

What is consciousness?

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<https://www.menti.com/ali588ygv46m>

Consciousness

What is it?

Table of Contents

Presentation (**45 min**)

- Celine
 - The Evolution of Consciousness
- Nawid
 - The Easy Problems of Consciousness
 - The Hard Problem of Consciousness

Discussion Round (**30 min**) (split into groups of ~5 and discuss questions)

Final get together (**30 min**) (discuss insights from the smaller groups in the large group)

***Science itself is not absolute.
But we love to talk in
absolutes!***

Important definitions

Consciousness

vs

Sentience

vs

Cognition

Consciousness

- literature: range from panpsychism to only humans
 - here:
 - advanced nervous system that allow sth to experience life
- awareness
- film of life

- awareness of self?
- free will?



Sentience

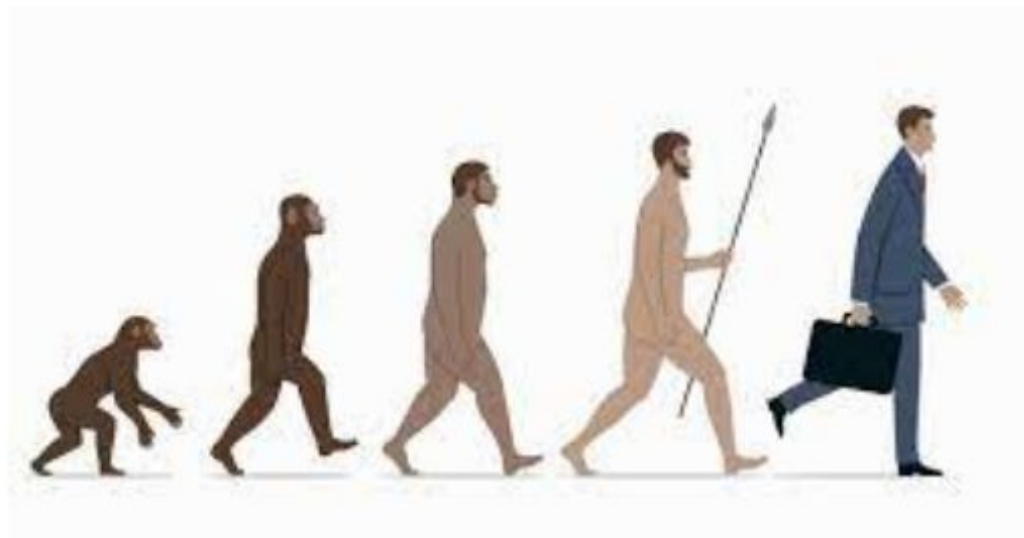
- humans that are conscious have feelings
- **feelings:**
 - experience with a positive or negative prevalence
 - ➔ **reward + punishment**
- **animals:**
 - consciousness + feelings
 - ➔ **sentient**

Cognition

- **definition not clear**
 - any form of neurological process
- **here:**
 - conscious process
 - where thoughts supplement feelings
 - in the process of finding the right action based on knowledge and intelligence

→ **flexible responses to input**

***Nothing makes sense but in the
light of evolution.***



The brain and consciousness

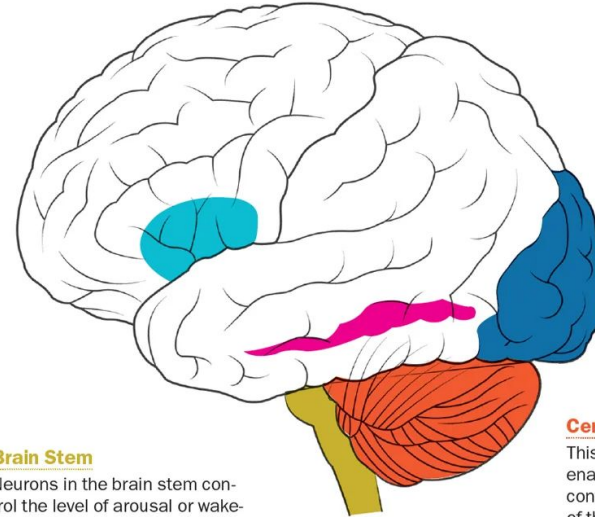
- **consciousness depends on**
 - many neurons linked together in
 - capacity for continuous back-ar
- **cerebellum**
 - 80 % of brain neurons, but not c
- **most interconnected neurons**
 - cortex and forebrain structures
- **long-distance nerve fibers in sepa**

Broca's Area

In 1861 Paul Broca discovered a small region at the brain's surface that is responsible for producing speech.

Occipital Cortex

Visual information about form and motion gets processed in this area at the back of the brain.



Fusiform Gyrus

Parts of this structure play a critical role in recognizing faces, among other visual tasks. Damage to it causes face blindness.

Brain Stem

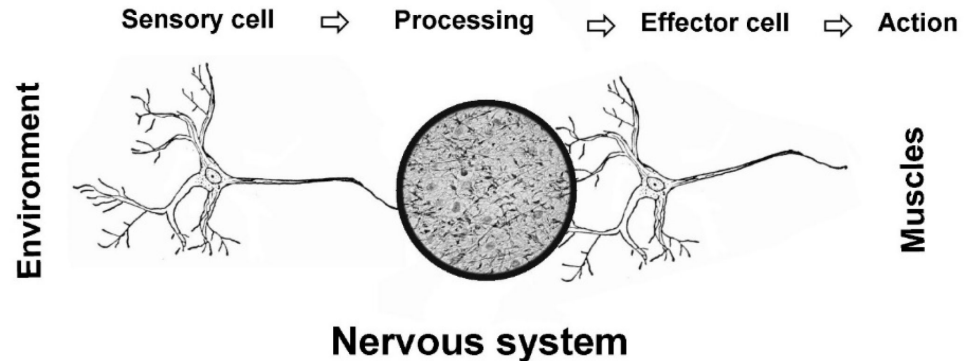
Neurons in the brain stem control the level of arousal or wakefulness. If these do not properly function, the patient lapses into stupor or a coma or may die.

Cerebellum

This mini brainlike structure enables precise motor control. Lesions in part of the cerebellum do not appear to lead to a loss of conscious experiences.

Nervous systems

- **coordinated use of muscles**
 - survival (food, mating, body functions)



- **evolution**
 - simple nerve net → small aggregates of neurons (ganglia) → advanced, centralized brains

Evolution of nervous systems



Evolution of nervous systems

- **convergent evolution**

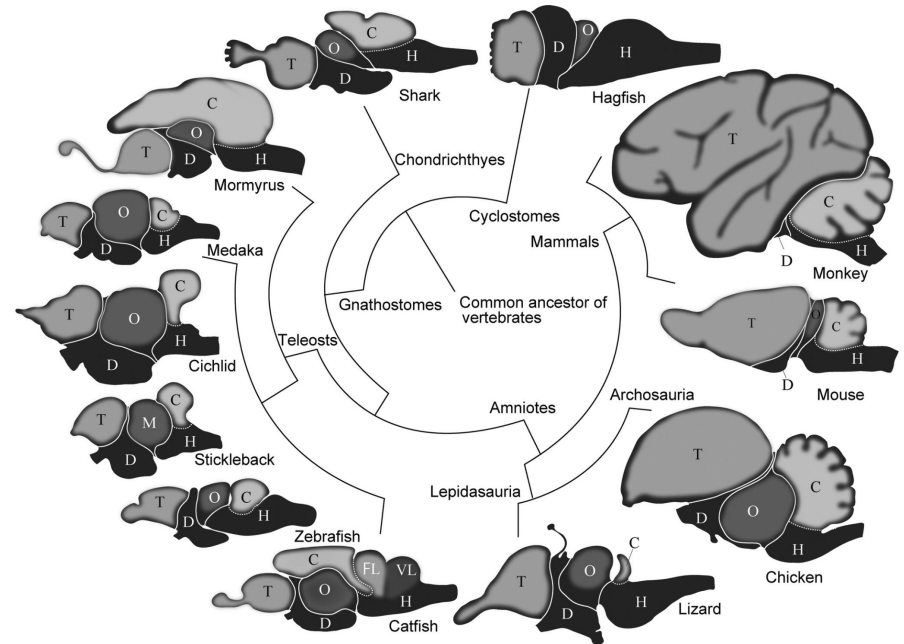
- simplest form of NS: sensory cells activate motor neurons/muscle cells

→ no processing

- Advanced NS only in bilaterians

→ only few show brain-like structures

→ **advantage:**
advanced processing
and coordinated response



Non-conscious algorithms

- **reflexes**
 - simplest form of behaviour
 - minimal processing
 - stereotyped responses
- **instincts**
- **learning, selective attention, conditioning**
 - next steps in evolution of NS
 - involve several consecutive procedures

Non-conscious algorithms

- reflexes

- simple

- multiple

- step-by-step

- instincts

- learning

- neural

- individual

Consciousness is the most versatile
but also the most expensive algorithm.

Disadvantages of consciousness

- **Arthropods (insects)**

- most successful phylum (biomass + variety)
- minute brain compared to mammals



- **Hominids**

- most evolved brain structure
- limited success until relatively recently (extinction of several species)



Disadvantages of consciousness

- **costly and slow strategy for decision making**
- brain (2 % body mass) needs 20 % of overall energy
 - Reflex: 20 ms
 - Perception of sensory stimulus: 300 ms
- focuses on one task at a time
- does NOT execute the decisions (e.g. talking vs walking and sleep walking)

- **no fitness-enhancing innovation**

Disadvantages of consciousness

→ costly and slow strategy for decision making

→ brain (2 % body mass) needs 20 % of overall energy

- Reflex: 20 ms

- Pe

→ foc

→ do

wa

Why did evolution install consciousness?
There has to be a distinct advantage!

d sleep

→ no fit

Disadvantages of consciousness

→ costly and slow strategy for decision making

→ brain (2)

- Re
- Pe

→ foc

→ do

wa

→ no fit

**Increased versatility and flexibility in
behaviour**

→ adaptability

→ finding solutions to novel situations

sleep

Role of Feelings

- **feelings**
 - behaviour based on negative or positive prevalence
 - versatile algorithm for lots of different situations
 - finding solutions to novel situations
- **weighing**
 - capacity to feel pleasure and pain
 - ability to experience



→ **feelings initiated the evolution of consciousness**

Vertebrates

- **consciousness in other mammals very likely**
 - similar brain anatomy, behaviour and feelings
 - signs of self-awareness (e.g. in apes)



birds

- brain structures and activity that are connected to consciousness
 - neuronal responses to visual stimuli comparable
-
- **consciousness is present in birds, mammals and reptiles**

Vertebrates

- **consciousness in other mammals**
 - similar brain anatomy, behavior
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birds

- brain structures and activities
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- **consciousness is present in birds, mammals and reptiles**

Vertebrates

- consciousness in other mammals very likely

→ sim

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birds

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**Transition from reptiles to birds (and
amniotes to mammals)**

→ increase in brain sizes

→ consciousness is present in birds, mammals and reptiles



consciousness

Why Amniotes?

- **consciousness is used in**
 - rapidly changing, unfamiliar, and complex environments
- flexibility of behavioral response
- 1. **Amniotes first colonized land**
 - large brains = advanced processing and algorithms
- 2. **Evolved lungs to breathe air**
 - more oxygen = more energy = bigger brain
- 3. **Novel habitat**
 - more variability in situations but also niches
- **flexible behavioural algorithms**



Conscious or not?

Sponge

incoming water is toxic

→ all the flagella stop beating



Mimosa pudica

touched in one spot

→ all subparts of the leaf fold

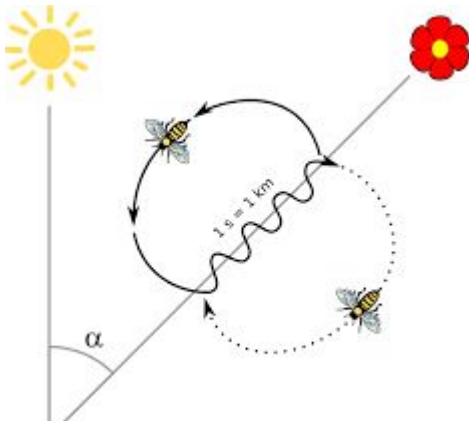


Conscious or not?

Honeybees

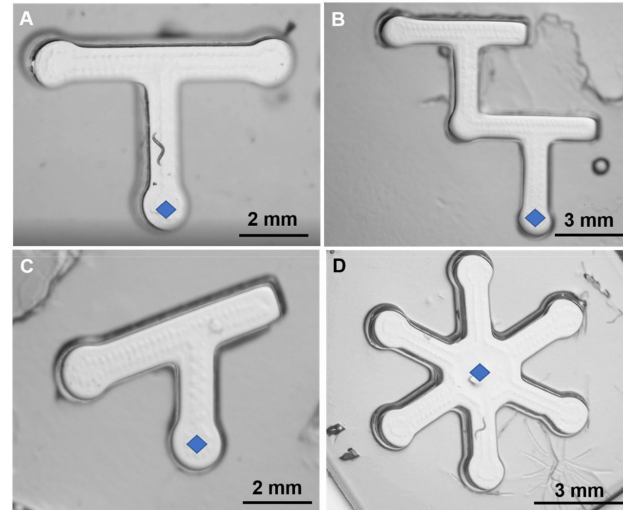
dance used to communicate the direction and distance of a food source

→ have dialects



C. elegans

learns how to navigate different arenas



Conscious or not?

Babies

Smile in their sleep

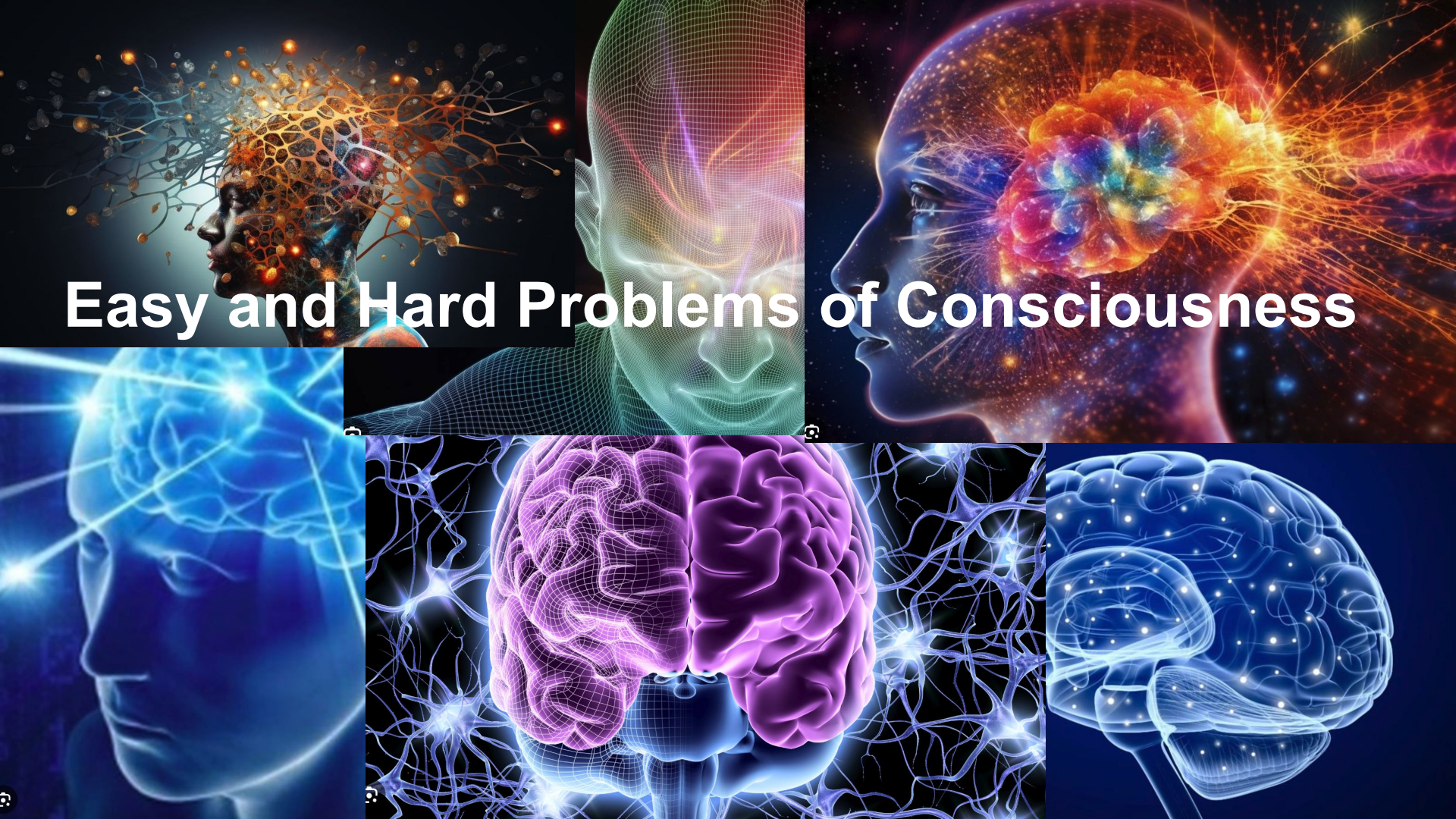


Octopus

Learn how to navigate mazes



Easy and Hard Problems of Consciousness



Blindsight

Caused by damage to the visual cortex, but not the eyes.

People with blindsight have **no visual conscious experience**.

They are better than chance in visual guessing tests.

They take no ownership of the ability to see, (lack of self-awareness).



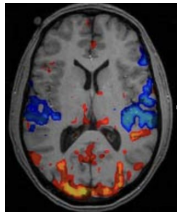
<https://www.jolyon.co.uk/illustrations/consciousness-a-very-short-introduction-2/>

Decoding Thought as **Language** through ML

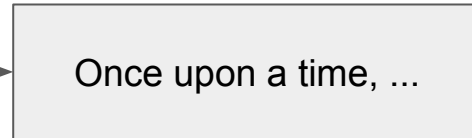
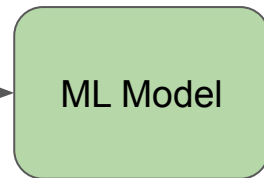
Volunteers listen to 16 hours of speech and brain is continuously scanned with **MRI**.

ML model **for each volunteer** trained to generate the respective text, based on MRI scans.

Volunteers are listening to new speech and the model generates the respective text.



Non invasive MRI scan



Decoding Thought as **Language** through ML Results

The decoder can predict what the person is listening to.

Actual stimulus

i got up from the air mattress and pressed my face against the glass of the bedroom window expecting to see eyes staring back at me but instead finding only darkness

i didn't know whether to scream cry or run away instead i said leave me alone i don't need your help adam disappeared and i cleaned up alone crying

Decoded stimulus

i just continued to walk up to the window and open the glass i stood on my toes and peered out i didn't see anything and looked up again i saw nothing

started to scream and cry and then she just said i told you to leave me alone you can't hurt me anymore i'm sorry and then he stormed off i thought he had left i started to cry

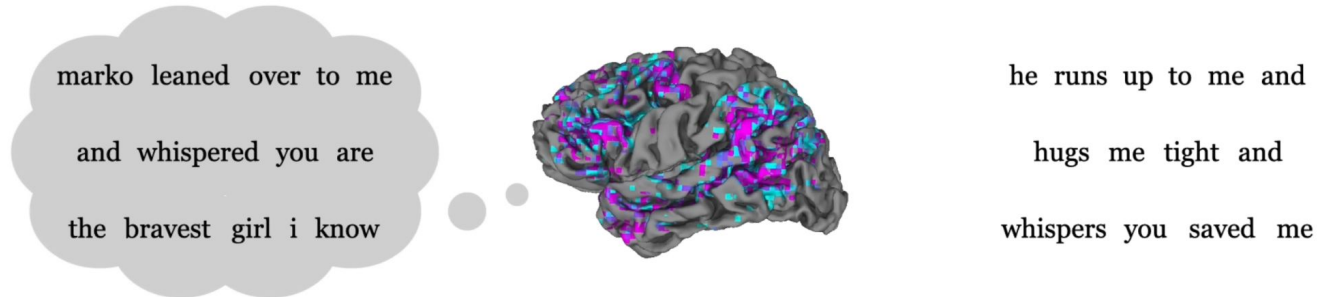
Exact

Gist

Error

Decoding Thought as **Language** through ML Results

The decoder can predict what the user is imagining

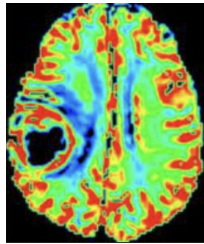


Decoding Thought as **Imagery** through ML

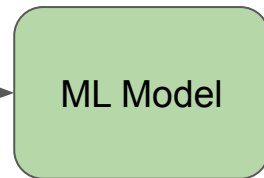
Volunteers are shown over 20.000 pictures and brain is continuously scanned with **MEG**.

An ML model is trained to generate the seen images, based on the MEG scans.

Volunteers are shown new images and model generates respective image **in real time**.



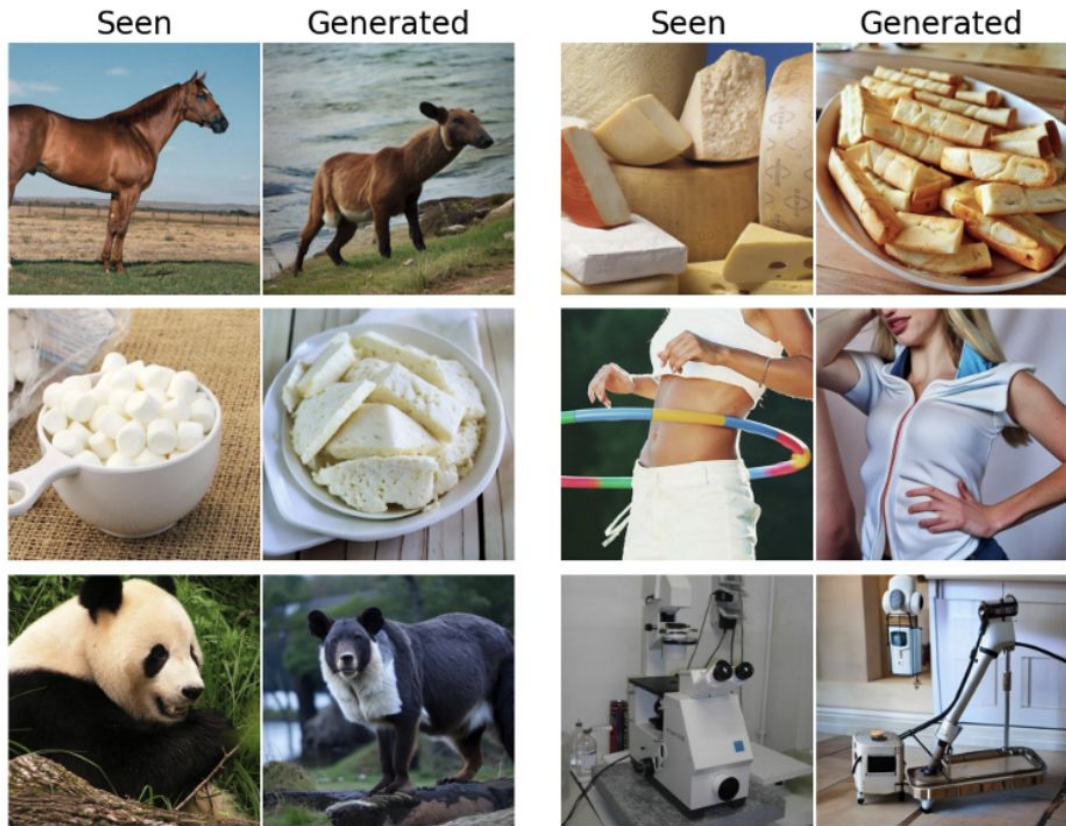
Non invasive MEG scan



Decoding Thought as **Imagery** through ML Results



Decoding Thought as **Imagery** through ML Results



<https://arxiv.org/pdf/2310.19812.pdf>

A Strong Case for Science

Assuming optimistic scenario for scientific progress, in the future it's very possible that:

We have complete understanding in the **evolutionary history** of consciousness.

We can identify **parts of the brain** required for **conscious experience** (neural correlates).

We can **identify thoughts** (language and visual) and **feelings** through brain scans.

We can **explain human (and animal) behaviour** accurately leaving **no space for free will**.

Anything else?

The Easy Problems of Consciousness

*The easy problems relevant to consciousness concern **mechanistic analysis** of the neural processes that accompany behaviour.*

*Examples of these include how sensory systems work, how sensory data is processed in the brain, how that data **influences behaviour or verbal reports**, the neural basis of thought and emotion, and so on.*

*They are problems that can be analyzed through "**structures and functions**".*

Everything that we discussed so far falls into this category.

Questions?

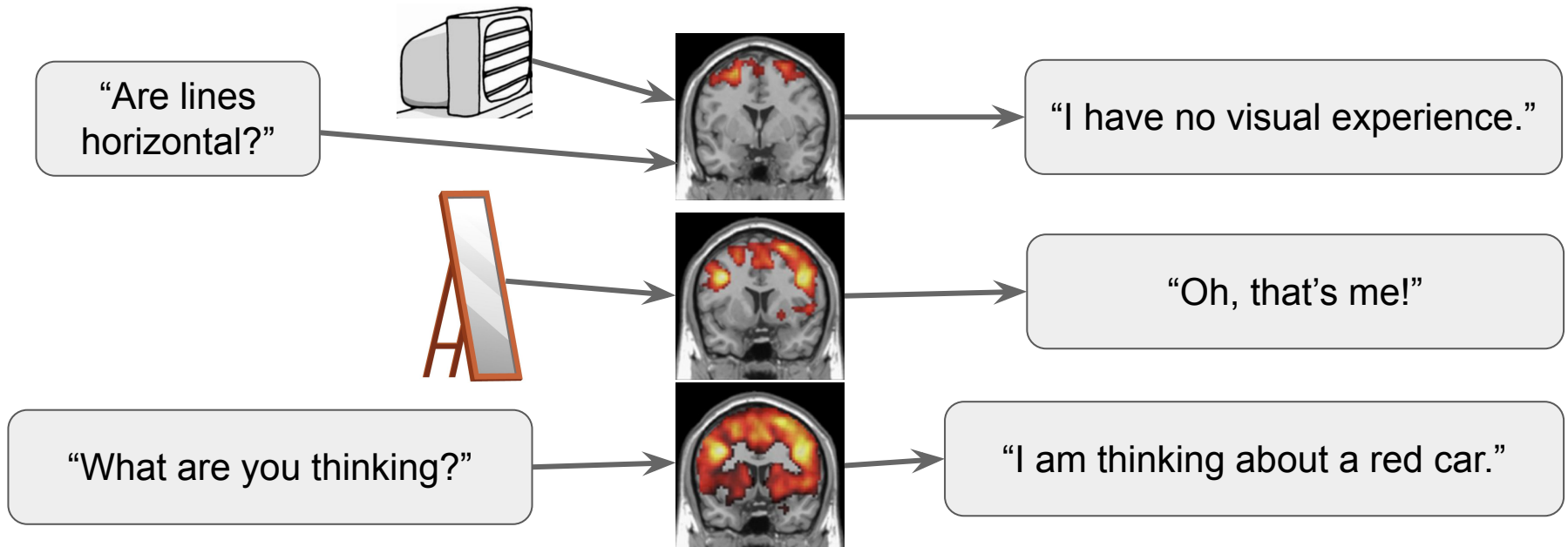
The Easy Problems of Consciousness

Scientifically we can only discover **accurate** and **predictive** relationships **between**:

Stimuli

Brain Activity

Behaviour



The Hard Problem of Consciousness

*The hard problem, in contrast, is the problem of **why** and **how** those processes are accompanied by **experience**.*

*It may further include the question of **why** these processes are accompanied by this or that particular experience, rather than some other kind of experience. In other words, the hard problem is the problem of explaining **why** certain mechanisms are accompanied by conscious experience.*

*For example, why should neural processing in the brain lead to the felt sensations of, say, feelings of hunger? And why should those **neural firings** lead to feelings of hunger rather than some other feeling (such as, for example, feelings of thirst)?*

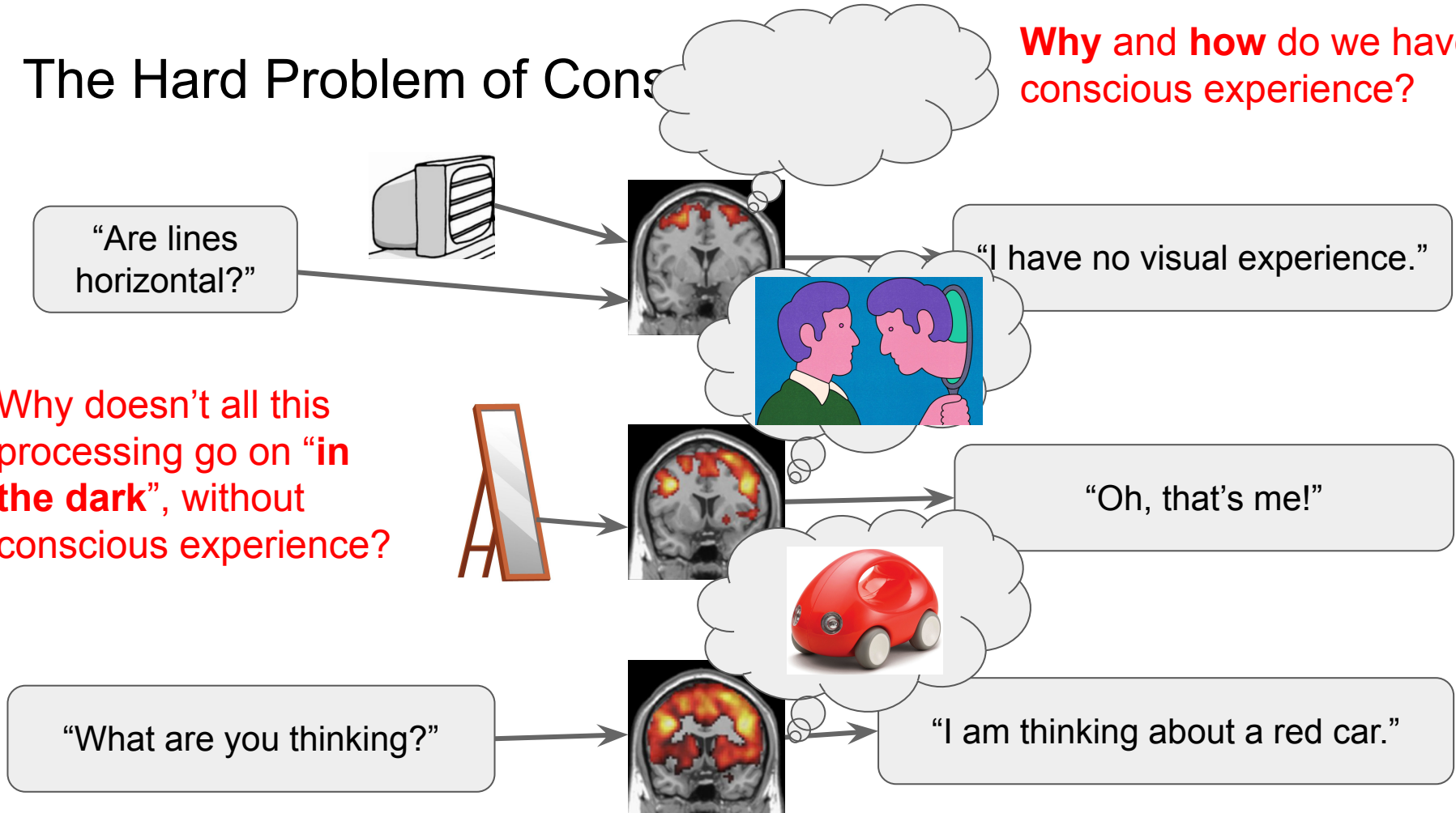
Questions?

https://en.wikipedia.org/wiki/Hard_problem_of_consciousness

The Hard Problem of Consciousness

Why and how do we have conscious experience?

Why doesn't all this processing go on **"in the dark"**, without conscious experience?



The Hard Problem of Consciousness

Is there a hard problem of consciousness?

According to PhilPapers, which surveyed 1000 professional philosophers in 2020:

- **62%** accept or lean towards **yes**.
- **30%** accept or lean towards **no**.

Physicalism: Everything that exists is a physical or material thing (including consciousness).
Do you subscribe to physicalism?

According to PhilPapers, which surveyed 1000 professional philosophers in 2020:

- **52%** accept or lean towards physicalism.
- **32%** reject physicalism.

Philosophical Zombies

Philosophical Zombies are **physically** identical to humans and behave in the same way, but have **no conscious experience**, or “Film of Life”.

Can Philosophical Zombies exist?

Who believes in **physicalism** and **philosophical zombies**?

Are these Philosophical Zombies?

- Clones
- Everyone else, except me

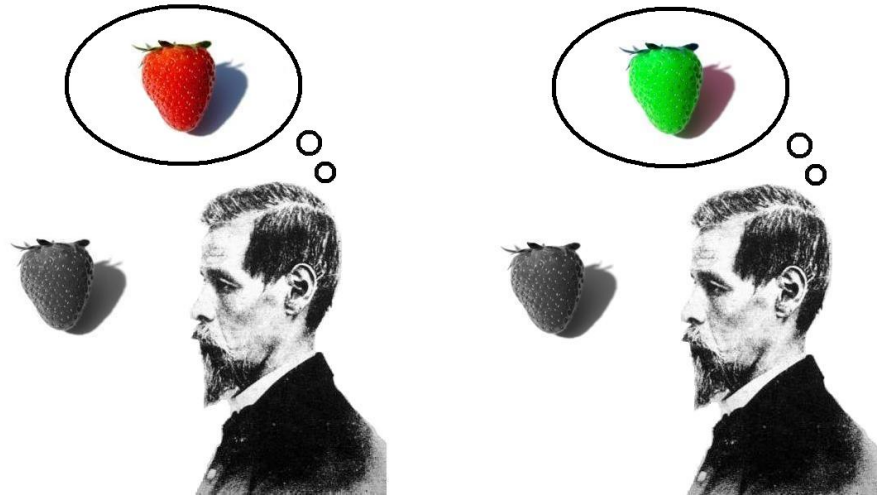


Inverted Visible Spectra

*If there is no logical contradiction in supposing that one's colour vision could be inverted, it follows that **mechanistic explanations of visual processing do not determine facts about what it is like to see colours.***

This argument can be applied to every possible conscious experience.

This would mean that **conscious experience can't** be explained by **physicalism**.



Illusionism

*Illusionism is an active program [...] to explain **phenomenal consciousness** as an illusion.*

Illusionists generally hold that once it is explained why people believe and say they are conscious, the hard problem of consciousness will dissolve.

Is conscious experience an illusion?

Criticism:

- There is a difference between first hand consciousness and beliefs / reports about consciousness. – David Chalmers
- “*Cogito, ergo sum*” – Descartes

Discussion Round In Groups

Why and **how** do we have **conscious experience**?

Why is there the **meta-problem of consciousness**? (Why do we even think that consciousness poses a hard problem.)

In how far are the following having **conscious experience**? Why and why not?

- Someone dreaming
- Animals
- Large Language Models

Take a photo and discuss.

Some Approaches to the Hard Problem

Physicalism: Everything that exists is a physical or material thing (including consciousness).

Panpsychism: Consciousness is intrinsic to matter.

Dualism: Consciousness is non-physical, mind and matter are separate.

Idealism: Consciousness is fundamental, matter is an image of mental processes.

The Hard Problem of Consciousness

- What is the easy Problem of Consciousness
 - Reference to Celines part of the talk
 - Explain the premise of the Hard Problem of Consciousness
 - Orthogonality to Free Will
 - Spectrum of beliefs
 - Strong Reductionism
 - Illusionism
 - Perception of the scientific community
 - [PhilPapers](#) is an organization that archives academic philosophy papers and periodically surveys professional philosophers about their views. It can be used to gauge professional attitudes towards the hard problem. As of the 2020 survey results, it seems that the majority of philosophers (62.42%) agree that the hard problem is real, with a substantial minority that disagrees (29.76%).^[50]
 - Attitudes towards physicalism also differ among professionals. In the 2009 PhilPapers survey, 56.5% of philosophers surveyed subscribed to physicalism and 27.1% of philosophers surveyed rejected physicalism. 16.4% fell into the "other" category.^[51] In the 2020 PhilPapers survey, 51.93% of philosophers surveyed indicated that they "accept or lean towards" physicalism and 32.08% indicated that they reject physicalism. 6.23% were "agnostic" or "undecided".^[50]

The Hard Problem of Consciousness

The hard problem of consciousness is the problem of explaining **why** any physical state is conscious rather than nonconscious.

It is the problem of explaining **why** there is “something it is like” for a subject in conscious experience, why conscious mental states “light up” and directly appear to the subject.

The usual methods of science involve explanation of functional, dynamical, and structural properties—explanation of **what** a thing does, **how** it changes over time, and **how** it is put together.

But even after we have explained the functional, dynamical, and structural properties of the conscious mind, we can still meaningfully ask the question, ***Why is it conscious?***

Questions?

<https://iep.utm.edu/hard-problem-of-consciousness/>



Answers at

<https://www.mentimeter.com/app/presentation/alhtvcrkpkd8dfqn11zacb69b2tjd754/hpnemtf6tbek/edit>