classmate
Date
Page

3/1/'20

IBM Synapse

→ Topics: 1. Effect of substance abuse on the brain
2. 5 senses (how the brain knows what you felt/tasted/etc.)
3. Language, speech, vision, motor functions
4. Memory, emotion, cognition, conciousness
5. Parts of the brain that aid survival (older parts)
[survival instincts, reflexes]

Brain v/s mind (duality)

Brain-dead ⇒ No EEG signal / signal from only one part
[observed over a long enough period of time (45 days)]

→ Does the need to eat originate in the brain? Yes

[Diseases that originate in the brain; current research about overcoming them (?)]

→ Books by Oliver Sacks [cases about people with something wrong with their brain]

→ Anna's problem: Can read individual letters but not words, music sheet, etc.

→ Neuropsychological tests: Visual percept^{n} (recognizing drawings)
Verbal fluency

Anna couldn't recognize objects

PET scan (Positron emission T) showed lower activity in posterior Visual cortex (on left mainly) things on right
↳ so couldn't see

→ Howard Engel's problem after a stroke:
After writing, cannot understand/read what he has written.
[So maybe the part of the brain that's responsible for reading, and the part ~~that writes~~ are different for writing]
→ Did not have problems in reading sheet music

⟹ Research on the brain:
1. smallest brain — worm (same species) (needed ~ 30 yrs to figure out how it maps to the behaviours of the worm)
↓
connections between neurons

epilepsy: abnormal, fast firing of neurons

2. brain of a housefly
[why study it? Because fundamental working of a brain is probably the same across species] (?)

3. 86 billion neurons in human brain

⟹ 5 unsolved mysteries about brain:
what is the brain made of? (Difficult to study a dead brain)
How does the brain change in disease?
(alzheimer's, multiple sclerosis, etc)
How do neurons talk to each other?
[Can model as an LCR ckt]

How does the brain compute?

What will it mean to understand our brains?

Top unsolved topics in neuroscience
1. Perception
eg: how doe you distinguish between good & bad smells? → Your brain has been taught to distinguish
2. Consciousness
3. Learning & memory
where is the information stored
4. Neuroplasticity
eg: writing with the hand that you don't usually use for writing
5. Development & evolution
6. Cognition & decisions
7. Language
→ role of multilinguality in the growth of the brain

HW: Interview w/ Dr. Eric ~~Randel~~ Kandell

'Golden time' for brain growth: 2 years old [need good nutrition at this age for cognitive abilities to develop]

[Project topic]
→ Pregnant woman / child / father being affected by Lead
(cognitive abilities are affected by exposure to lead)

10/01/2020

→ Perception: You try to match/map what you see/hear/feel (perceive) to something you have experienced in the past

→ Can you predict the future if you have no knowledge or experience?

difficult from neuroscience aspect, studied in philosophy mostly

Where does the model (which makes predictions) even come from?

→ Brain area for memory: hippocampus

Thoughts: Cognitive structures formed from memories

⇒ Dreams:

→ while a person is asleep, 'cleaning up' occurs in the brain → firing of neurons, synaptic activity is reduced, and plaque is removed
↳ ions can turn into salts, or plaque

→ Even though different people have the same brain, how do they all think differently? (

melanos... (?) cells → you feel sleepy when they slow down (come down to their original energy band)

If constantly exposed to light, will continue to remain active

⇒ Sleep-walking: → motor actions occur properly during sleep

[* multiple-personality disorder]

→ Phantom limbs:

Started w/ soldiers involved in war

even though the limb isn't there, can still feel pain

propioception — being aware of where the parts of your body are

[since your brain has known for a very long time where different parts are, it takes time to rewire the brain when a part is suddenly missing]

↳ because you spend many years using that part,

eg: using hand to write

→ If prosthetic limb attached before brain rewiring occurs, helps in controlling it

Saying 'female brain' is derogatory, say 'brain of a female'

→ Neo-frontal cortex is the most evolved part [part of frontal lobe] → this is where thinking takes place

→ total 4 assignments

~~Human~~ Evolution occurs on the basis of what is used/needed [that remains, the rest goes]

17/01/2020

How do you store language in your brain?

→ Assignment 1: Choose 2 research papers on a topic (can ask TA for help)
(don't get into psychology / philosophy much, focus on neuroscience)
[Write summaries on both papers]
→ what were the researchers looking for
how they did it
what did they find
[don't need to bother about details of techniques like fMRI]

eg: How the visual system perceives colour

✳ CNS & brain:
→ A cut in a nerve → you lose sensation there
bright light → ~~darkness~~ ⇒ pupil contracts / constricts [parasympathetic] [it's a protection mechanism]

avg. size of pupil ~ 4.5 mm upto age 40
→ After that, it's about 2.5 - 3.5 mm
So it's difficult to see in the dark when you're old (because less light can come in since the pupil size is small!)

sympathetic → dilates pupil

⇒ Parasympathetic signals come somewhere from the bottom/base of the brain, whereas sympathetic signals come from base spinal cord [need to be fast for reflex actions]

You can view the brain as a sort of electronic ckt, where you attach electrodes at different positions and measure ΔV

⇒ Brain Structure:
Humans: non-invasive analysis

Brain tissue has: 1) Gray matter (all neurons firing & other fns performed by this part) (→ doesn't look gray, unless you use chloroform)
2) white matter (connects parts of the brain to each other

→ Occipital lobe (has visual cortex) at the back of your head
Temporal → auditory system

→ Eyes are at the base of frontal lobe

⇒ Is there a 'map' in the brain corresponding to different parts of the body?
[Each part being controlled by a particular part of the brain] ← Cortical localization

Read: A little man of some importance

→ How do painkillers work?
If there's pain, the constituents can make their way to the part where it hurts [There's a sort of potential difference created which helps it go]

→ How does the brain distinguish between physical pain & emotional pain?
there's also an in-between, you see someone get physical pain and you 'feel' pain [the brain area is the same] → 'mirroring'

HW: Watch ① video on how charge is [Sodium & K ions] transferred across neurons [how neurons work] for next class

electrochemical activity slide → 'little man' in ppt : Size of each part of the body corresponds to how big the corresponding part of the brain is (the part which controls it)

→ After a stroke, the tongue is the 1st part to lose sensation

→ Ancient Egyptians could remove the brain through the nose while mummifying a dead person

[Remember all the terms on the slide w/ a structure like this]

Types of neurons:

→ Electrodes used on the brain → negatively charged ends of neurons → positively charged

Unknown: If neurons hold information, or gray cells do [and neurons just transmit info]

→ Brains ~ Computers

Brains → 'graded' ⇒ not a binary threshold, (if) can keep varying on a continuous range (threshold)

Brains → 1000 ops/sec ⇒ 1000 neural firings / sec

* Electrochemical activity: → video

→ HW ② Epilepsy slide video + multiple sclerosis video

De-myelination (Multiple sclerosis)

→ Myelin sheath ensures there's no discharge / loss of charge

In multiple sclerosis, the myelin sheath degenerates, so charge can be lost from the nerve fibre [axons]

→ people suffering from this lose sensation, and also often memory

→ One way to treat: Using stem cells

→ Gray cells are not regenerated [It's not like skin grafting]

→ Epilepsy : Problem in temporal lobe [slide: colourful representations : from EEG scans]

→ Every time a neuron fires, it needs a lot of oxygen So after an epileptic attack, the person would feel very tired

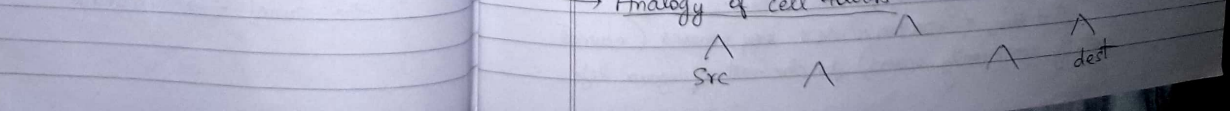
ADHD medicine → slows down the activity in your brain → Sometimes it can cause epilepsy

21/01/2020

→ how does a neuron know that it has to receive / send a signal?

→ Chemistry has the ans

→ Analogy of cell towers:



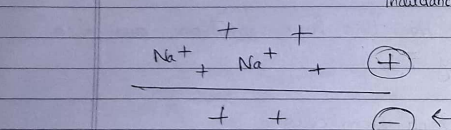
myelin sheath protects from radiation

How does signal go from src to dest

→ A stimulus causes neurons to fire above a certain threshold, and the signal travels across to other neurons

Can view neuron as an LCR ckt

inductance (represents a load)



← Just because there are fewer +ve ions here, you can consider this as negative

→ Connections between neurons are temporary (they connect when they need)

As we age, white matter degenerates (also does in Alzheimer's)

⇒ Dopamine → both inhibitory & excitatory

→ There are non-myelinated neurons in peripheral NS & basal ganglia (signal is high anyway so don't bother about insulation)

→ Where did electrical signals in neurons start from? (How did the very first neuron start firing, the one which started the whole chain?) → Unknown, but the very 1st one starts firing around 6 weeks of gestation (neural activity starts very early in life)

And then, it CONTINUOUSLY remains (neural activity continuously occurs) for the rest of your life

(?) There are Cl^- ions in neurons too

Pain relievers: there's more blood flow in parts where there's pain, so the chemicals go to those parts (can find their way there)

→ when you watch something / think of something / do that something yourself, the same area of the brain is activated in all 3 cases

Experiment: Choose an action that looks very complicated,
① view it, and do it immediately after
② memorize it in your head after viewing, and then do it

→ It's not always a synapse between tail of neuron's axon & dendrites of another (that's an electrical one, dendrite-dendrite). There's also a chemical synapse when the tail touches the middle of another neuron's axon.

⇒ Action potential:
When Na^+ channels open, depolarization occurs.
[Difficult to measure action potential on axon, you can measure on dendrites]

* Neurotransmitters:
They are indicators eg: to indicate you're hungry or in pain

→ Artificial neurotransmitters are available (ones which are artificial dopamine) → narcotics?
If you take external drugs, your body will stop generating neurotransmitters naturally on its own.

inhibitory : slows down your system

(Black sabbath lead guitarist : drugs + binge drinking → lost most of his memory, but remembered singing & playing guitar)

→ If there's an imbalance of serotonin, sleep cycle is affected

Gaba – can be used as suppressant

Dopamine — major focus of studies cause of link to depression

→ Excessive activation (NOT production; it's already there) of norepinephrine → leads to anxiety

→ CSF (Cerebral Spinal Fluid) ← can measure lvls of neurotransmitters in this.
→ Can also measure dopamine, glutamate in saliva (anything else?)
↓
2 main ones studied in Neuroscience

→ What causes a seizure?
Too much inward Na^+ & Ca^{++} currents
(medicines can balance these, but the effect is temporary) → the ones available can't 'cure' epilepsy

Study EEG for next class

24/01/2020

EEG device manufacturer: Emotiv

→ electrical signals measured by device : come from synapses, dendrites
(small electrical field)
↑ V [microVolts]

HW: Learn to use EEG

→ Watch video on EEG on sleeping children ↳ to check sleep cycles

BCI interface [Brain Computer Interface]

artefacts in signals

CSF is like a coolant for the brain

[There's also machine learning for BCI; a lot of training involved]

→ 5 channel device → you get 5 channels (waveform-like)

→ Action potential → occurs along axon → not measurable by EEG usu.
EPSP is measured by EEG ⇒ in synapse between 2 neurons

→ There is 1 amplifier needed for EACH electrode
industrial-grade

→ electrode measures change in potential

→ dura mater causes lots of noise (compared to other parts)

→ Occipital lobe has visual cortex

→ The amplifier works like an OR gate
If 2 electrodes give same signal ⇒ either lot of activity in region, OR, both electrodes shorted

P600 → Takes 600ms to get response (signal) to language

→ photic stimulation : stimulating eyes

AED → drugs used for epilepsy

HW: EEG – brain development video

(next class: visual systems)

etiology → cause (where the dysfunction occurs)

→ small & deep lesions can be detected by MRI

Limited time sampling is not a problem in modern EEG devices.

intoxicating substances → remove inhibitions

⇒ Intracranial EEG: Used for Parkinson's

They open the skull, keep electrode patch inside, and stitch back the opening.

Whenever the person has uncontrollable movements, sending an impulse to the electrode stabilizes the movement.

videos:

[Duke uni, UPenn,
EEG for alcohol & drug abuse,
epilepsy,

* Visual system:

eye to brain; perception & visual system

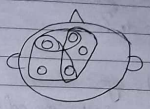
The gold & white / black & blue dress

→ Perceptions are different; how perception works is unknown

Is visual perception independent of the visual system?

→ Shadows change the way in which we perceive colours

* Each amplifier takes signals from 2 electrodes, so that it covers different (but close-by) areas of the brain, because we don't know where the dendrites are [Can also take from 3 electrodes, and then average]



[maybe if taken from only one electrode, maybe it doesn't contact any dendrites, so hardly any signal]

→ Potential project:

28/01/2020

Differences in the way people from West & East think

a simple stimulus shown to people in experiment eg: ↑ ↑ ⇩

Westerners: arrow pointing upwards (more analytical)

Easterners: 2 arrows are parallel (more within context/holistic)

[more contextual way of thinking, linking objects to contexts]

→ Narrative format of learning/analyzing

eg: See a tree within the context of where it grows, its surroundings

→ Early greying of hair: caused by stress (it induces neo-adrenaline (?))

→ Animals are very sensitive to colour

→ You don't need both eyes to perceive depth, one is enough (by tilting head)

→ Where does biology of understanding visual system fail? → How perception works

Where are perceptions processed? In the eye, or in the visual system inside?

→ Biological structure of eyes

imp. structures: superior colliculus (for reflex actions)

LGN (read about it)

optic radiations → like fibres

→ something from left eye goes to right brain and ~~something from~~ right eye goes to left side of brain (nerves)

→ for co-ordination between L & R → they both meet at the visual cortex

helps to distinguish between colours, textures, etc. ["it's a layered structure, has a layer for each of in colour, texture, etc."]

connects spinal cord to upper layers of brain (to detect fast movements)

normal blindness → retina cells damaged

cortical ~~blindness~~ → the eye is fine, but brain cannot see

cones → cells in the eye responsible for colour

fovea: area on retina where information has to fall, for you to process it

blind spot: disk, which connects to rest of the brain (no photo receptors there)

→ 3 quizzes after mid-sem (will be allowed cheatsheets)

→ 1 mid-sem exam: will get research papers → Qs based on them

→ 'Pathway to visual cortex' slide: if any problem in lies on path from the start of optic nerves upto occipital lobes (either) ⇒ cortical blindness

→ Very first experiments on eyes were done on cats (and then mice, monkeys)

→ Testing babies' reflex action a few months after birth [Check if peripheral vision is fine, along w/ other things]

→ Can detect eye-lvl blindness very early in children

→ Light needs to fall on an object for the eye to see it

working of an eye ≈ working of a camera

→ Some animals like reptiles, frogs, have better visual systems than humans

↳ needed for survival

→ many animals cannot see static images, but can detect movements (changes in light)

auditory system is extremely good in visually challenged people (brain compensates for lost f/n)

Retina layers:

→ Light goes to the back of the retina (that's where photo receptors are) and it is then reflected back

→ EMG: muscle sensors (pot. pro.)

(how the brain identifies type of smell)
↓
cell sensitivity
(some people → more sensitive)

31/01/2020

(odorless gases are more dangerous)
→ can't smell, but cells react to it (gasping for breath)

? → Michael Hutchinson's paper (how body reflexes occur in response to something you see)

SLSC → superior layer

_ _ _ _ ? Is for quick reflex actions (run, do something quickly)
(SNPR, SNPC?) ↓ survival instinct

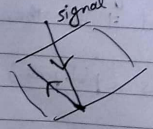
(reticular formation)
RF → tells you what the object actually is
spinal cord → for movement

→ Role of dopamine in reflex actions
↓ Parkinson's → reflex actions affected → dopamine levels low
- crucial for movement
- neurotransmitter for reward mechanism

→ EMG sensors available

→ superior colliculus → (midbrain) deep in the brain, close to spinal cord

→ Info from reticular formation is sent to all parts of brain

Retina:


→ Cheatsheets will be provided during exams

one potential project: 1000 different hues available (study on colour perception) (physical boards)

→ rods & cones in the retina
↓ colour differentiation; rods also influence colour to some extent

→ functioning of rods & cones
→ colour deficiency
→ adapting vision in darkness

→ cones are less sensitive in dark

colour - different people : Some imbalance in RGB ratio

→ rods work in the dark, useful for survival

→ some animals see better in the dark / better colour vision
→ they have a different distribution of rods & cones
→ photosensitivity of cells different
[depends on what the creature needs, & doesn't need → goes away through evolution]

⇒ Retinal receptive fields:
light on ganglion initiates action potential (if light good enough, threshold crossed)
↳ everything that hits the eye needs to go through this process
[L to R, and then again back from R to L, to the brain]

→ ganglion & bipolar cell functionality
↳ to understand why it has to go to photoreceptors & come back

HW: Read Hubel & Wiesel's paper → for exams

white & bright yellow → wavelengths close by
→ difficult to distinguish

Hubel & Wiesel: Put electrode on a cat's V1 area to check for orientation sensitivity
(black image with small white strip of light moving around in some direction)
→ (video) HW

V1, V2, V3, ... ⇒ areas in visual cortex

→ They mapped the V1 area of the cat (learn the architecture of V1 area)

Orientation-sensitive cells are needed to understand at what angle something is coming towards you

Function of V1 (simple cell) slide:
when the light stimulus is moved downward, cell stops responding (like gates)

hypercomplex:
4th diagram ⇒ light is way off → no signal
2nd diagram ⇒ good signal

→ bipolar cells (between photoreceptors & ganglion cells)

off-center & on-center RGC → signal processing

small sharp ray of light → high response
[The light is the stimulus]
↓
white part

circularly polarized → can see light in all directions
humans → not polarization-sensitive

action potential
how a synapse occurs

retinal ganglion cells → do edge detection

an experiment:
person sees something → you record neural signals
If you examine signals, can you find out what the person saw?
(not really)

what pathway → what you saw → ventral (lower part of brain)
where pathway → where you saw it → dorsal (upper part of brain)
↓
if something goes wrong here ⇒ cortical blindness
(can't understand what it is & where it is)

mid sem: slides + research papers

project: eye-tracker, pulse recorders, 5 channel & 14 channel EEG available
→ Sleep, yoga w/ EEG
(EEG good for temporal measurements)

04/02/20

→ Auditory & visual i/ps compete for the brain
Closing your eyes (stopping visual i/p) heightens auditory perception
[potential project]

song → [Sting]

→ an experiment done: reading + listening at the same time → there's a conflict
only listening → more immersive experience
[UC Davis]

[good cinematographer wouldn't mix complex visuals w/ audio at the same time]

Feature-based pathways hypothesis

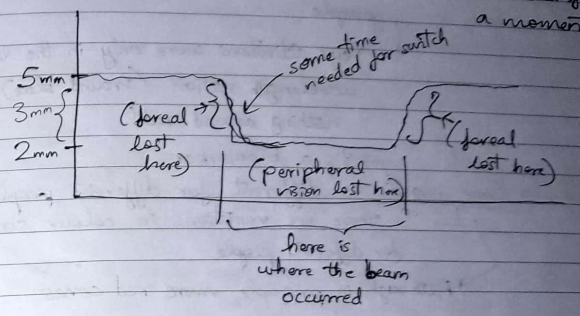
Color Form in LGN is broken into color (stored separately) & form (of the object; stored separately) → stored in V1
→ about features that you extract from an image how are sent to different parts of visual cortex

→ motion information goes to motor cortex so that you can react quickly to danger
→ motion is processed faster, because when you sense danger, you won't care about color or form

→ Cone/rod sensitivity
Too much / too little light: Cannot easily tell what the colours are

cones & rods → important

⇒ driving in the dark → suddenly see a beam of light → switching from rods to cones → blinded for a moment



As you age, time needed for switching increases

⇒ Distribution of rods & cones:
(vision field of → left, right, common to both)

diagram: small spot pointed to by arrow is the fovea
→ only about 10° of parts

400nm (short wavelength) → blue

→ why do we see light of only 400–700?
→ Energy levels there are high
→ Certain photoreceptors in the eye are sensitive to that range

purple = red + blue
(on opposite sides of spectrum!)
So, blue & red cones should be activated

But, we perceive purple as a distinct colour
So there should be separate cones for purple
↳ eye activations were only in the lower wavelength section (around blue), nothing around red!
↳ it's a biomarker

→ Cone mosaic is different for different people
↳ So there are variations in colour sensitivity for different people
↳ Although, in principle, more red cones

deuteranomaly : green affected, but red also slightly affected
protanopia : higher wavelength cones don't work/ not there

→ LGN has colour, form, motion & depth info
(an area of brain which is like a black box, its working is not known).

[Image → eye → LGN → V1 → rest of the brain
↳ feedback to LGN?

→ magno & parvo → skipped

V1 structure → videos

→ higher cortical areas : V2, V3, V4....

→ kind of stimulus used
→ about participants
↳ look for brain map w/ detailed labels)

* Visual agnosia:

'agnosia' : problem w/ recognizing features

associative agnosia : can't recognize an object though you can see it

(video)
area of brain that recognizes faces is separate from area that recognizes objects
[fusiform??] agyrus → (nice MIT paper)
↳ it's a special area that's meant only for recognizing faces (it exists perhaps because recognizing faces is important for survival)

(next class: all kinds of agnosia)

11/02/2020

→ How quickly can you adapt to viewing in 4 directions?
(spy glasses game)
Children can adapt very fast
We adapt to things if we feel afraid that we need to
(neuroplasticity)
(eg. experiments for adapting : walking in darkness, writing w/ non-major hand)

→ apperceptive → about extracting features (eg: strap, zip, it of a bag)
associative → attaching a meaning (its a bag belongs to someone, contains something)

→ Can't recognize faces if shown at a different angle / profile? (not all)
Plasticity occurs for some people; the other hemisphere may take over

HW: videos on face blindness

Someone w/ apperceptive ag. can remember meanings/ associations, but cannot comprehend minute features

→ Face memory is different (Hippocampus is involved for past memories, long time (including past faces) back)

→ People w/ face blindness cannot recognize their own face (3 stages)

→ occurs across a spectrum (may lose ability to extract features OR remember whose face it is OR understand that it's a face in the 1st place)

(?) uncan..... → a computer-generated face that looks very realistic

brain

→ table: injury patients; not developmental problems
next table: treatments used

→ hemispatial neglect in Alan Burgess:
ignored stimuli on his left (sounds, objects, ...) (neglected)
↳ not that he couldn't see/hear, his ability to pay attention was messed up

→ object-centered: can't see left of object
object & location: can't even see object on the left

But when given a reward, could perform better

'left' ⇒ to the left of your center of your common vision

→ There were no problems w/ eyes / ears

figure b): white region is a lesion

dorsal → top, ventral → bottom
→ assoc. w/ 'where' something is; → associated w/ 'what' something is

→ apperceptive is bilateral (affects both sides)
(flowchart: next class)
(notice: colour coding)
↓
(If red region affected, facial memories affected)

(Making a bot recognize people (even through a disguise) voices & gaits (even if you keep a pebble in your shoe & walk))

14/02/2020

→ Why study visual metaphors? Applications?
⇒ Desktop icons, desktop itself, close button on windows → all are metaphors
⇒ Metaphor identification in tweets (people who don't understand them take them literally)
Generally, a metaphor is used for comparing 2 ideas

Metaphors are culture-specific (eg: sun)

A metaphor may become a literal sentence depending on the context (if there's a referrant/reference)

In logic, the truth value of all metaphors is false. (Will become true if you find a reference; it becomes a fact then)

→ diff between metaphors & similes
(is) (like)
↓
Basic linguistic structure : X is Y

→ novel metaphors : where the referrant is unknown
(you don't know what the metaphor means)

Theories behind metaphors:

1. Comparison (like previous page)

2. Anomaly theory
eg: "this person is so nice I want to put him in a glass" (idea: preserve the person)
sounds anomalous

→ If there's an incongruent sentence then EEG gives N400 signal [will get a negative signal after 400 ms]
(eg: I ate a guitar)

N400 signal → semantically anomalous
→ positive

3. Interaction theory
Make sense of it based on your interaction with the sentence, which is based on your own experiences & imagination

4. Conceptual theory
Metaphors are not just linguistic, can put them in any form, like pictures
(modality)

The font used for text is also a visual metaphor
(eg: happy font, scary font)

→ There's no grammar for reading images

Stroop effect : conflict between processing text & visual info

→ the bandaid & pearly whites eg. → these are hyperboles not visual metaphors
(Because the properties are same → shining teeth & shining pearls)

depends on interpretation which depends on context

No MCQs 18/02/20
Will get cheat sheet
No questions on visual metaphors (guest lecture)

* Bálint's syndrome
→ A problem in dorsal stream
→ There are bilateral lesions
→ video of person who is unable to see (perceive) something at a depth, and can see something if it's moving (not when it's static)

(attention blindness : a normal thing; a person misses an object right in front of them & searches for things all around
→ not cause of any brain damage)

(?) what's early perceptual encoding?

Blue 'did not see face' curve → happens for prosopagnosia

→ Each face shown only for 50 ms → enough to recognize a face

* Visual Agnosia (cont. from previous lecture ←→ RGB encoding)

problem w/ association : you can see face of a person, but cannot recognize them

red → inferior temporal lobe
blue (at the back of the brain) → unable to do FFA (extract features from face)

(dynamic → extracting info from movements
static → extracting static info like how facial features appear)

(static & dynamic encoding done in 11 Oct)

* Spatial Disorientation :

can't remember where you saw something

→ monkeys are very good at spatial recognition, better than humans (needed for their survival)
(humans don't need for survival, so lost ability to do it as well)

Monarch butterflies → Mexico to Canada (7th gen reaches there and comes back

optic ataxia : don't have depth perception
→ no correction for this, although research ongoing

→ Testing children for these deficiencies when they're just born

glasses made by students from

* Motion Perception :

Estimating velocity at which something moves is done within nanoseconds by brain

what brain does:

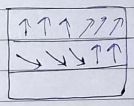
video : 1) try to match the movement to our own movement
2) connecting the dots to figure out a human figure

→ purpose of perceiving motion : survival

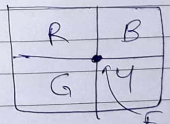
biological motion → for extreme survival

(slide w/ pattern)

the theory of direction-selective responses ..... related to LGN



motion aftereffect: look at water flowing then look at grass → would feel that grass is moving for a bit



Focus on the dot, if the colours are removed, you'll see their complementary colours

3 quizzes after midsem: mcqs

No motion perception for mid sem

Long form questions (no trick Qs like in game design)

→ apparent movement eg: diwali lights

Why don't we see motion when we move our eyes? Brain knows that I'm the one who's moving

how? explained by cor..... discharge theory

imp

[Portion: all slides till motion perception
biological motion]