

# Where Mind meets Matter: Our Divided Brain

Acronyms:

RH: right hemisphere

LH: left hemisphere

## Preface

- enormous 60+ years field of study (EEG, MRI, lobotomy, stroke-victims, "split-brain", etc.)  
(me: amateur, included some ref. that I opened, but didn't support all statements with refs.)  
  
<sup>↑</sup>  
(surgical or temporary)
- LH + RH contributions in almost all activities  
(but  $\exists$  large asymmetries)  
  
 $\downarrow$
- many asymmetries in brain, inhibitory in nature  
(e.g. seminal book: <https://psycnet.apa.org/record/2009-00519-000>)
- fascinating lessons & suggestions for daily life

## Opening Question

- Why is the brain divided ?

# The two Hemispheres ("standard" layout, 90% of people)

(book: <https://psycnet.apa.org/record/2019-39475-000>)

- contralateral motor & sensor control

LH

the whole (from RH) is broken down into parts for analysis

sequential, linear, logical, linguistic  
"serial processor" analogy

builds systems (past ↔ future)  
⇒ unchanging, transmittable

focused attention to pick out things (for food, obstacles, etc.)

(language-associated)  
LH posterior region  
asymmetrically\* larger than RH

RH

RH frontal lobe asymmetrically\* larger

"Aha!" moments

more:

- neurons
- white matter
- global interconnectivity (vs. local in LH)

→ longer, wider, heavier, larger (from child- to adulthood)

→ noradrenaline based neurons  
↳ fatigue less → multi-sensory-data CPU  
"parallel processor" analogy

→ open awareness of environment (for predators, allies, mates, etc.)

\* ↑ size => ↑ ability (London taxi drivers)

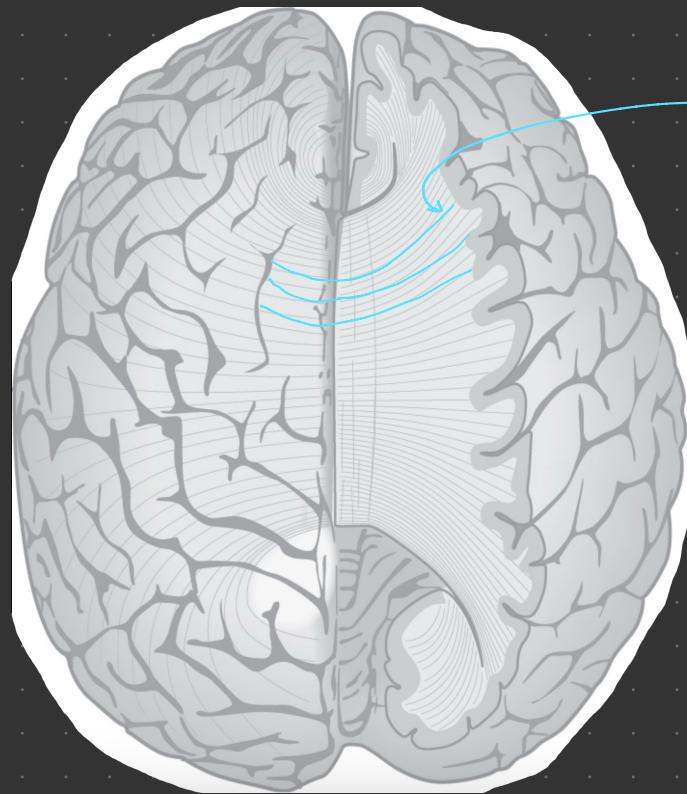


whole brain twist  
(viewed from top)

# The "Bridge": Corpus Callosum

(book: <https://doi.org/10.7551/mitpress/5233.001.0001>)

- $0(80 \text{ bil.})$  neurons >  $0(20 \text{ bil.})$  cortical neurons



- $0(100 \text{ mil.})$  fibres:

- ! ↳ only 2% cortical neurons connected
- ! ↳ many inhibitory connections

- as brains evolved:

- became smaller rel. to brain size
- less interconnectivity

# The divided brain (example papers)

## Left Hemisphere

local & focussed attention

(Gorilla in our midst <https://pubmed.ncbi.nlm.nih.gov/10694957/>)

(motor) controls and only cares about right body



delusions / confabulations

(Mother's arm <https://pubmed.ncbi.nlm.nih.gov/1762671/>)

planar, abstracted 2D vision

prefers the inanimate & mechanical

(virtual vs. real hand <https://doi.org/10.1006/jnmg.2001.0872>)

classification at basic level

- to re-cognize it re-presents the experienced
- self-referential, needs to be right (RH ambiguous)

## Right Hemisphere

→ broad & flexible, large FOV attention

(predators scan with left eye, catch with right paw)

→ (motor) controls left body but cares about whole (+ total FOV)

(① & ② below)

linear (LH) vs. holistic (RH) thinking

(false premises <https://www.sciencedirect.com/science/article/pii/S0278262696900482?via%3Dihub>)

→ depth 3D vision, objects embedded in world

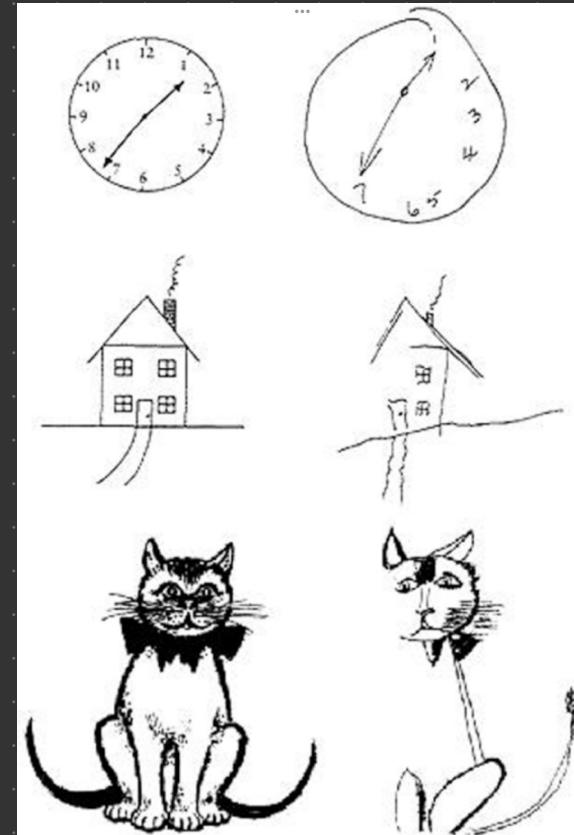
↳ prefers the living & changing (③ below)

→ fine & nuanced classification

([https://doi.org/10.1016/S0278-2626\(03\)00184-2](https://doi.org/10.1016/S0278-2626(03)00184-2))

- presents experience
- social mediator, empathetic, "theory of mind" ability
- understands the non-verbal
- metaphor, irony, sarcasm, humor

template  $\leftarrow$   $I \rightarrow LH$ -only recreation



(*book*: <https://psycnet.apa.org/record/2019-39475-000>)

A detailed botanical line drawing of a flowering plant, showing a central stem with several leaves and a terminal flower head.

both

LH only

RH only

( paper: <https://pubmed.ncbi.nlm.nih.gov/24486744/> )

2



both



LH only



RH only

( paper: <https://pubmed.ncbi.nlm.nih.gov/24486744/> )

# Evolutionary history (book: <https://doi.org/10.1017/CBO9780511546372>)

## ► Since when and who ?

- Bi-hemispheric functionality since long in phylogenetic tree
- Widespread in vertebrates

## ► What drove LHI expansion ?

- asymmetry in early hominids (before language believed to develop)
- species with less or no sophisticated language have it
- thought, evaluations without language (many anecdotes of e.g. Einstein, Poincaré, Gauss)

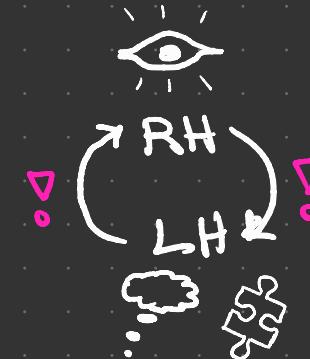
## ► Tool-making hypothesis ?

- grasp and language center close
- our vocabulary reflects this
  - "grasping/getting" idea
  - "hold that thought"
  - "can't put my finger on it"
- pos. feedback loop of tools + language

(more evident in latin  
or germanic languages)

# Primacy of the RH

- RH has ontological precedence over LH:



- Metaphor before denotation
  - abstract (latin, "abs-" away "trahere" pull)
  - explicit (latin, "ex-" out, "plicare" fold)

- Affect first, "thinking" later : "Feelings first, cognition later"  
(paper: <https://pubmed.ncbi.nlm.nih.gov/8505704/>)

- "Gestalt" first (gestive) , structure later (linguistic)  
( book: <https://psycnet.apa.org/record/1992-98214-000> )