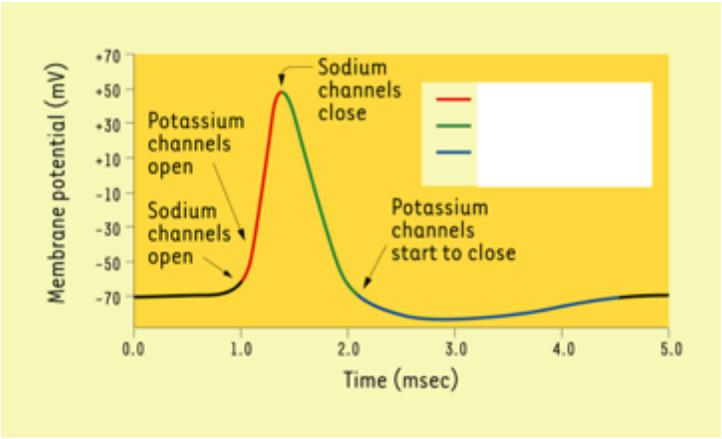


The Resting Membrane Potential

- The resting membrane potential (RMP) derives from the **difference in chemical composition inside and outside the cell at rest**.
- It is the result of relative concentrations of potassium ions (K+), chloride ions (Cl-), negatively charged protein ions, and sodium ions (Na+).
- More potassium outside, more sodium inside (???)

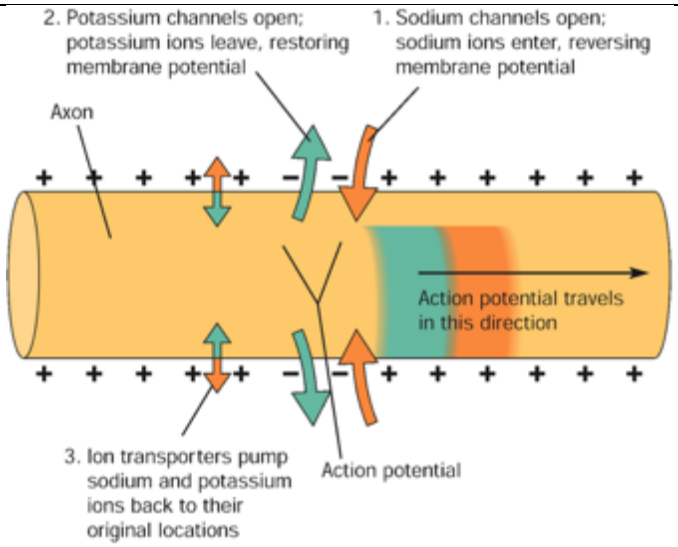
	The RMP is approximately equal to **-70mV** (range between-50 mV to -80mV).

Measuring the Resting Membrane Potential	
The Action Potential	• An action potential is a brief reversal in the resting charge of the neuron. It is triggered by an exchange of ions across the neuron membrane. • The action potential is created when the neuron membrane is sufficiently depolarised (i.e. the resting potential moves towards 0 mV). • When the **depolarisation** reaches the threshold of about **- 55** mV, the neuron will fire an action potential. • If the neuron does not reach this critical threshold level, then no action potential will fire.  • 1/2/3/4 means membrane potential, voltage of membrane • if you stimulate a little bit, e.g. sensory neuron is sensing there is a spider crawling on you, and sending the info to sensory thalamus, sensory cortex, eventually you realise you need to brush it off. You need to activate movement to activate muscles, so your sensory cortex tells the motor cortex by triggering action potential. So it gets stimulated and it doesn't happen. Then we have this all or nothing event. Once we get to this point, action potential occurs. The cells depolarize to positive territory and it will overshoot a little bit. • the whole process of firing is about 2 milliseconds • This is the fundamental process, thousands of action potential is firing right now while we are sitting, walking, thinking etc.
The all-or-none principle	If the threshold level is reached, an action potential of a fixed sized will always fire. For any given neuron, the size of the action potential is always the same. Therefore, the neuron either does not reach the threshold or a full action potential is fired.



- Membrane potential is drive by voltage
- Sodium rushes in at 1.0
- Potassium is trying to do the opposite and trying to slow down the action potential but it cannot. Like driving a car, foot on the accelerator (sodium) hard, then changed to brake (potassium). The car will still move forward.
- In the Green zone, action potential won't happen again. Sodium/Potassium pumps play a role in bringing those back together.
- Some axons are long and travel a long way from motor cortex to spinal cord, some travel left to right in the brain.

Movement of sodium and potassium ions during the action potential



Speed of Propagation of the Action Potential

Speed of propagation (travel through) of the action potential is determined by:

- **diameter** of axon
- presence or absence of a **myelin** sheath (speeds up action potential)

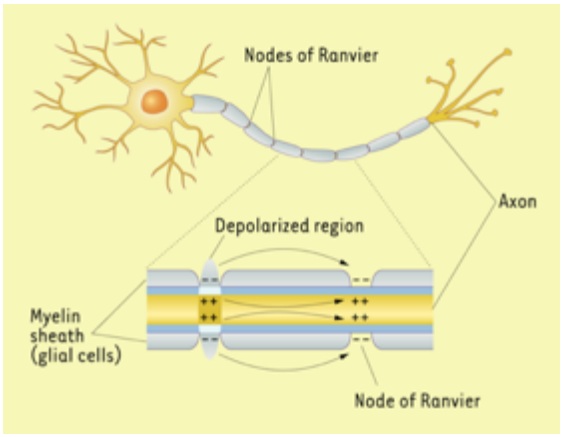
The Myelin Sheath

Electric insulator

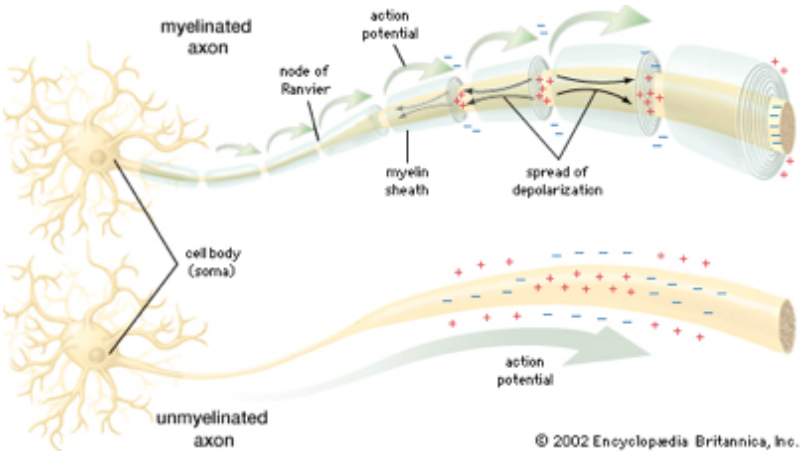
- Prevents current flow across membrane

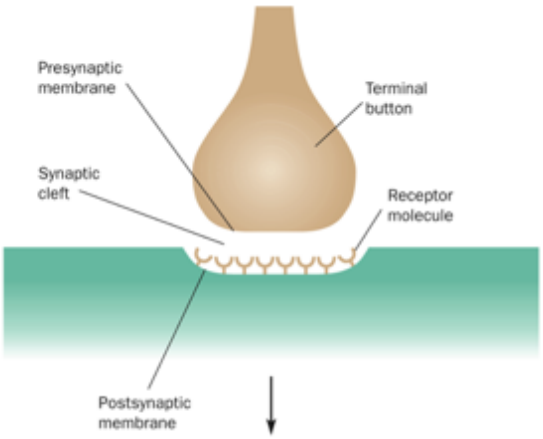
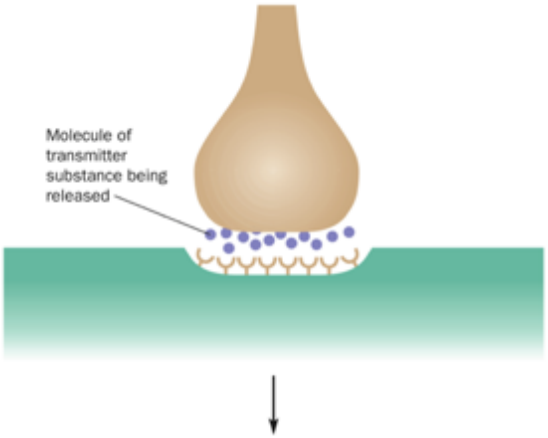
Current can only flow across membrane at breaks in the myelin (called **Nodes of Ranvier**)

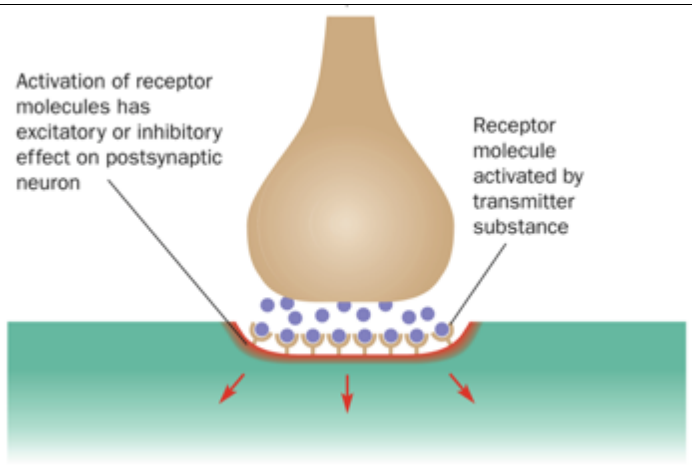
- **Sodium** channels are concentrated in Nodes of Ranvier
- Action potential can only be generated in these gaps



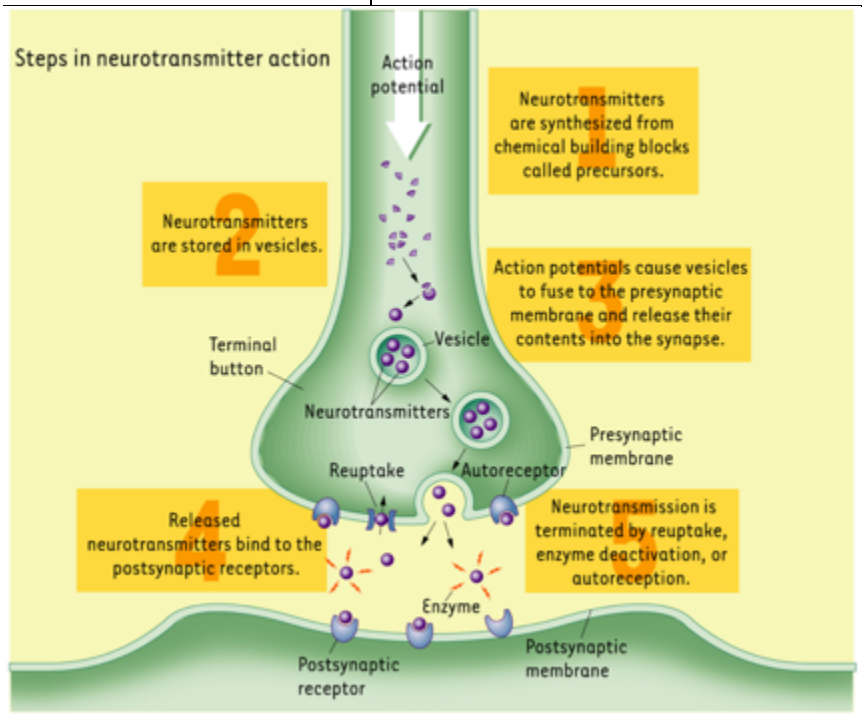
- 'Jumping' of the action potential from break to break massively increases speed
- Non-myelinated axons are much slower as the action potential is generated repeatedly along the axon. Slower because it cannot jump.



Synaptic Transmission	• Between neurons and chemical level. • Neurons do not touch one another; they are separated by a small space known as the synaptic cleft (or synaptic gap or synapse). • When an action potential reaches the terminal buttons it causes the release of specialised chemicals (**neurotransmitters**) that travel across the synaptic cleft and are received by the dendrites of other neurons. Synapse: a region where nerve impulses are transmitted and received, encompassing the axon terminal of a neuron that releases neurotransmitters in response to an impulse, an extremely small gap across which the neurotransmitters travel, and the adjacent membrane of an axon, dendrite, or muscle or gland cell with the appropriate receptor molecules for picking up the neurotransmitters. (dictionary meaning)
The release of neurotransmitters from a terminal button (Stage 1)	• Before the action potential has arrived, the neurotransmitters are stored in vesicles (a fluid-filled cavity) within the terminal button • Pre and post just means either side of the synapse. 
The release of neurotransmitters from a terminal button (Stage 2)	The action potential triggers the release of the **neurotransmitter** into the synaptic cleft 
The release of neurotransmitters from a terminal button (Stage 3)	The neurotransmitters diffuse across the synaptic cleft. Some of them will attach to receptor molecules in the postsynaptic membrane and activate them, thus either inhibiting or enabling the postsynaptic neuron to generate an action potential. Major excitatory transmitter is called **Glutamine**, inhibitory is called **Gaba**.



This is how chemical transmission works in the brain.



Synthesis (combination)
Precursors are something that happens before something else

Anti-depressants

- **Tri-cyclics**: prevent reuptake of Noradrenalin and Serotonin into presynaptic cells
- **Selective Serotonin Reuptake Inhibitors (SSRIs)**: inhibit the reuptake of Serotonin into presynaptic cells
- **Monoamine Oxidase Inhibitors (MAOIs)**: prevent breakdown of neurotransmitters in pre-synaptic terminal

All are increase the amount of Neurotransmitter at postsynaptic neurons.

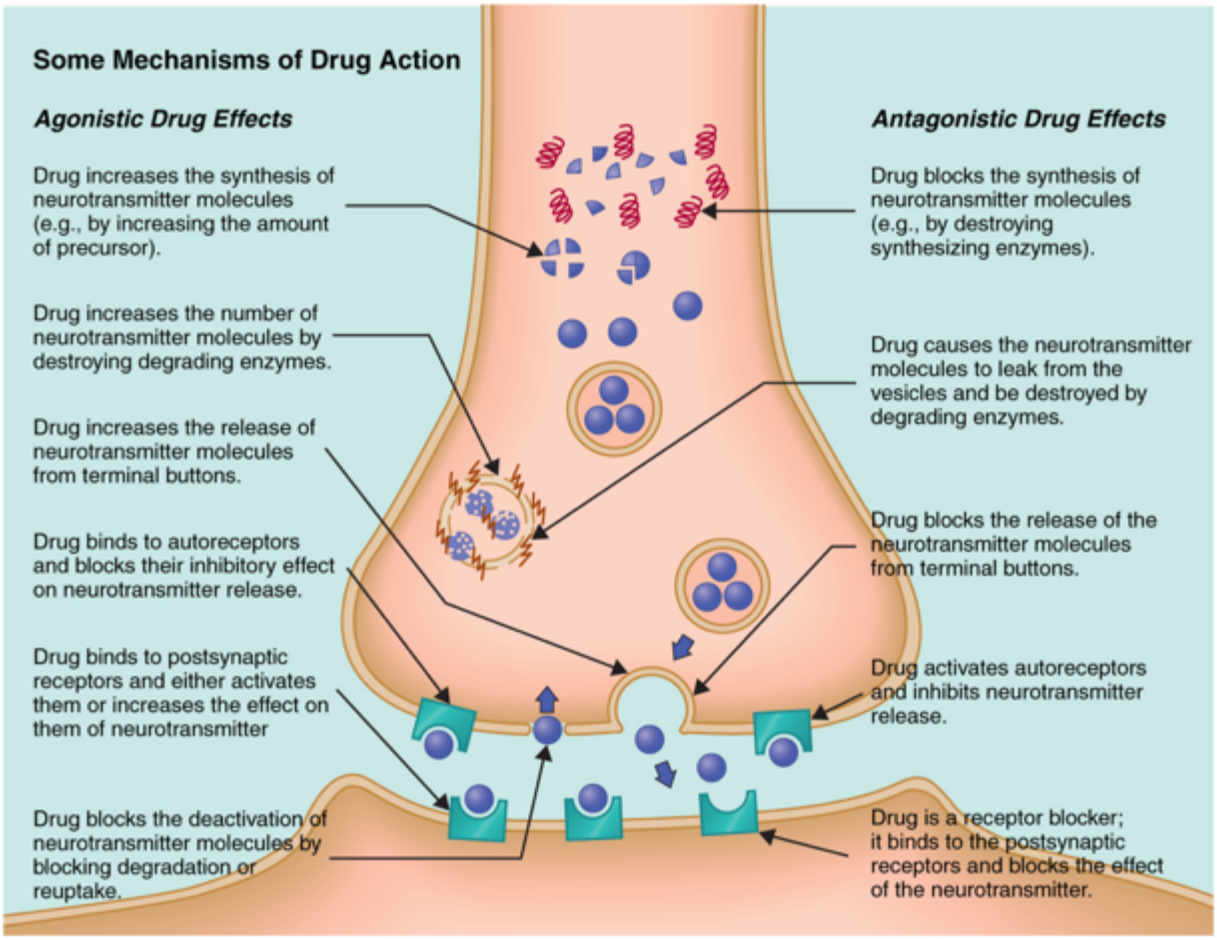
Some mechanisms of drug action

Agonistic

- Mimic what natural underlying transmitter does, e.g. Parkinson disease (dopamine cells die off) takes the drug called liverdopa (building block of purple triangle), build more dopamine

Antagonistic (against)

- Stop or block molecules going into postsynaptic



Videos

See through brains
https://www.youtube.com/watch?v=c-NMfp13Uug
Firing Neurons | Cell Dance 2010, Public Outreach Video Winner
https://www.youtube.com/watch?v=GIGqp6_PG6k

Lecture 3 Week 4: Methods in Biological and Cognitive Psychology/Cognitive Neuroscience

Methods

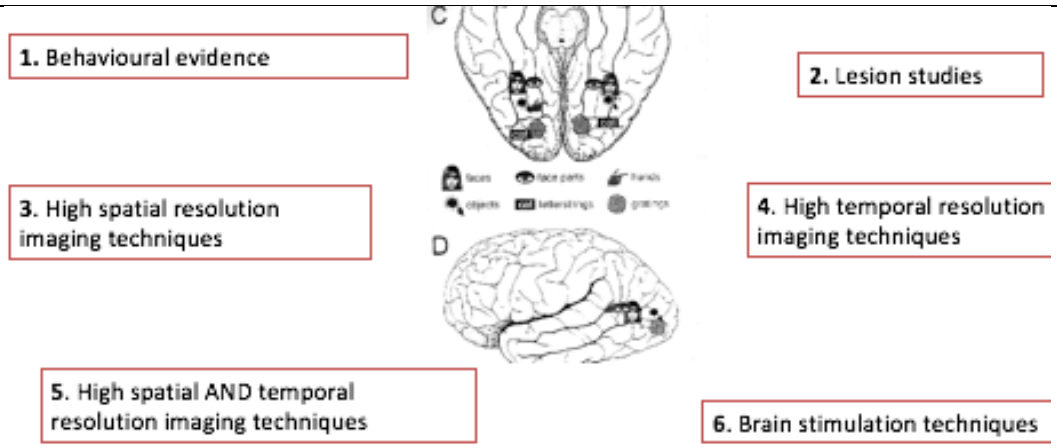
An introduction to the main methods used in cognitive and biological psychology/cognitive neuroscience, including behavioural experiments, neuroimaging and neuro-stimulation techniques

Resolutions

Temporal resolution (TR) refers to the precision of a measurement with respect to **time**.

In terms of digital images, **spatial** resolution refers to the number of **pixels** utilized in construction of the image. Images having higher spatial resolution are composed with a greater number of pixels than those of lower spatial resolution.

Often there is a trade-off between the temporal resolution of a measurement and its spatial resolution.



Behaviour Studying

The experiment: scientist DOES SOMETHING and then MEASURE the consequences.
True experiment has to have manipulation by the experimenter.

Variables in Quantitative Research

Independent Variable (**IV**)

- presumed to cause changes in another variable
- often variable **manipulated** by the researcher

Dependent Variable (**DV**)

- the presumed effect or outcome of the study
- variable that is **measured** by the researcher and influenced by the IV
  - behaviors, attitudes, feelings measured through tests, monitoring, questionnaires, number of items recalled on memory task, reaction time, EEG data

Are changes in the **IV** associated with changes in the **DV**?
Does **amount of alcohol drunk** affect **ability to drive safely**?

The issue of Causation

Causation

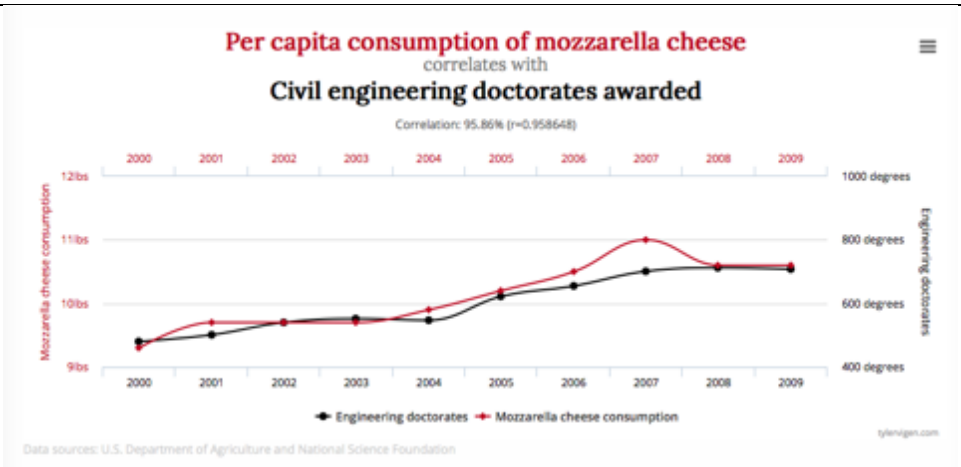
- a condition in which one event (the cause) generates another event (the effect)

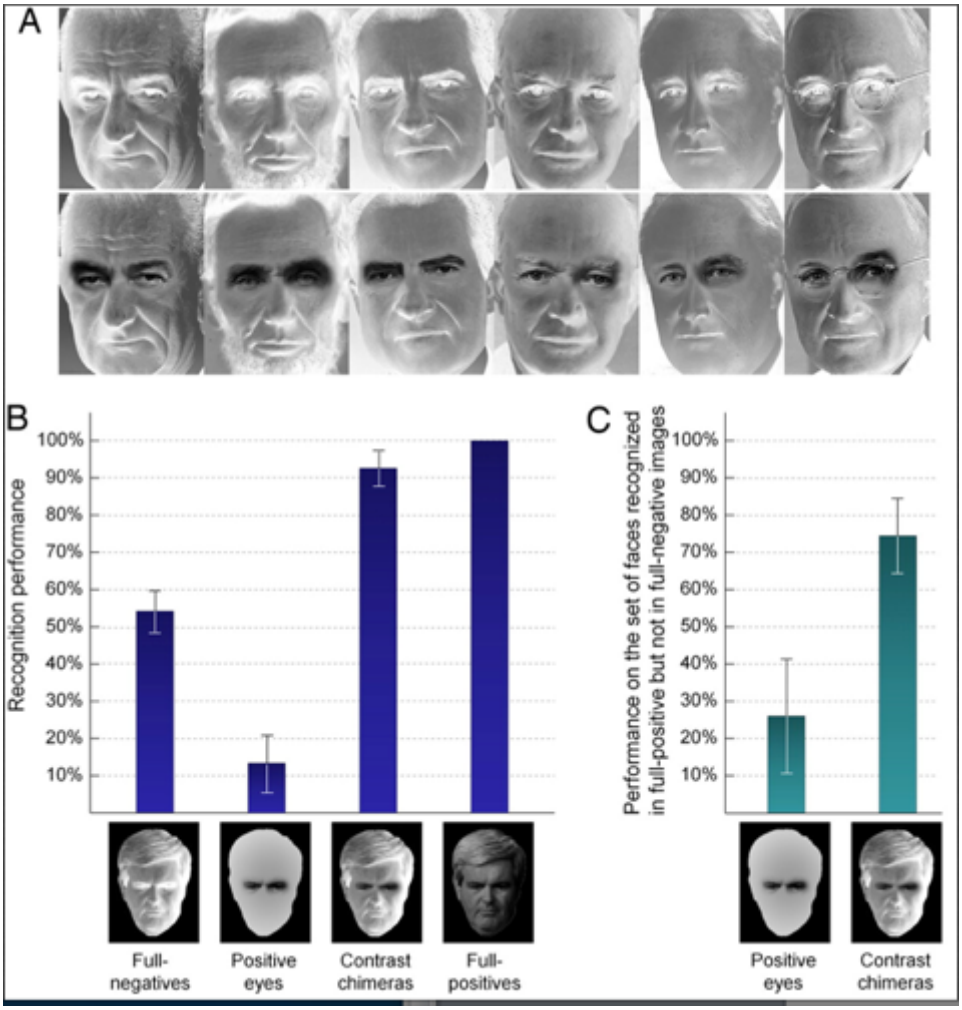
Criteria for identifying a causal relation

- cause (IV) must be related to the effect (DV) (relationship condition)
- changes in IV must precede changes in DV (temporal order condition)
- no other plausible explanation must exist for the effect

What's wrong with just measuring things?

Correlation cannot prove causation


Per capita consumption of mozzarella cheese
correlates with
Civil engineering doctorates awarded
Correlation: 95.86% (r=0.958648)
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
12lbs
11lbs
10lbs
9lbs
Mozzarella cheese consumption
1000 degrees
800 degrees
600 degrees
400 degrees
Engineering doctorates
Engineering doctorates
Mozzarella cheese consumption
tylervigen.com
Data sources: U.S. Department of Agriculture and National Science Foundation

Methods in Biological and Cognitive Psychology	**The experiment** The experimenter/scientist DOES SOMETHING and MEASURES the consequences • **DOES SOMETHING** = manipulates the IV • **MEASURES** the consequences = measures the effects on the DV
Facial Inversion effects, Thatcherised Faces Thompson (1980) 	Facial inversion effects imply orientation sensitive processes that are specific to faces as opposed to other classes of objects. The Thatcher effect or Thatcher illusion is a phenomenon where it becomes more difficult to detect local feature changes in an upside-down face, despite identical changes being obvious in an upright face. It is named after the former British Prime Minister Margaret Thatcher, on whose photograph the effect was first and most famously demonstrated.
Photonegative faces Gilad et al., 2009	Eyes with normal "shading" are crucially important to recognition, but only when in the context of the overall facial feature configuration
Contrast chimeras	positive eyes, negative faces. This explains something about the eye region, but only useful with rest of the face showing. 
	Johnson et al (1991) • Infants 30 minutes old • Measured "tracking" of by waving a bat with different stimuli • Young infants prefer face stimuli, follow by scrambled up bat, and not interested in blank bat