

M U N I

M E D

17 The Highest Functions of Nervous System

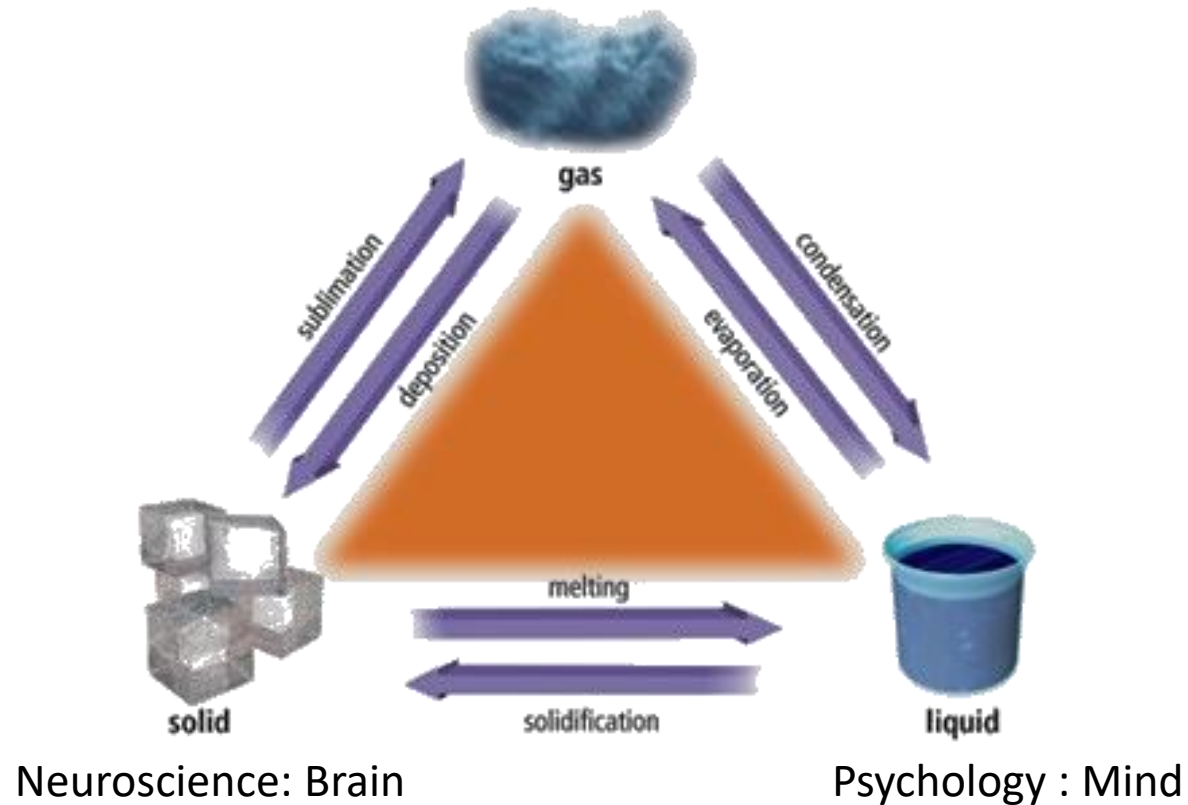
Psychological and Social Aspects of Brain Activity

Three States of Cognition

Philosophy : Mind behind Mind



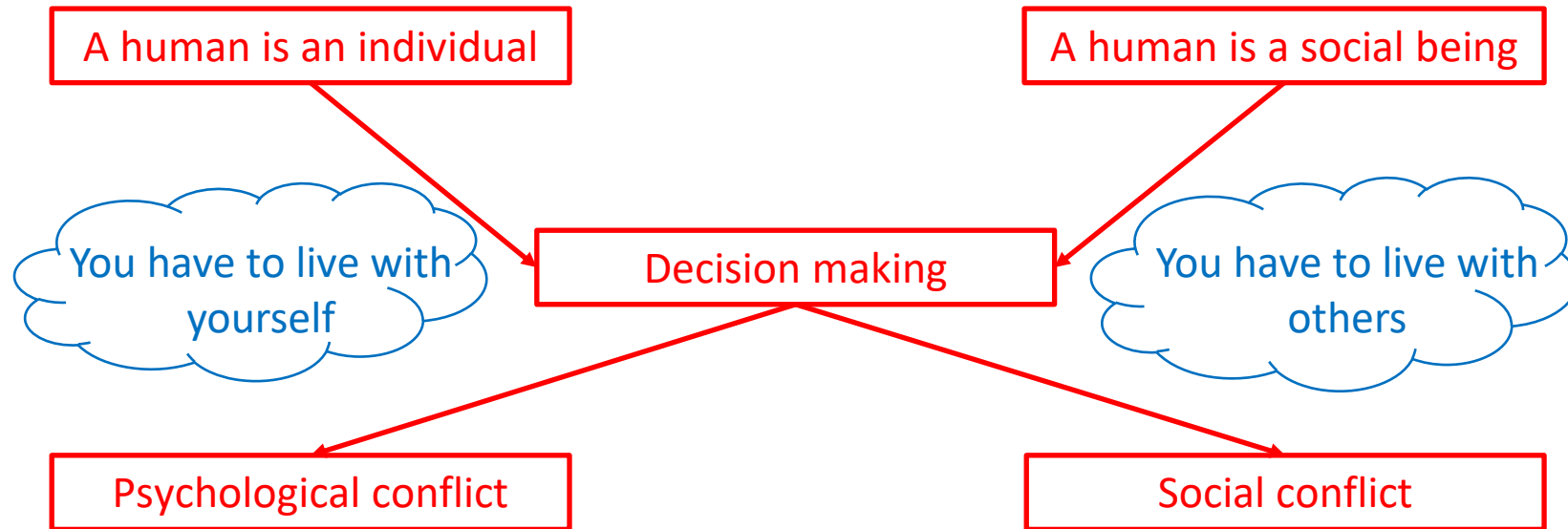
PS Deb



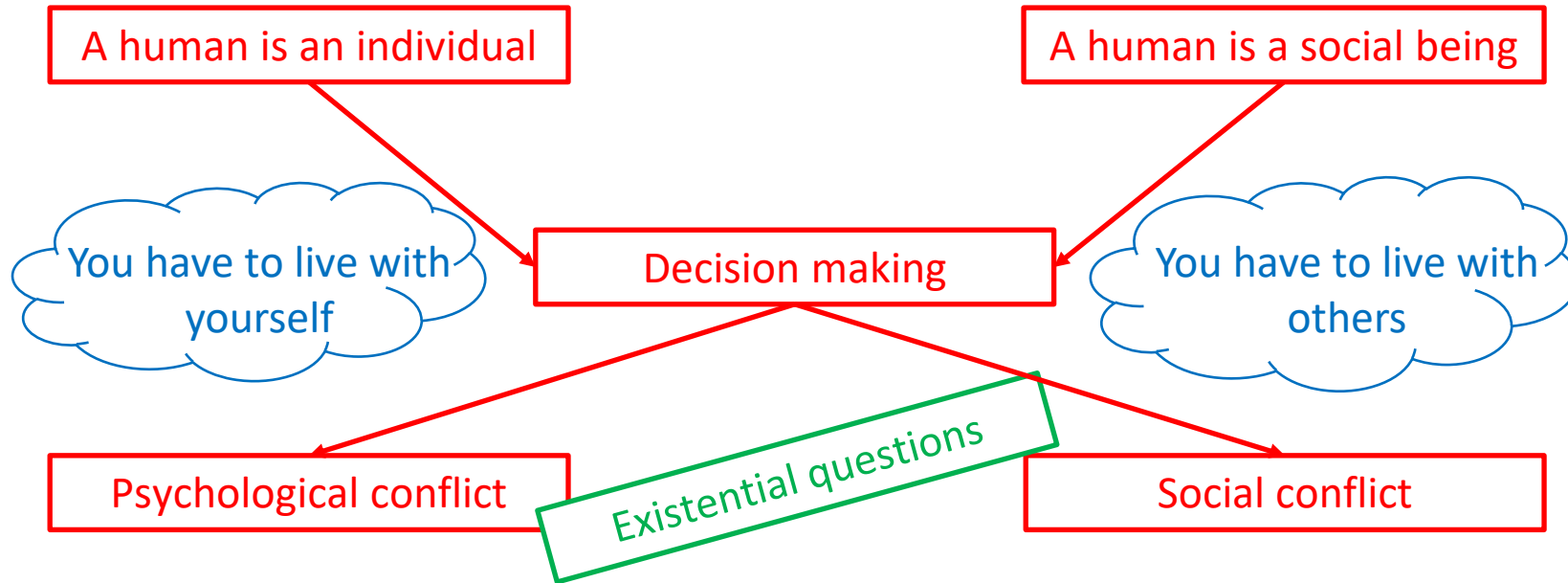
Why?



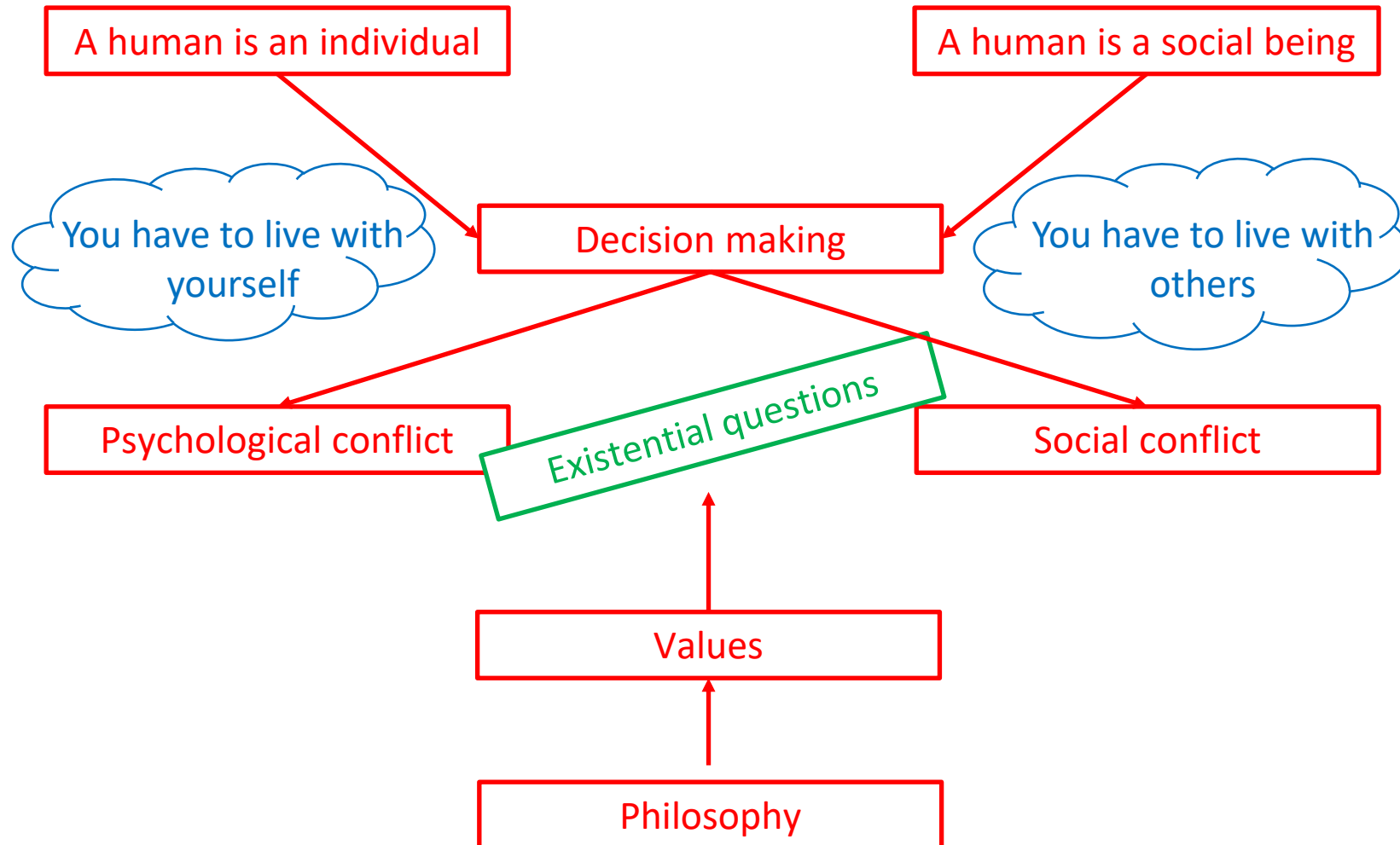
Why?



Why?



Why?



Philosophy

Philosophy of life is a personal philosophy, whose focus is **resolving the existential questions** about the human condition.

Wikipedia

Philosophy

FORMAL
PHILOSOPHY

Philosophy is the study of **general and fundamental problems** concerning matters such as existence, knowledge, values, reason, mind, and language.

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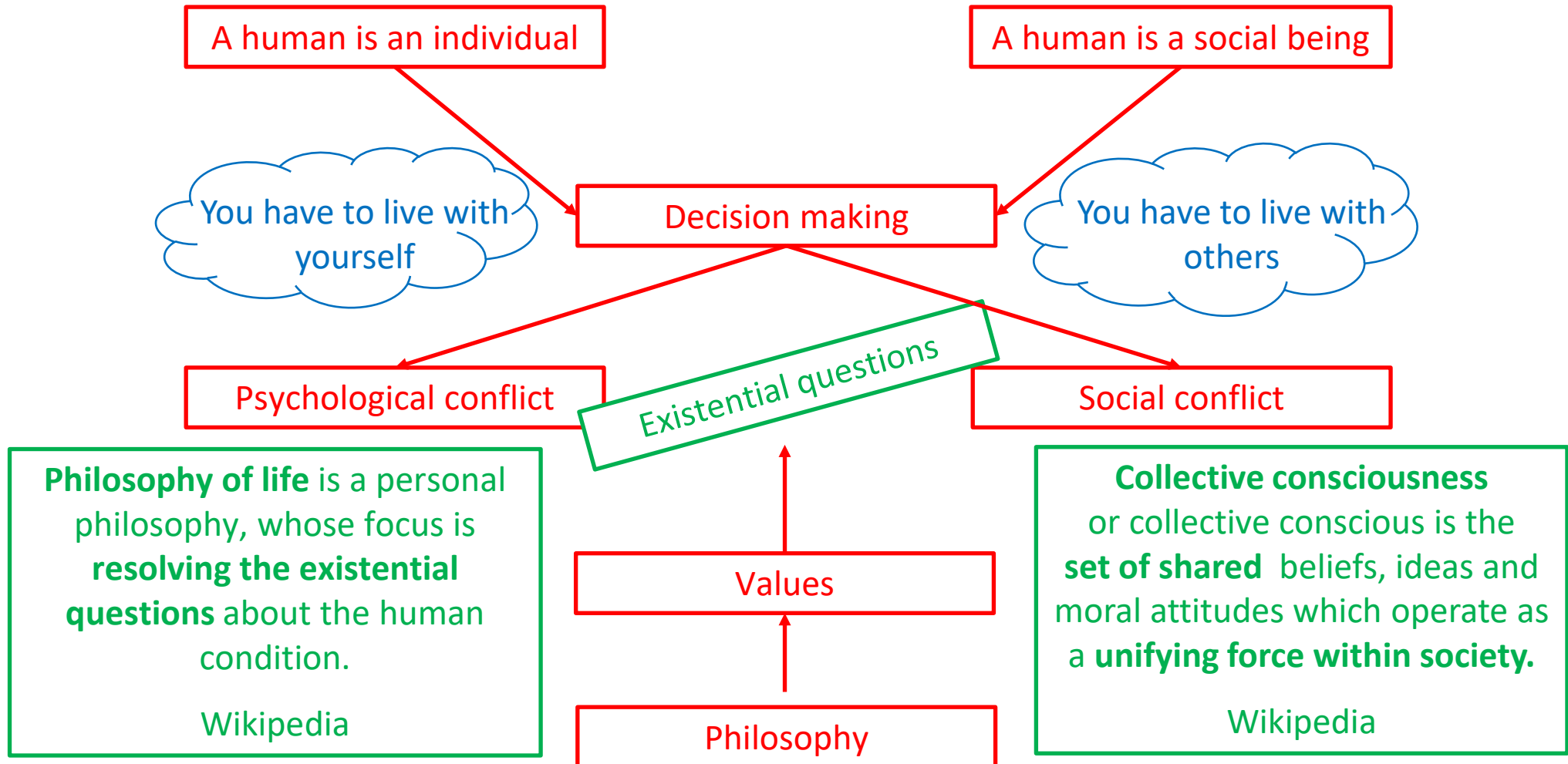
Wikipedia

COLLECTIVE CONSCIOUSNESS

Collective consciousness or collective consciousness is the **set of shared beliefs, ideas and moral attitudes** which operate as a **unifying force within society.**

Wikipedia

Why?



Why?

A human is an individual

A human is a social being

You have to live with yourself

You have to die

You have to live with others

Psychological conflict

Existential questions

Social conflict

Philosophy of life is a personal philosophy, whose focus is **resolving the existential questions** about the human condition.

Wikipedia

Values

Collective consciousness or collective conscious is the **set of shared** beliefs, ideas and moral attitudes which operate as a **unifying force within society**.

Wikipedia

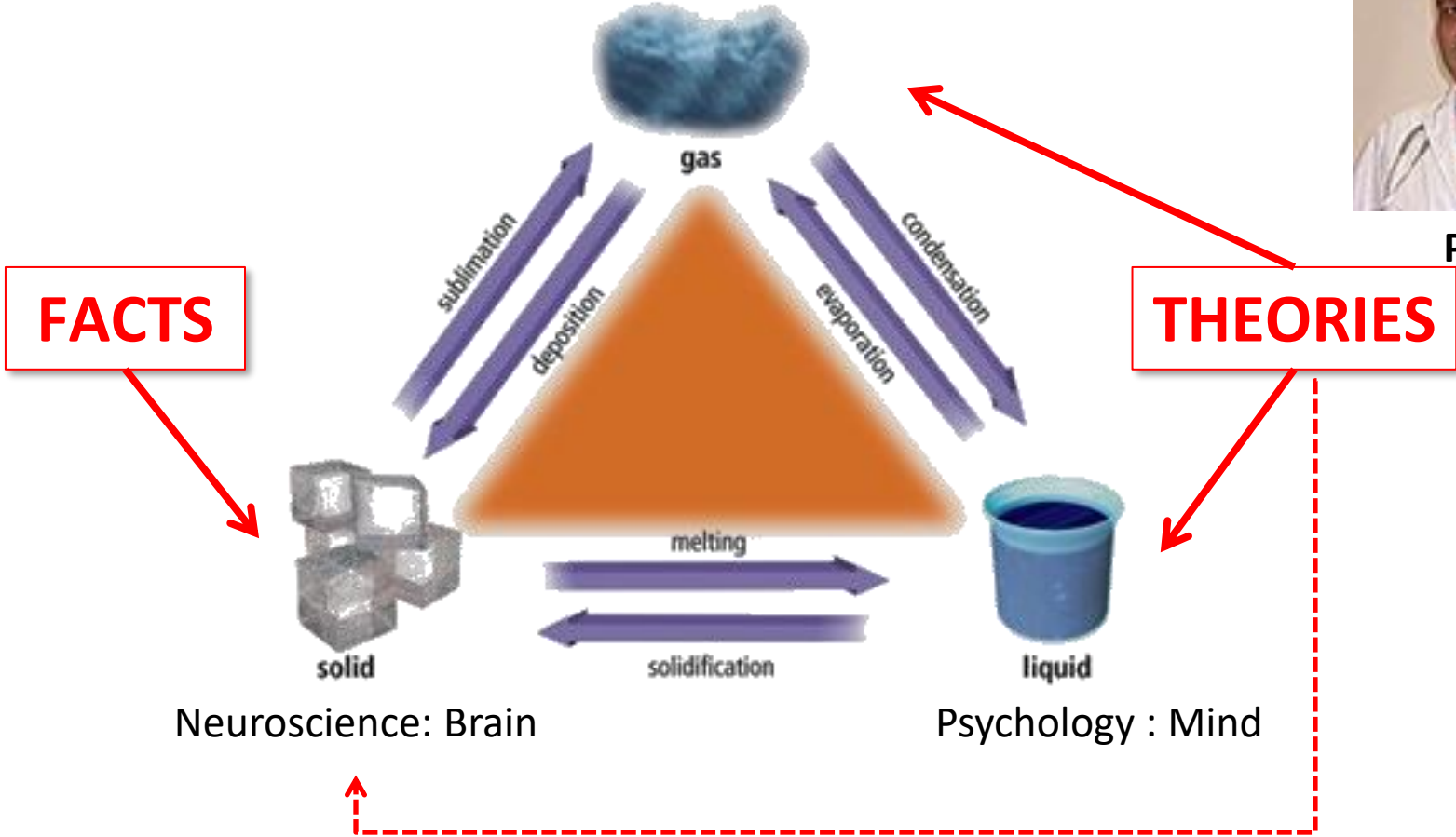
Philosophy

Three States of Cognition

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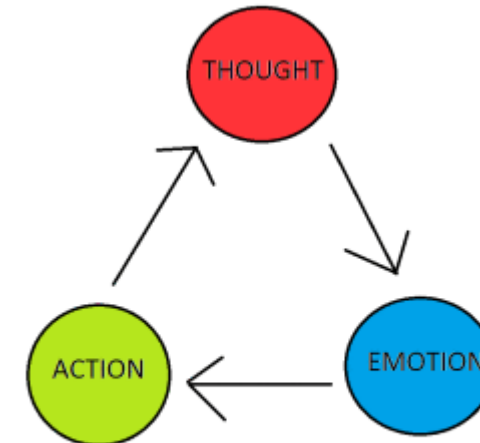
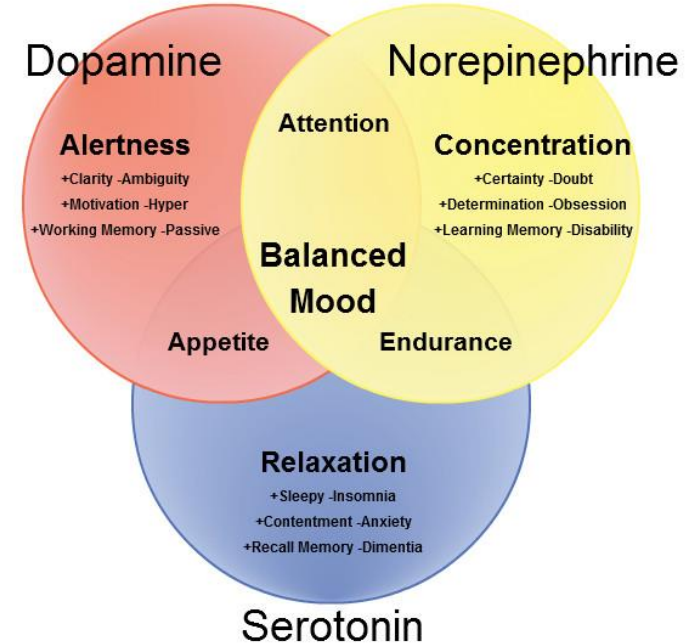


PS Deb



Influence of hypothalamus on neocortex

- Papez circuit
- Via neuromodulating systems
 - Consciousness
 - Mood
- Via thalamus
 - Via nucleus mediodorsalis to orbitofrontal cortex (influence on decision making)
 - Influence gating function of other thalamic nuclei



http://ausm.org.uk/wp-content/uploads/2015/02/Dopamine_Norepinephrine_Serotonin.jpg

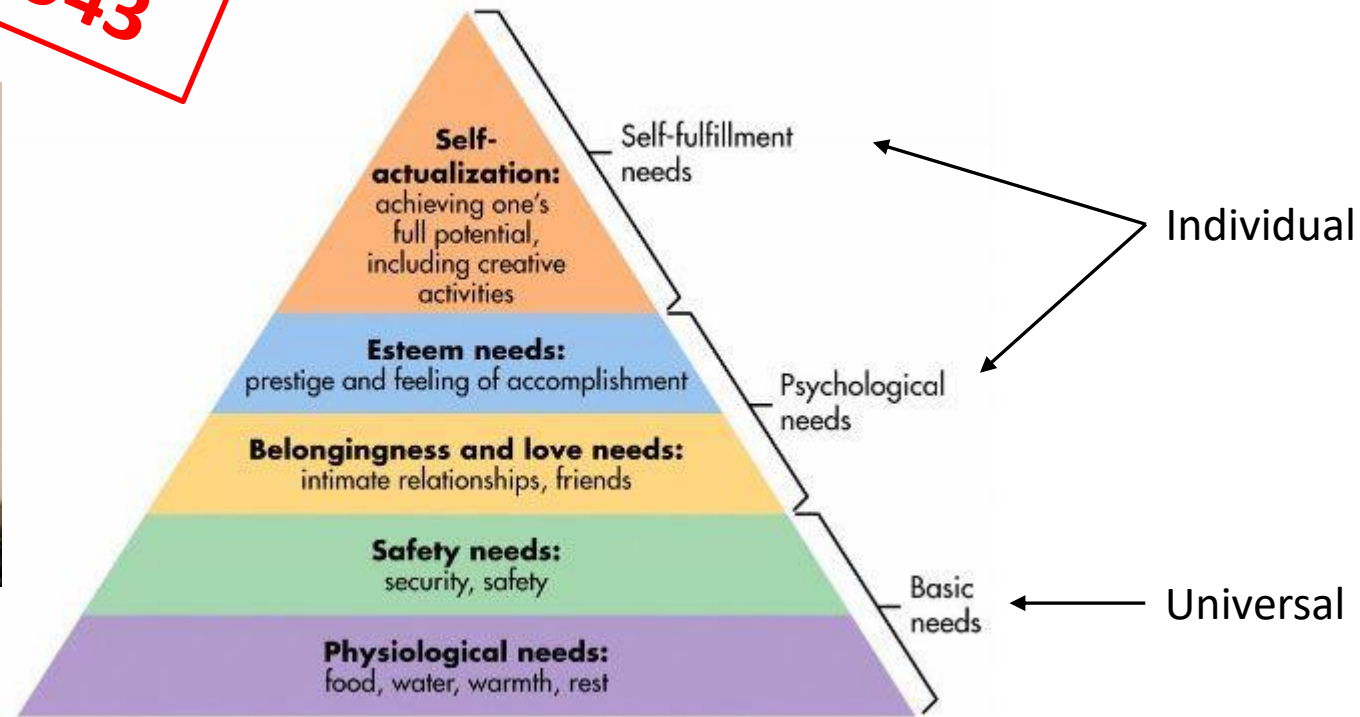
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Hierarchy of Needs by Abraham Maslow

1943



https://en.wikipedia.org/wiki/Abraham_Maslow#/media/File:Abraham_Maslow.jpg

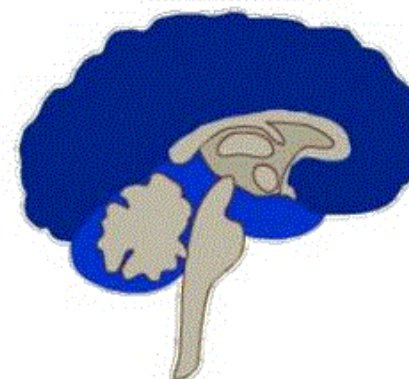
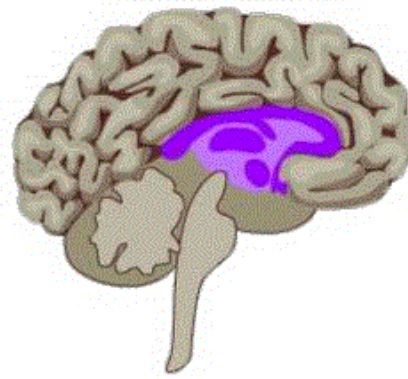
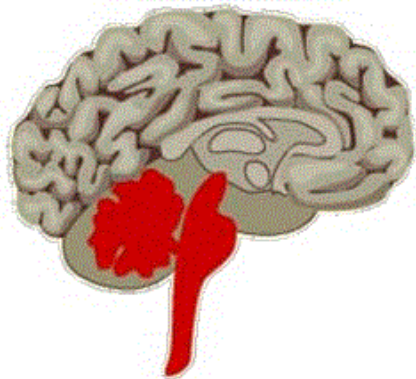


<http://www.simplypsychology.org/maslow-pyramid.jpg>

Triune Brain Theory

Lizard Brain	Mammal Brain	Human Brain
Brain stem & cerebellum	Limbic System	Neocortex
Fight or flight	Emotions, memories, habits	Language, abstract thought, imagination, consciousness
Autopilot	Decisions	Reasons, rationalizes

1960



The Triune Brain in Evolution, Paul MacLean, 1960

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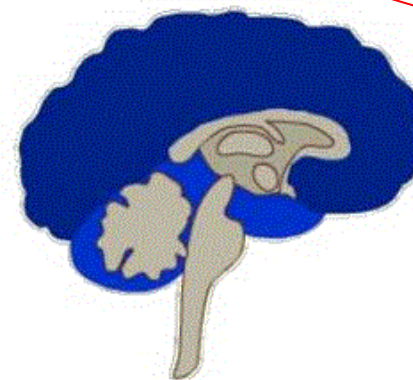
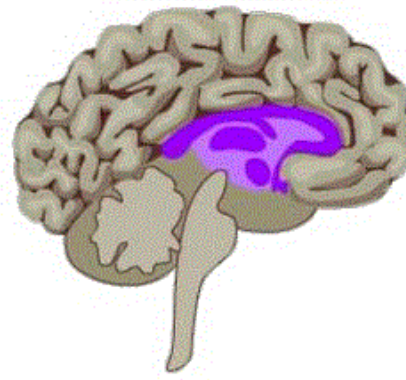
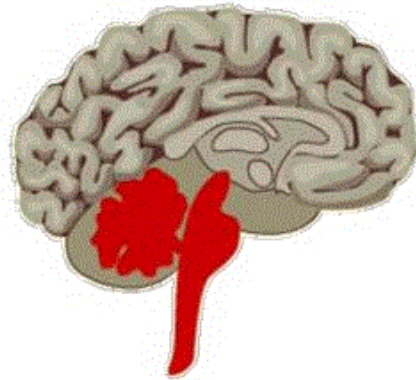
https://upload.wikimedia.org/wikipedia/commons/thumb/d/d4/Paul_D_MacLean.jpg/220px-Paul_D_MacLean.jpg

Triune Brain Theory

Lizard Brain	Mammal Brain	Human Brain
Brain stem & cerebellum	Limbic System	Neocortex
Fixed programs Uniform ACTION Economy	Emotions, memories, habits	La th c
	Decisions	Performance

Fixed programs
Uniform **ACTION**
Economy

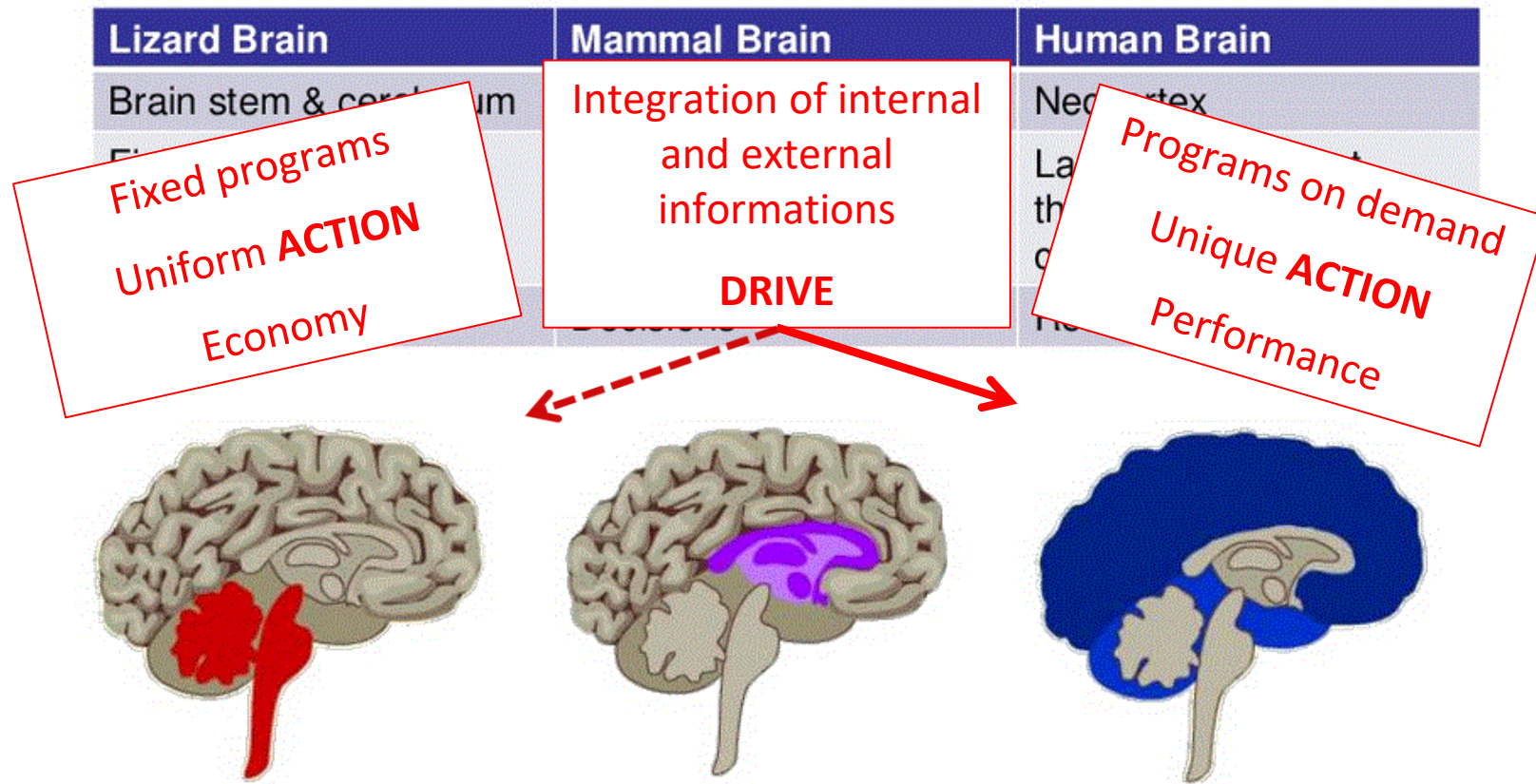
Programs on demand
Unique **ACTION**
Performance



The Triune Brain in Evolution, Paul MacLean, 1960

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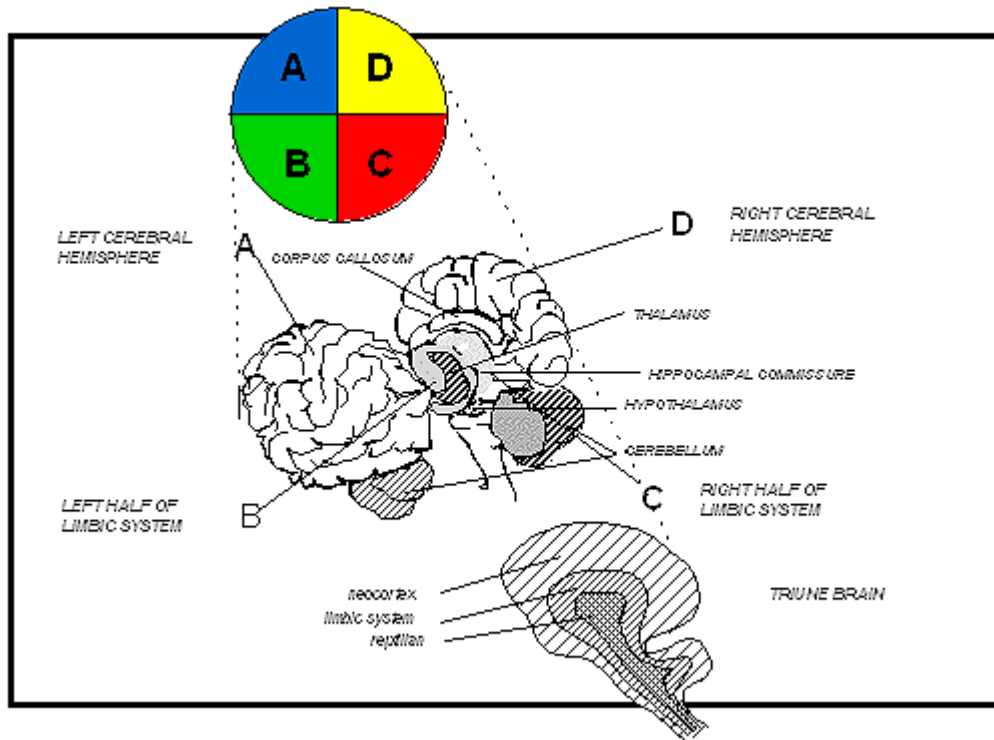
Triune Brain Theory



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Whole brain model

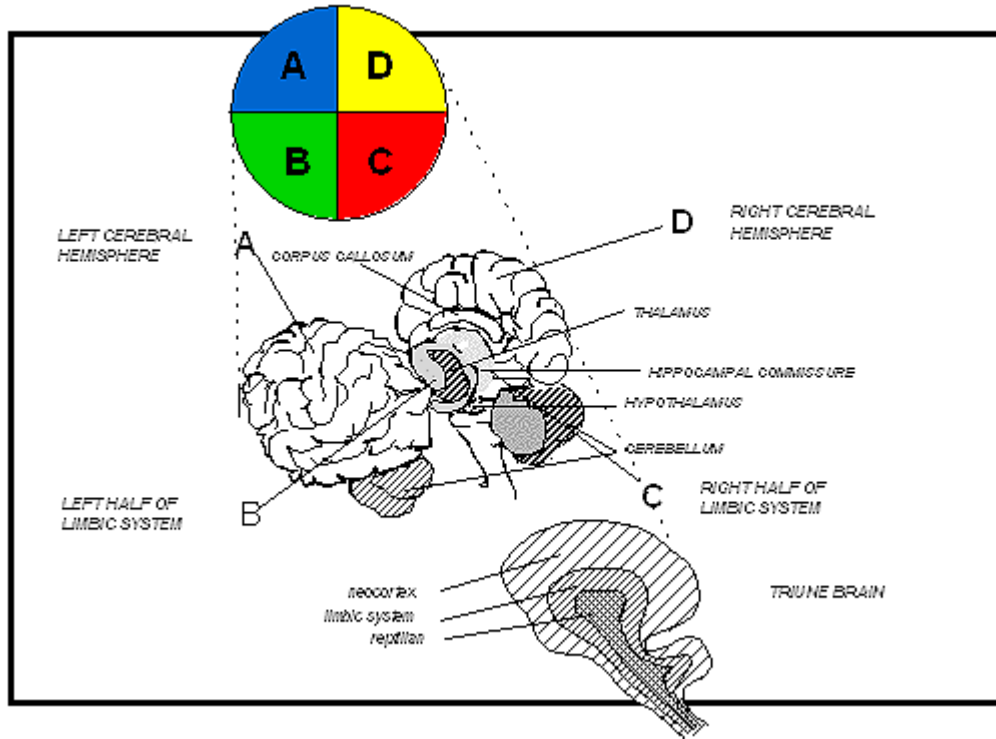


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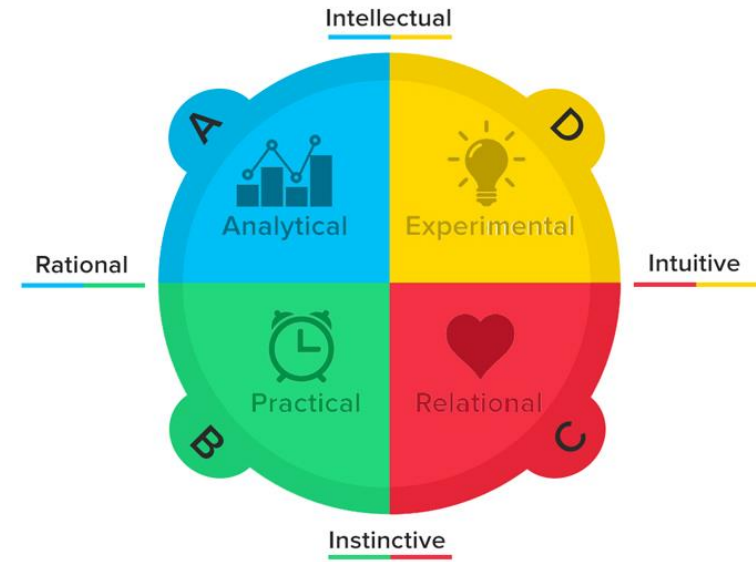
1978



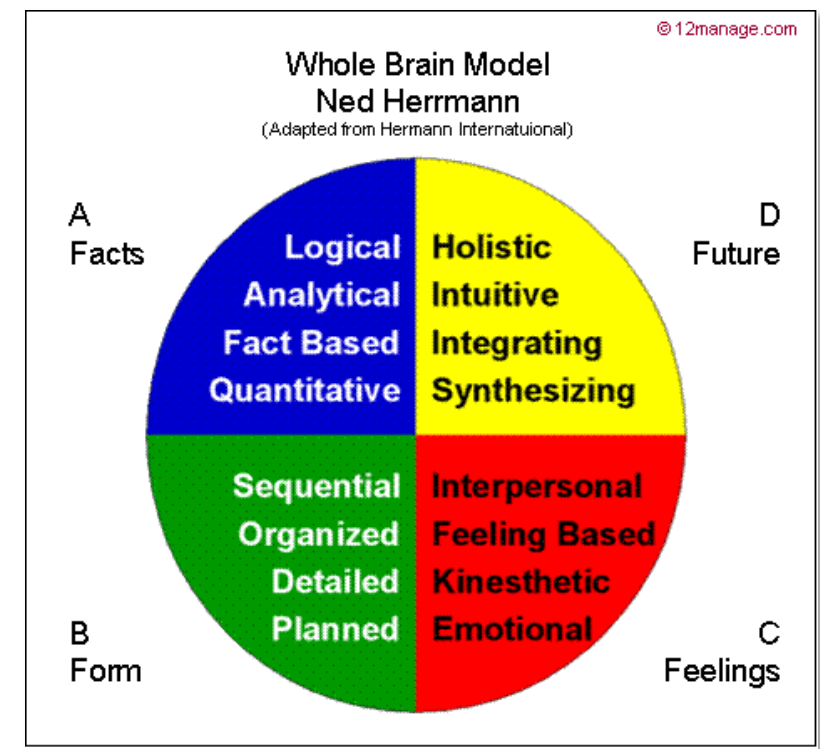
Whole brain model



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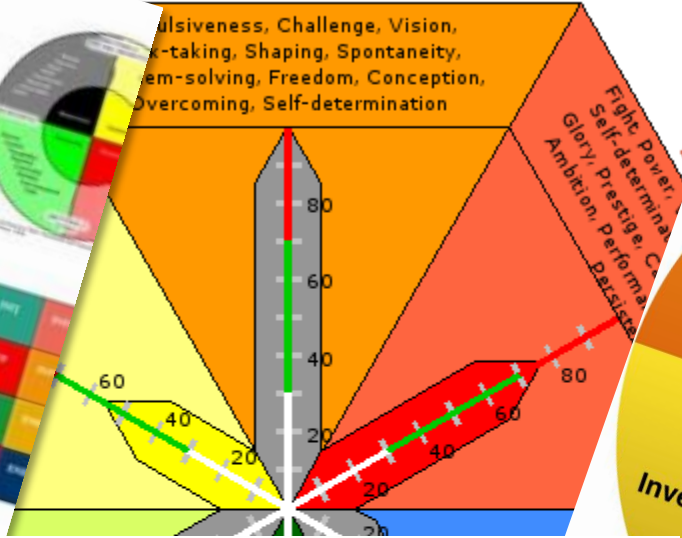


1978



Innovation "Pioneer"

Enthusiasm, Challenge, Vision, Risk-taking, Shaping, Spontaneity, Problem-solving, Freedom, Conception, Overcoming, Self-determination



The Four Quadrants of Technology Service & Support



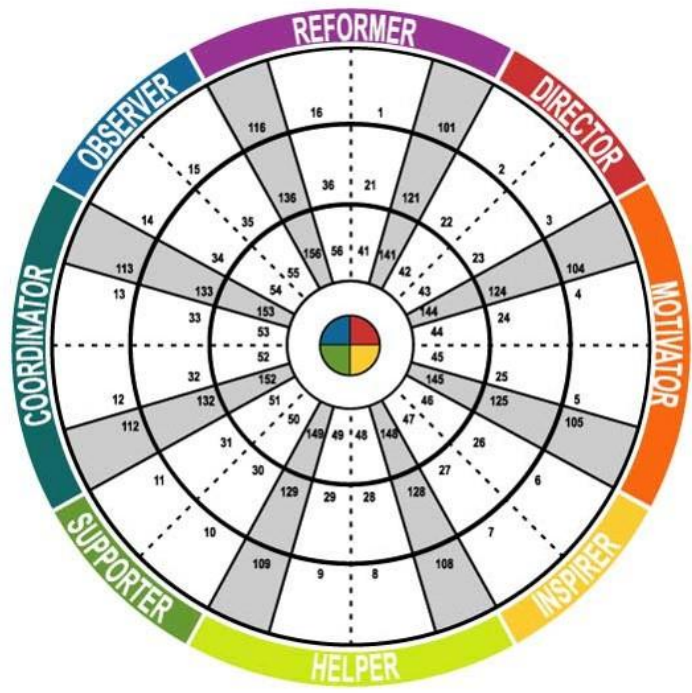
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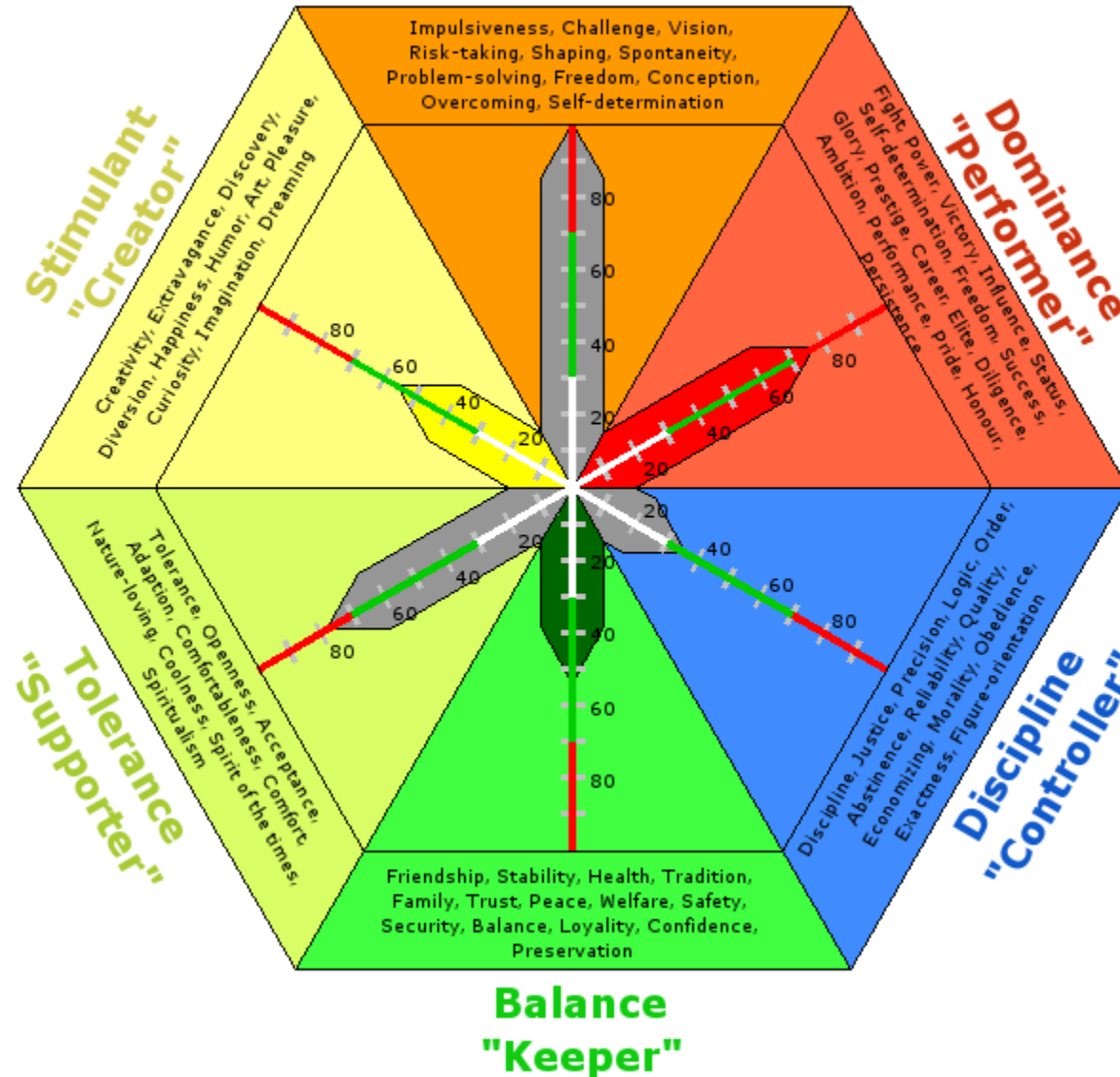
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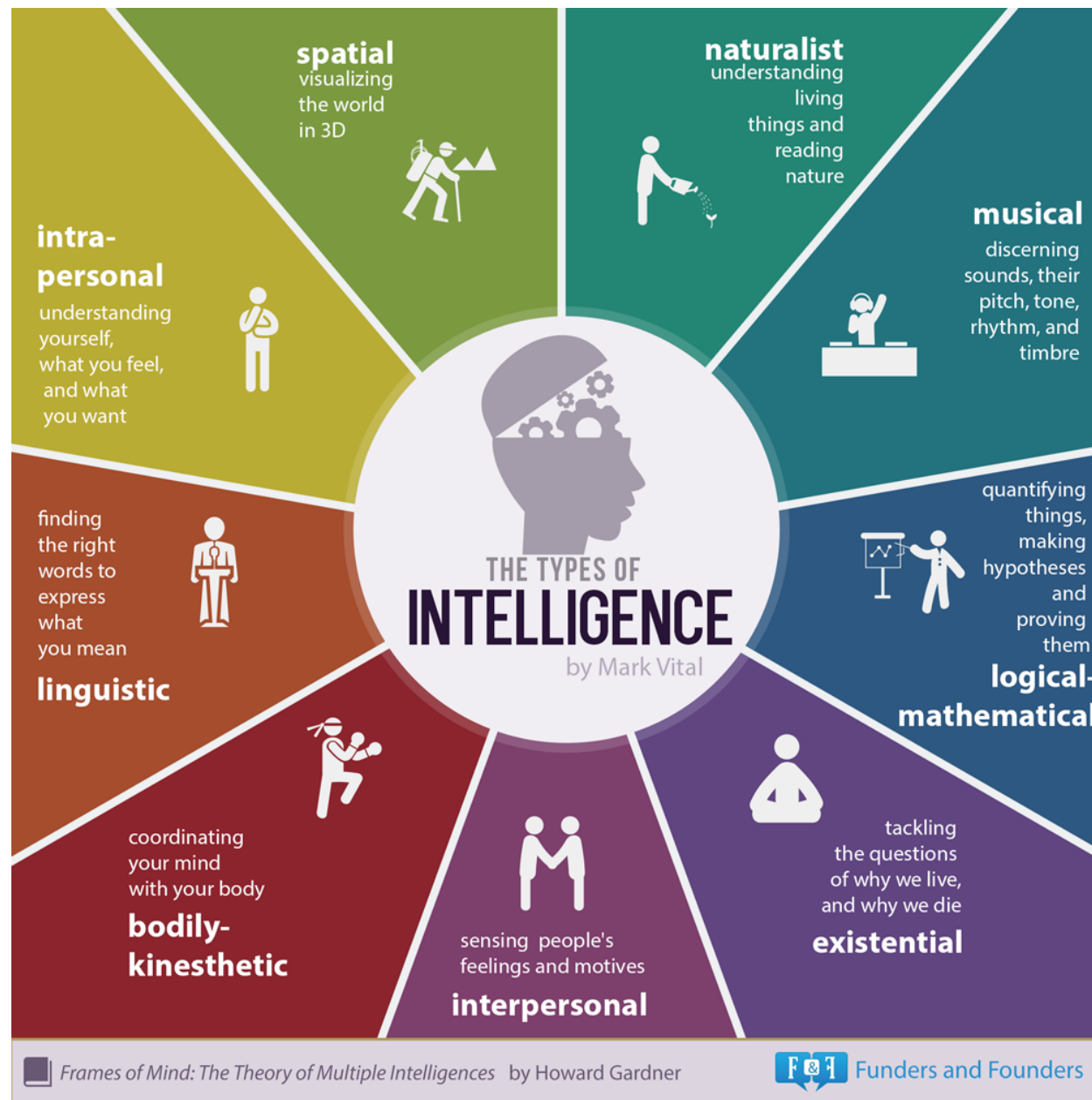
Disciplined "Control"

<http://scottschwefel.com/wp-content/uploads/2016/01/smart-skills.jpg>

Innovation "Pioneer"

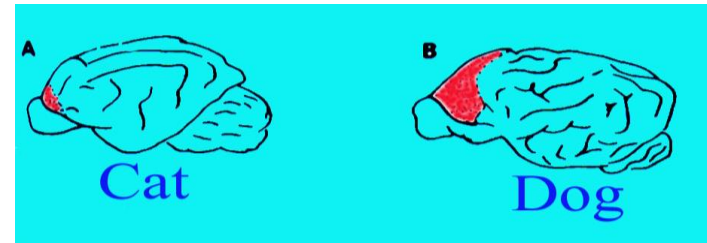


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Socialization

- ✓ Socialization is an evolutionary strategy of „weak/less skilfull“



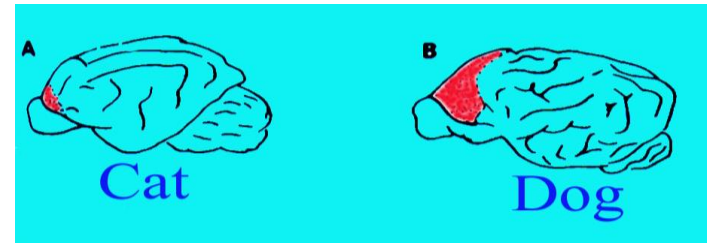
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<https://wallhere.com/cs/wallpaper/1065382>

https://en.wikipedia.org/wiki/Society#/media/File:Canis_lupus_pack_surrounding_Bison.jpg

Socialization

- ✓ ~~Socialization is an evolutionary strategy of „weak/less skilfull“~~
- ✓ Socialization allows be specialized („weak/less sklifull“)



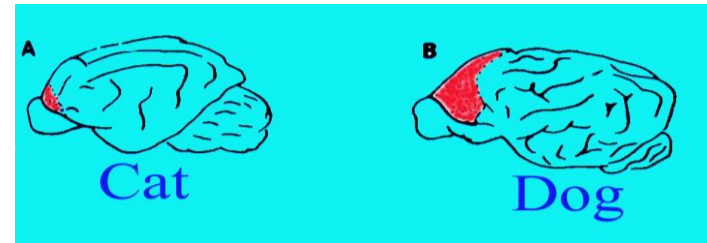
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Socialization

- ✓ ~~Socialization is an evolutionary strategy of „weak/less skilfull“~~
- ✓ Socialization allows be specialized („weak/less sklifull“)
- ✓ The social group brings its members benefits which could not be achieved on an individual basis
- ✓ Society
 - Collaboration
 - Categorization of duties and responsibilities
 - Hierearchy



<http://www.slideshare.net/drpsdeb/presentation>

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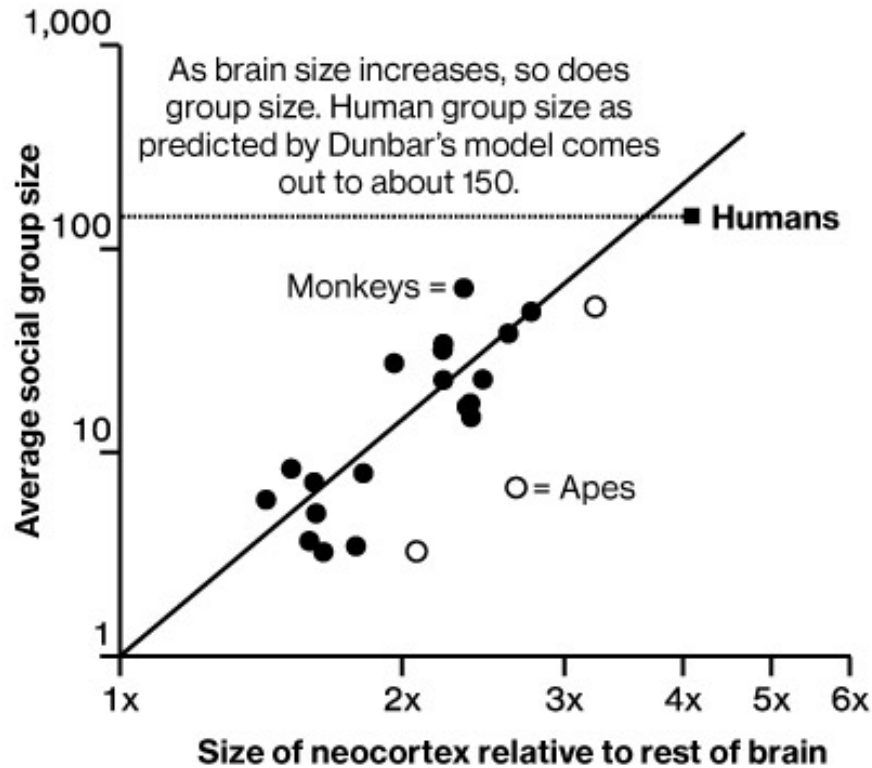
Socialization



1998

Socialization

The Social Cortex



DATA: THE SOCIAL BRAIN HYPOTHESIS, DUNBAR 1998

<http://assets.bwbx.io/images/users/iqjWHBFdfxIU/ibn8LbKHvbxI/v1/-1x-1.jpg>

Robin Dunbar



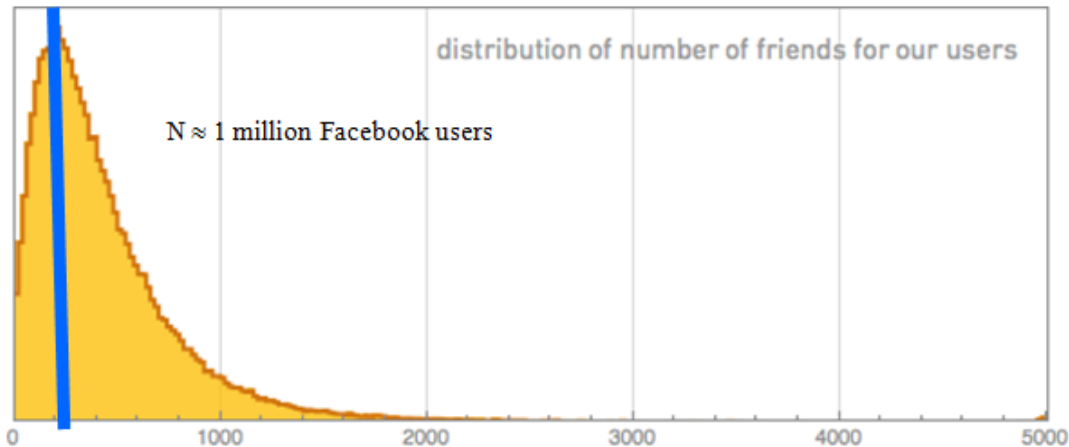
https://en.wikipedia.org/wiki/Robin_Dunbar

Socialization

2014

Has Facebook Really Widened Your Social World?

- It seems not....
- Modal number of 'friends' on Facebook = 150-250
- You may list 100s of friends, but you only talk to a handful



Robin Dunbar

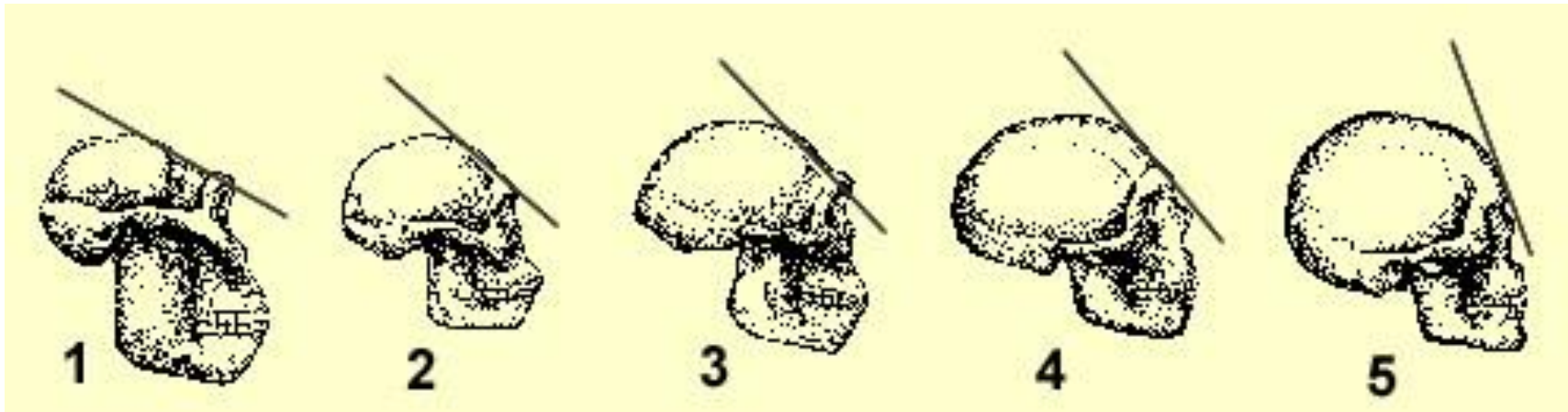
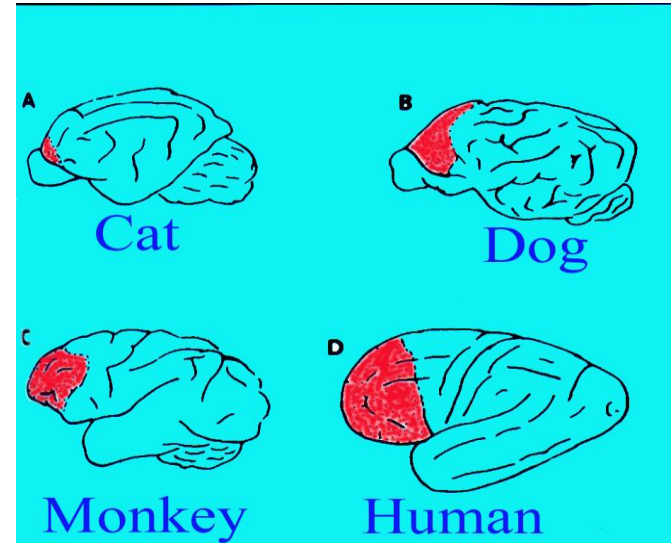


https://en.wikipedia.org/wiki/Robin_Dunbar

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Frontal association area

- Executive function
 - Motor / behavioral
 - Cognitive
- Mostly developed in human



1. *Australopithecus robustus*
2. *Homo habilis*
3. *Homo erectus*
4. *Homo sapiens neanderthalensis*
5. *Homo sapiens sapiens*

Functions of frontal association area

- Motor/non-motor planning/organization - strategy - anticipation

- Thinking – mental models processing

- Attention – „information filtering“

- Behavioral control
 - Facilitation of „wanted“
 - Inhibition of „unwanted“

**Social brain may be considered as
an anticipation in social context**



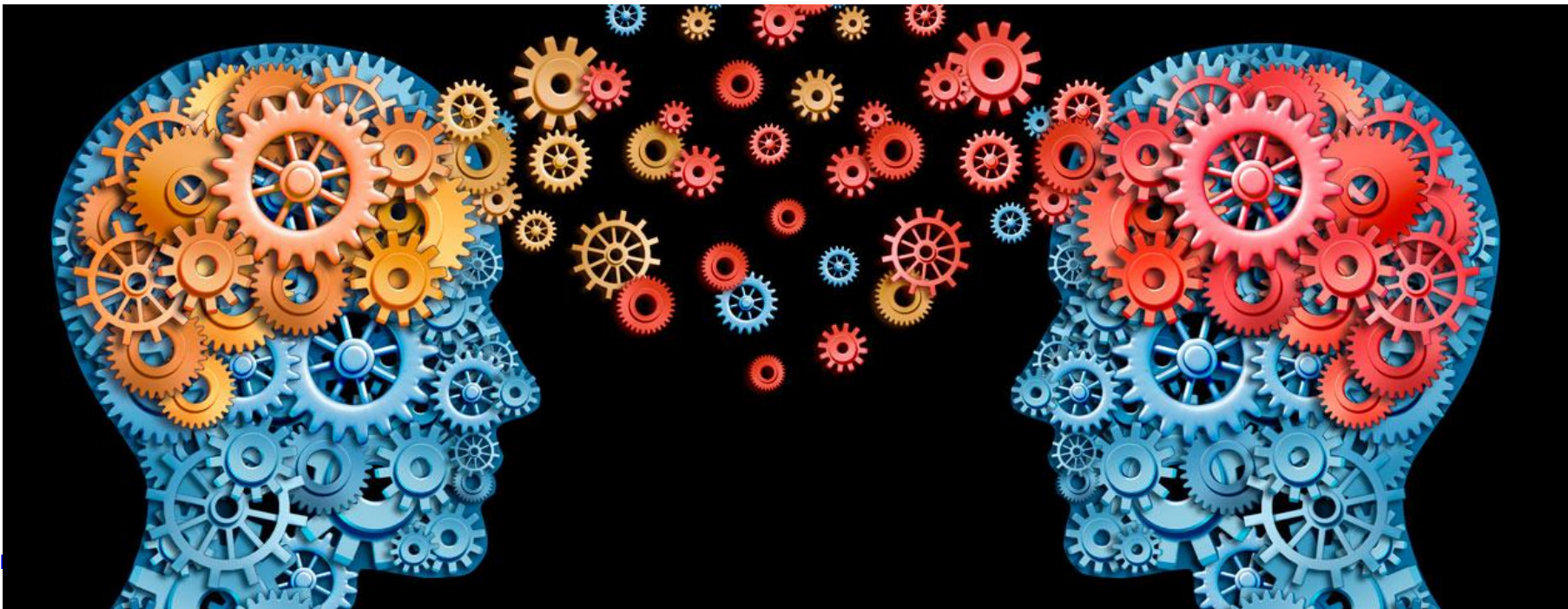
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Mentalization

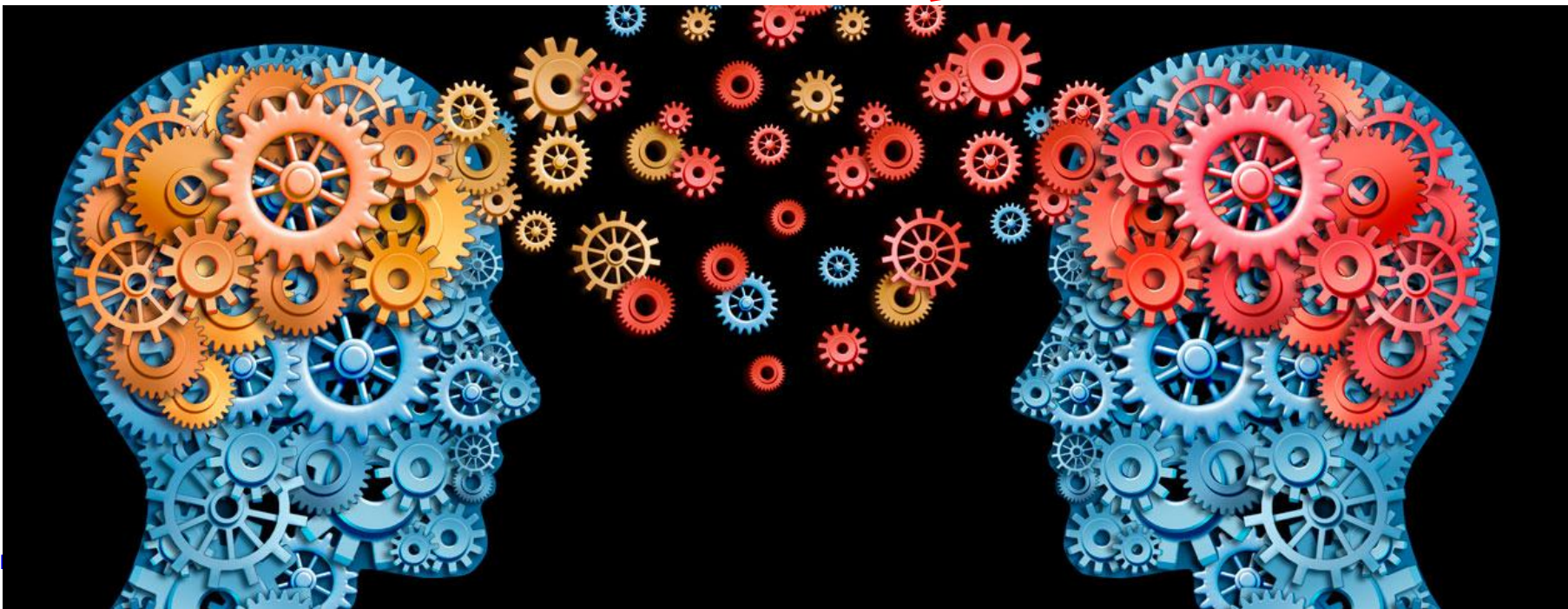
- the ability to understand the mental state, of oneself or others, that underlies the behavior
 - Rationally
 - Emotionally



Mentalization

- the ability to understand the mental state, of oneself or others, that underlies the behavior
- Rationally
- Emotionally

**Empathy – „mentalization
in a positive sense“**



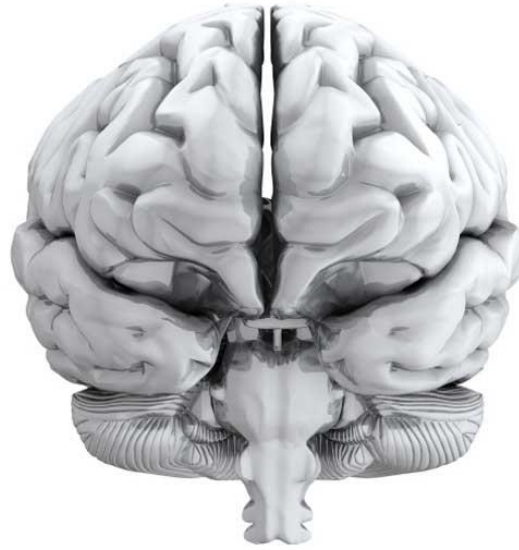
Social brain

„The first sign of civilization was a femur that had been broken and then healed... Helping someone else through difficulty is where civilization starts“

Margaret Mead



Social brain



35 The Highest Functions of Nervous System

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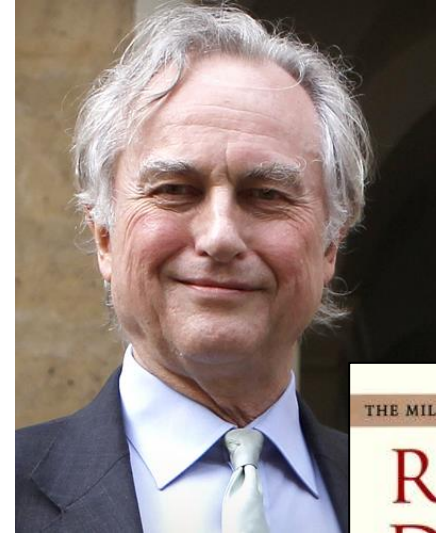
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<http://www.autotribute.com/wp-content/uploads/2016/02/Rimac-electric-supercar-front-view.jpg>

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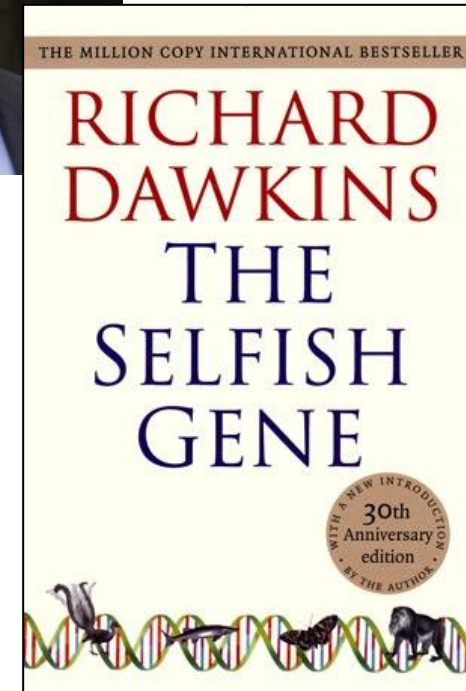
**MUNI
MED**

Memetics

- Evolutionary model of cultural information transfer
- Analogy genetic information transfer



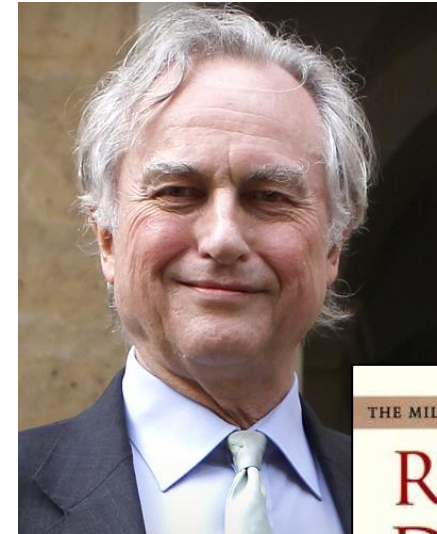
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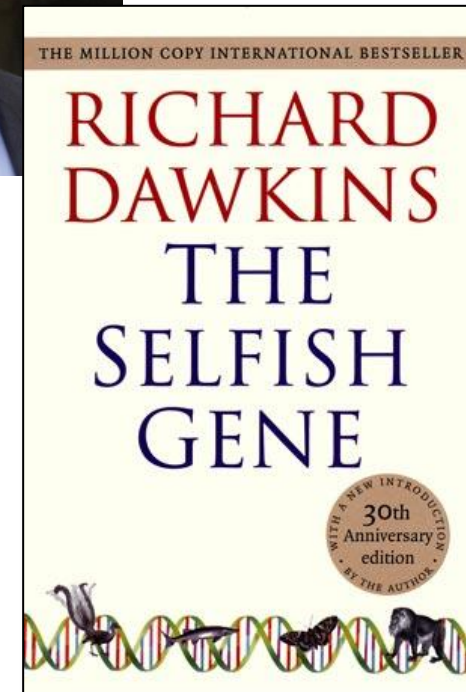
Memetics

- Evolutionary model of cultural information transfer
- Analogy genetic information transfer
- Mem
 - „unit of cultural information“
- Memetic complex
 - System of values/philosophy/religion



http://media.salon.com/2013/08/richard_dawkins2.jpg

1976

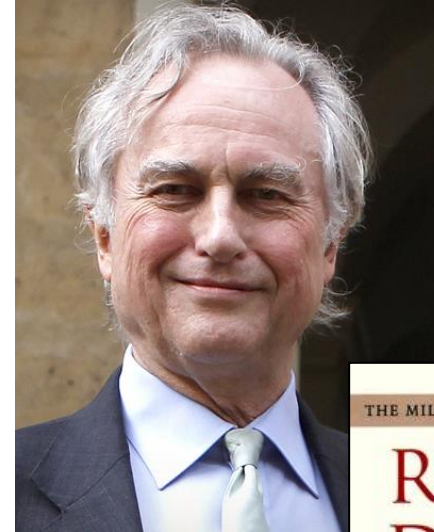


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Memetics

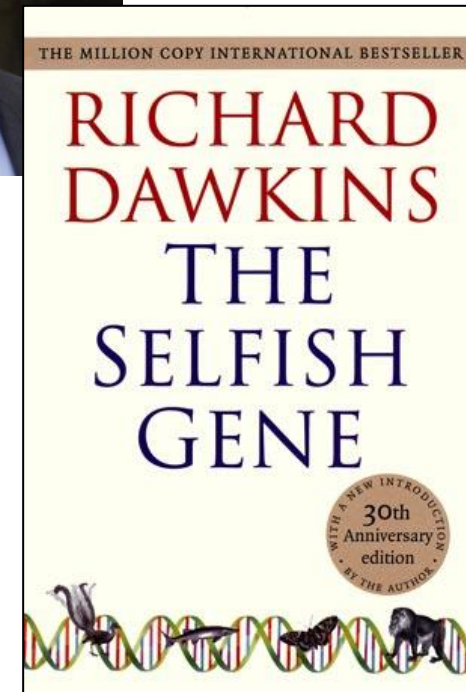
- Evolutionary model of cultural information transfer
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- Memetic complex
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Every system of values has to be considered as a memetic complex (philosophy of consume lifestyle, biker or hooligan)



http://media.salon.com/2013/08/richard_dawkins2.jpg

1976



https://geophagus.files.wordpress.com/2009/07/b123pb_lg.jpg

Memetics

- Memetic complex has to replicate, otherwise it will become a "dead learning / information"
- Memetic complexes compete each other for „substrate“ (human mind)



<http://cdn2.5wm83b1.maxcdn-edge.com/wp-content/uploads/2014/08/pepsiad2.jpg>



http://4.bp.blogspot.com/_4ryHM8waEOc/S5ZL9uKNi0I/AAAAAAAAA4w/9cyf2Jf7rnc/s400/coke_vs_pepsi.jpg

Memetics may be applied to any part of the culture, eg. on technological processes

Culture

– the sum of knowledge

- ✓ Material
- ✓ Spiritual



<https://cdn.nexternal.com/tjb/images/FC-11.jpg>



<https://s-media-cache-ak0.pinimg.com/564x/9a/86/da/9a86da32052973bb085dc1511d4b7102.jpg>



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<https://www.wikiart.org/en/leonardo-da-vinci/the-madonna-of-the-carnation>



<https://pixels.com/featured/1-madonna-and-child-peter-paul-rubens.html>



<https://www.wikiart.org/en/m-h-maxy/madonna>

Jan Sokol

<http://www.jansokol.cz/2014/03/civilizace-kultura-a-nabozenstvi/>

Three levels of life in society

Civilization level

- Everyday activities, user
- „Manual“ is sufficient, imitation

Jan Sokol

<http://www.jansokol.cz/2014/03/civilizace-kultura-a-nabozenstvi/>

Three levels of life in society

Civilization level

- Everyday activities, user
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Cultural level

- Creativity
- Knowledge and technique are needed

Jan Sokol

<http://www.jansokol.cz/2014/03/civilizace-kultura-a-nabozenstvi/>

Three levels of life in society

Civilization level

- Everyday activities, user
- „Manual“ is sufficient, imitation

Cultural level

- Creativity
- Knowledge and technique are needed

Religious level

- Inspiration of creativity
- Awareness of meaning is needed

The conflict between the limbic system and the neocortex

- **Power**
 - Hera
- **Love**
 - Aphrodite
- **Wisdom**
 - Athena



<https://www.museodelprado.es/en/the-collection/art-work/the-judgement-of-paris/f8b061e1-8248-42ae-81f8-6acb5b1d5a0a>

The conflict between the limbic system and the neocortex

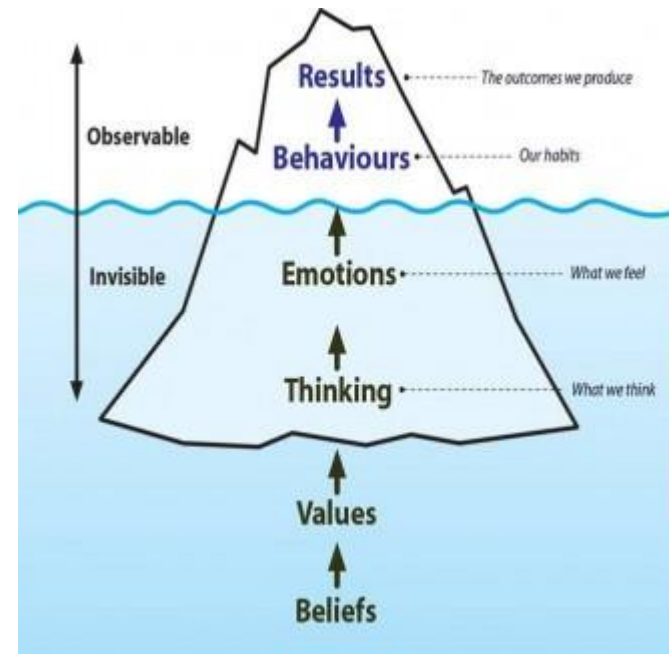


✓ The problem with effective control of the neocortex

Limbic system and neocortex

Instinctive behavior

- Limbic system
- ✓ I see a nice thing, so why not to steel it?



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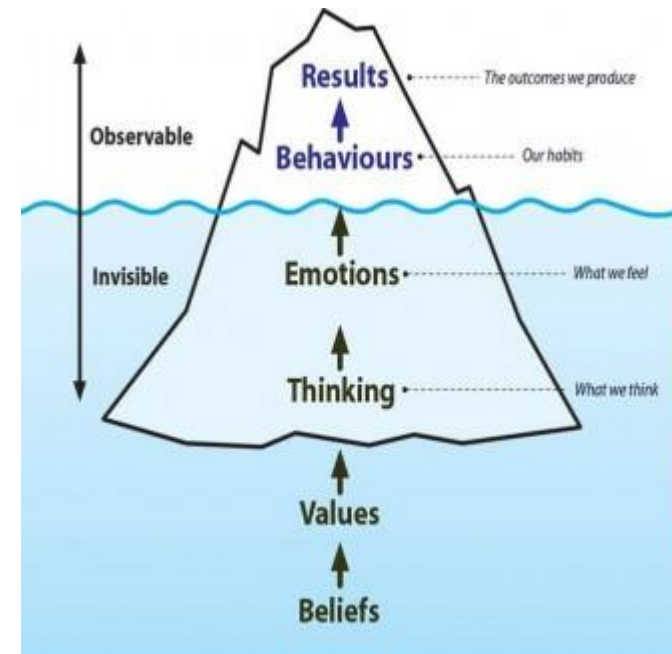
Limbic system and neocortex

Instinctive behavior

- Limbic system
- ✓ I see a nice thing, so why not to steal it?

Socially enforced behavior

- Legal behavior
- Neocortex – limbic system
- ✓ Theft is a crime, and punishment may come



<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-j-e1371521135440.jpg>

Limbic system and neocortex

Instinctive behavior

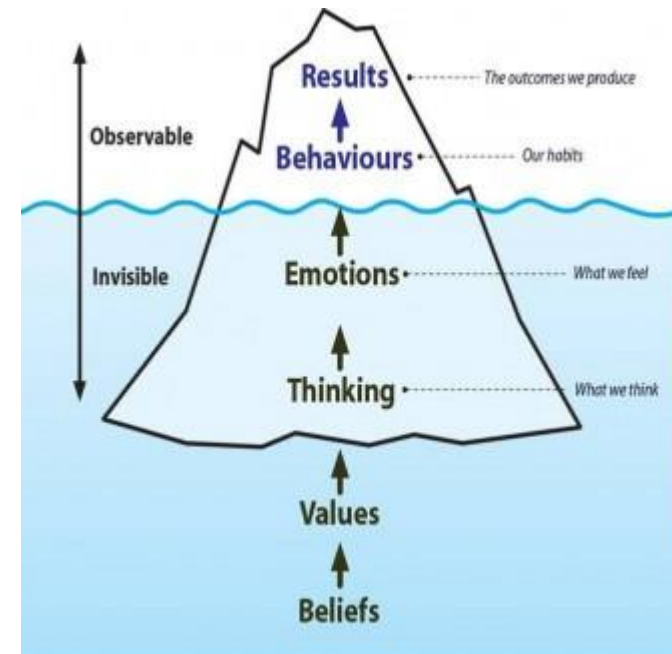
- Limbic system
- ✓ I see a nice thing, so why not to steal it?

Socially enforced behavior

- Legal behavior
- Neocortex – limbic system
- ✓ Theft is a crime, and punishment may come

Moral behavior

- Legitimate behavior
- Limbic system
- ✓ Stealing is a bad thing



<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-j-e1371521135440.jpg>

Limbic system and neocortex

Instinctive behavior

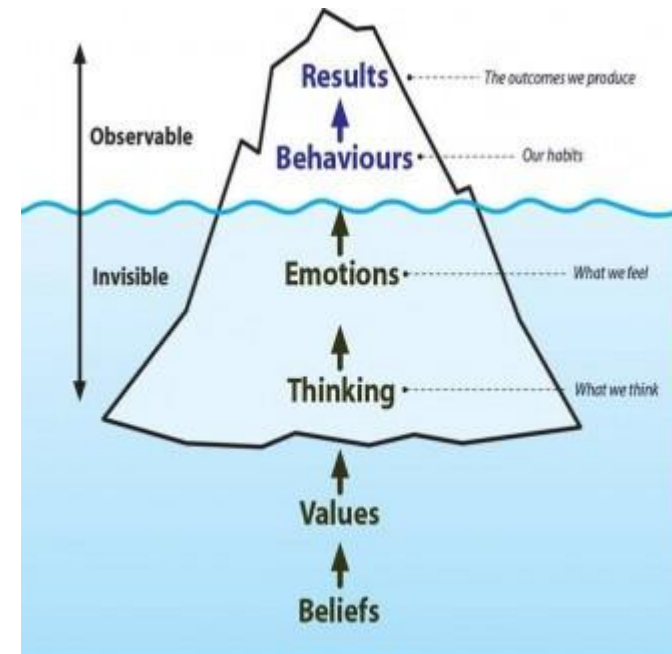
- Limbic system
- ✓ I see a nice thing, so why not to steal it?

Socially enforced behavior

- Legal behavior
- **Fear of punishment** (Limbic system)
- ✓ Stealing is a crime, and punishment may come

Moral behavior

- Legal behavior
- **Moral stance** (Neocortex)
- ✓ Stealing is a bad thing



<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-j-e1371521135440.jpg>

Limbic system and neocortex

„ The whole is greater than the sum of its parts“

Aristoteles

Information

NEOCORTEX

VS

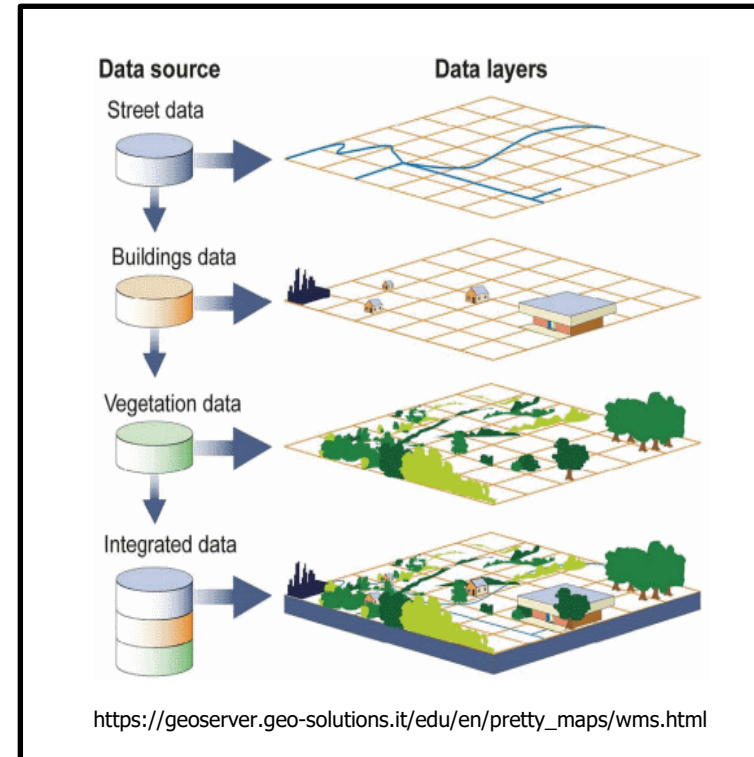
Complex information

NEOCORTEX/limbic system

VS

Values/Philosophy/Faith

Neocortex/LIMBIC SYSTEM



Cognitive maps

Type of **mental representation** which serves an individual to acquire, code, store, recall, and decode information about the **relative locations and attributes** of phenomena in their everyday or metaphorical spatial environment.

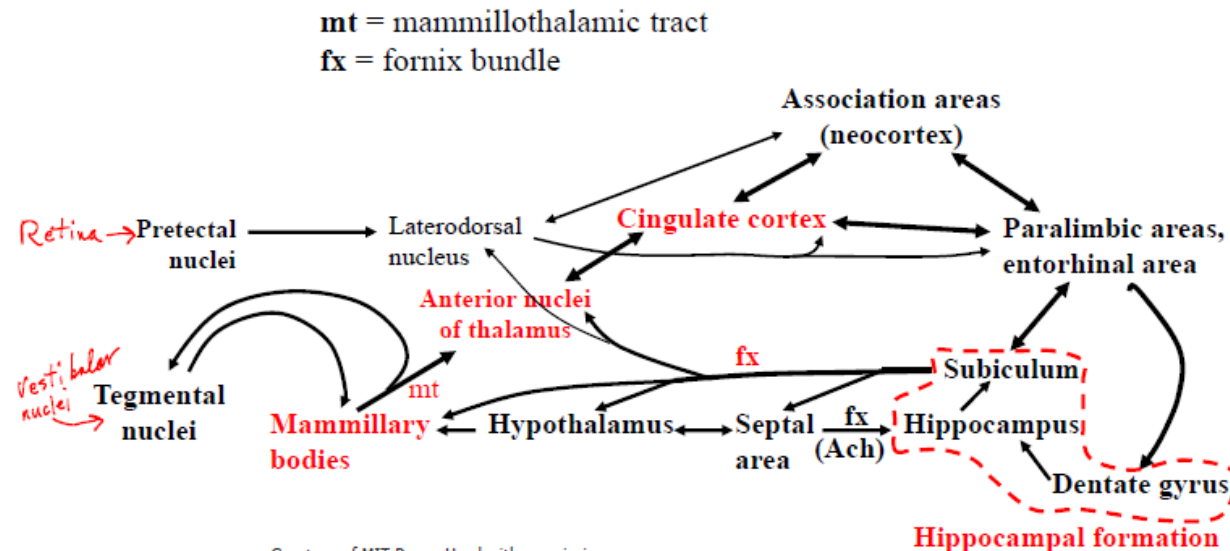
Wikipedia

- Origins of endbrain: Structures underlying olfaction
- Two major links between olfactory system and the motor systems of the midbrain

✓ Object oriented
✓ Implicite

✓ Location oriented
✓ Explicite

- 1) Through the ventral endbrain, which became corpus striatum and basal forebrain (including much of the septal area)
 - Outputs to hypothalamus, (epithalamus, subthalamus), midbrain
 - These outputs affected locomotion and orienting movements
 - The links were plastic, so habits were formed according to rewarding effects mediated, e.g., by taste effects.
- 2) Through the medial part of the dorsal endbrain, which became medial pallium—the hippocampal formation
 - Outputs to ventral striatum, hypothalamus, epithalamus
 - The links were plastic, but the “habits” formed were different: The association of place with good or bad consequences of approach.



Courtesy of MIT Press. Used with permission.
Schneider, G. E. Brain Structure and its Origins: In the Development and in Evolution of Behavior and the Mind. MIT Press, 2014. ISBN: 9780262026734.

http://www.slideshare.net/drsunilsuthar/neurobiology-of-emotion



Prof. Gerald Schneider

MUNI
MED

Learning and memory

- Connections of striatum and hippocampus are plastic
- Plasticity is a base of learning
- Learning is a forming of long- term memory

- Declarative memory (explicit)
- Based on hippocampus
- Explicit information is stored and later recollected
- „Construction of the maps (relationships)“ – spatial or abstract

- Procedural memory (implicit)
- Based on striatum
- Habitual learning – motor skills, but also social habits
- „Construction of the algorithms“

Location oriented:
Where am I and what
has happened here?

Object oriented:
Can I eat it and how
to eat it?

**Cognitive map
term definition**

Edward C. Tolman

1948



https://en.wikipedia.org/wiki/Edward_C._Tolman

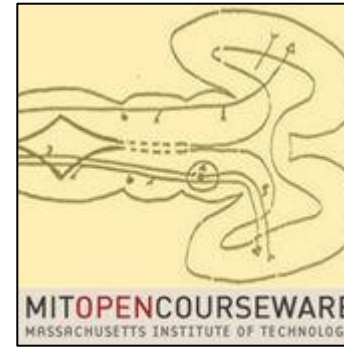
**Anatomical
correlate?**

Gerald Schneider



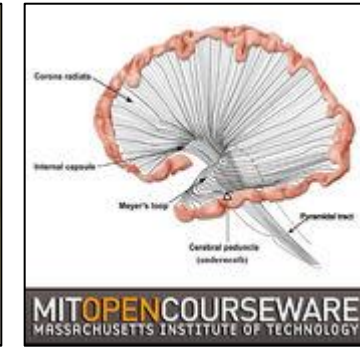
O'Keefe and Nadel
'70s
And others

2009

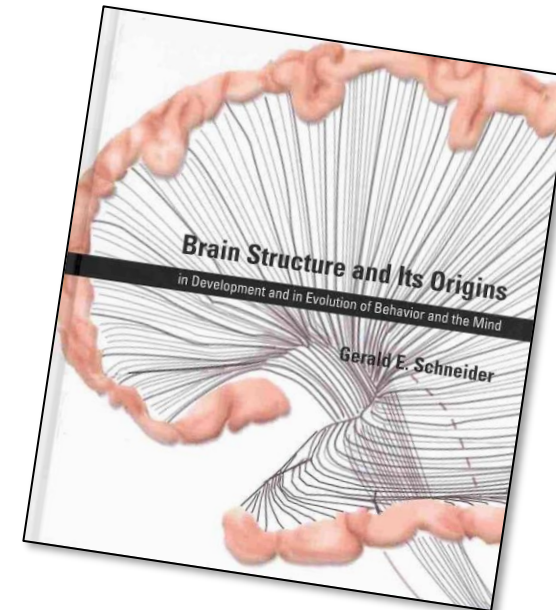


<https://itunes.apple.com/us/podcast/brain-structure-and-its-origins-2009/id385157530?mt=2>

2014



<https://itunes.apple.com/us/podcast/brain-structure-and-its-origins-2014/id944293984?mt=2>



2014

Cognitive maps

Type of **mental representation** which serves an individual to acquire, code, store, recall, and decode information about the **relative locations and attributes** of phenomena in their everyday or metaphorical spatial environment.

Wikipedia

Later generalized to refer to a kind of **semantic network** **representing** an individual's personal **knowledge or schemas**.

Wikipedia

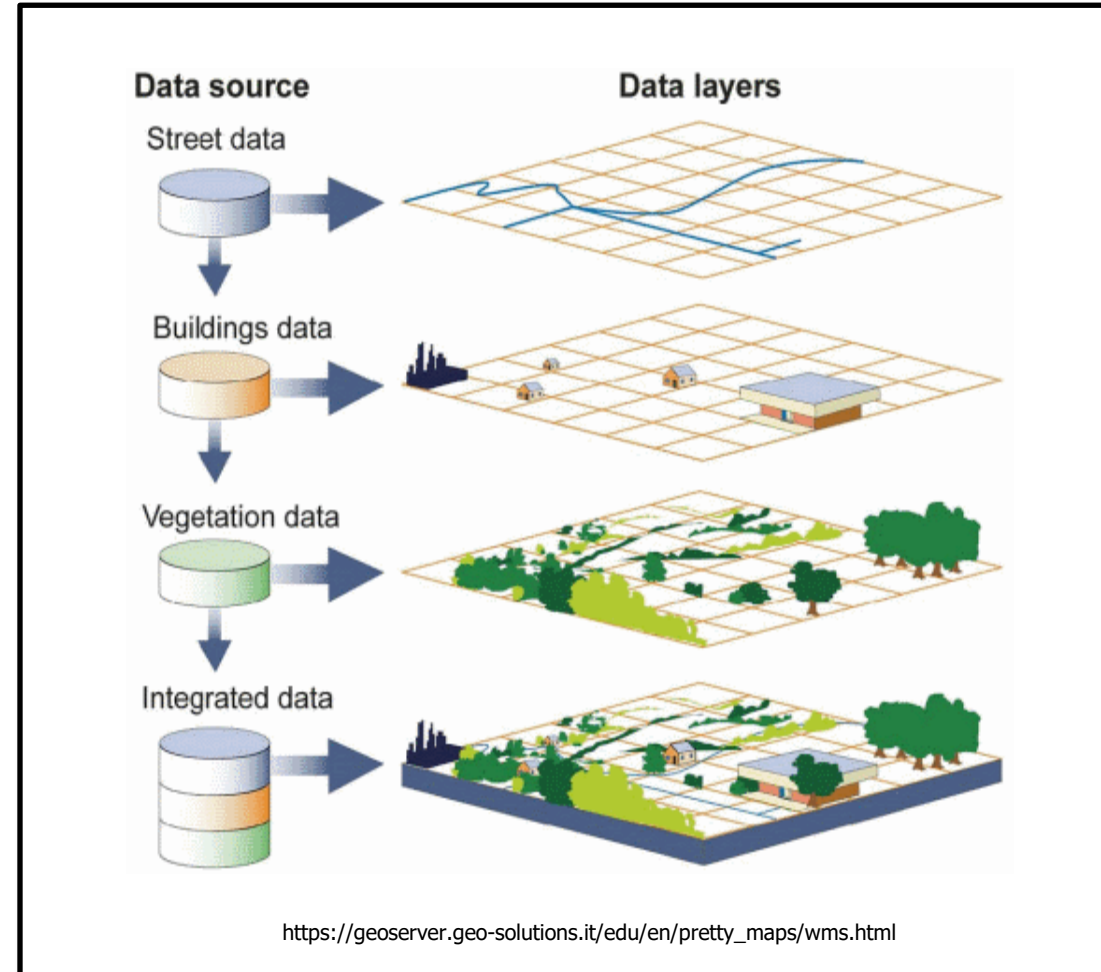
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- ✓ Unique
- ✓ Egocentric, but multiple points of view
- ✓ Complex

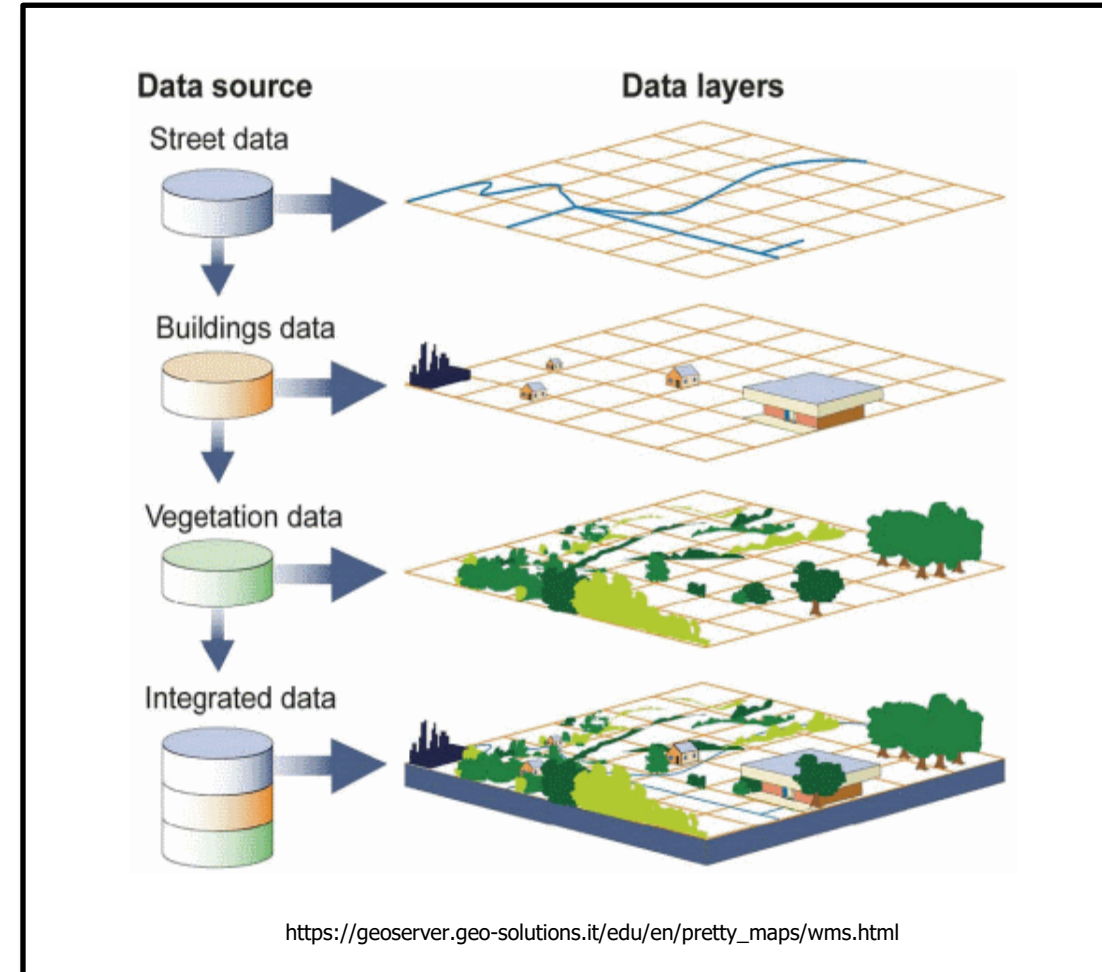
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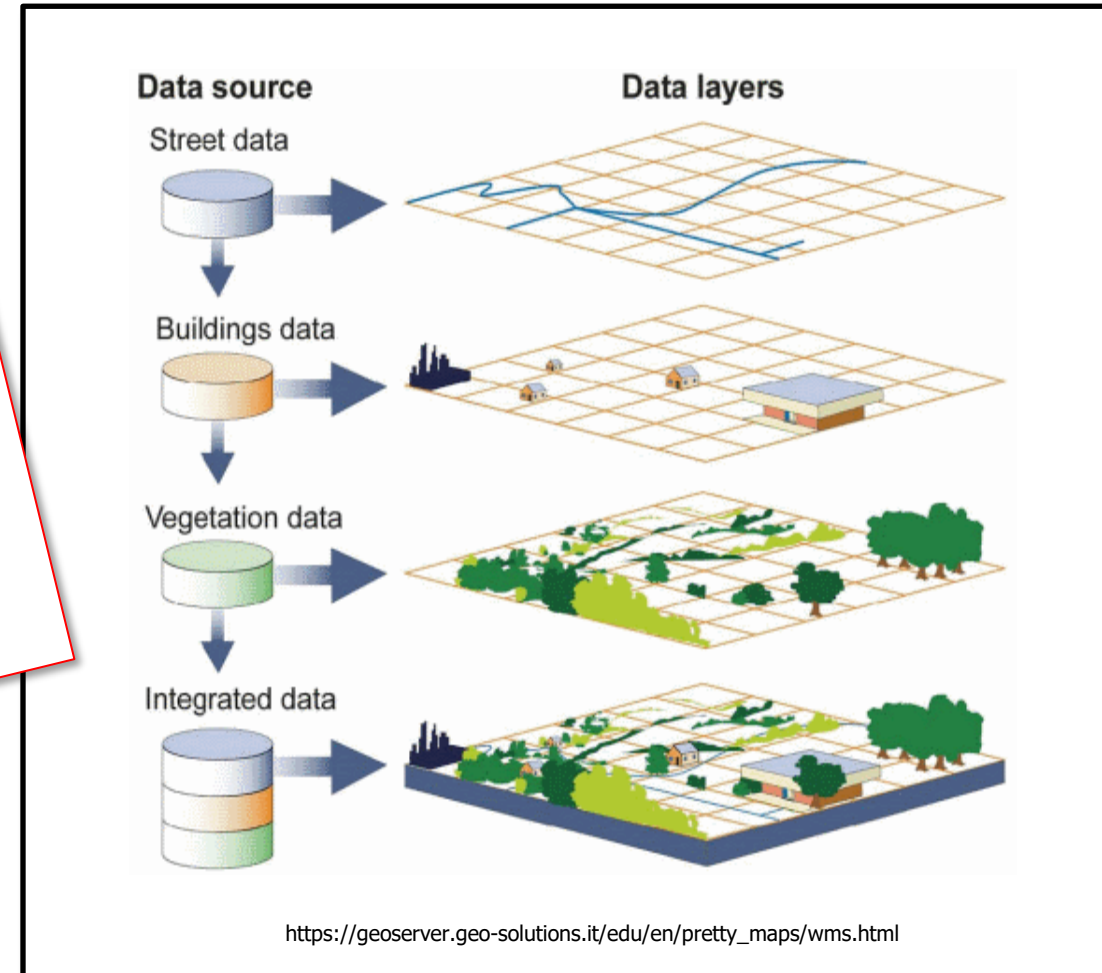


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Cognitive maps

Brain activity

- ✓ Highly individual
- ✓ Very subjective

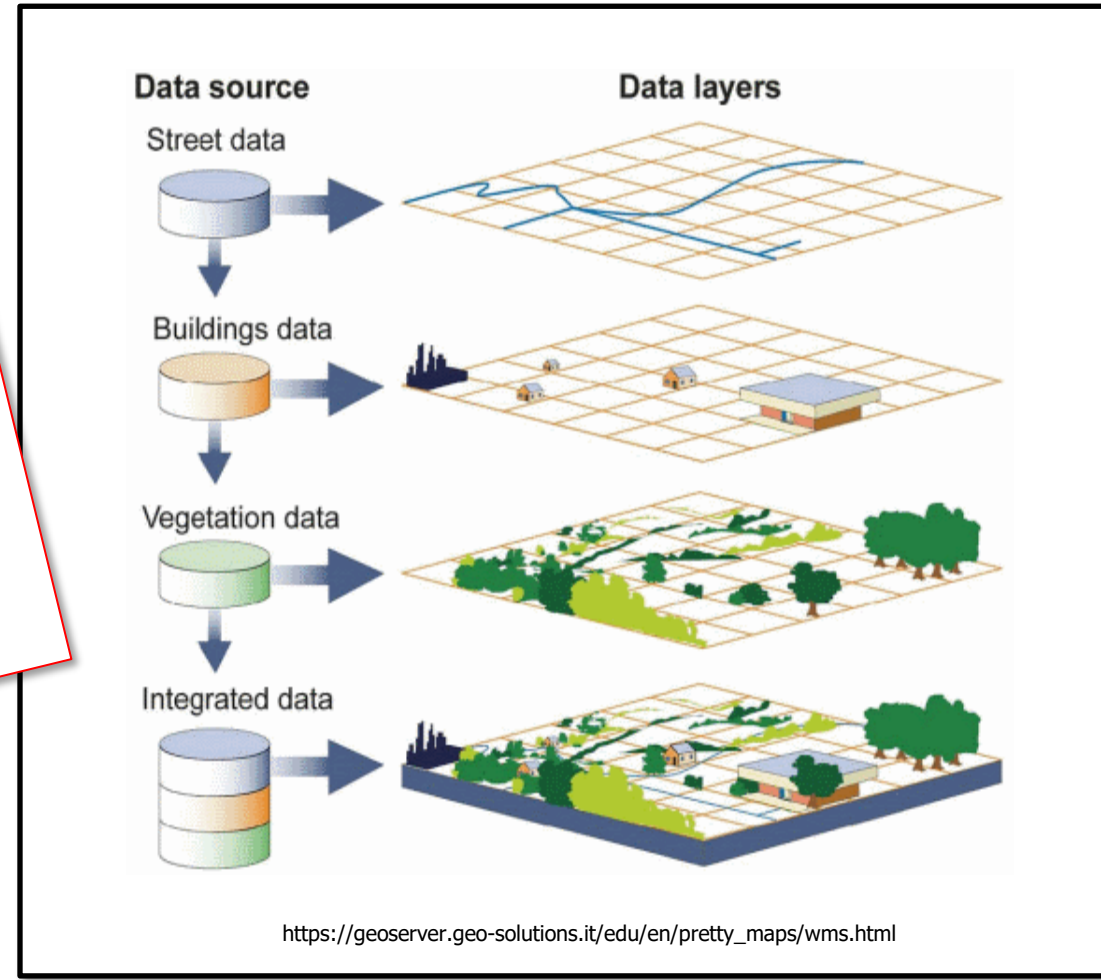


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- ✓ Very subjective
- ✓ Values/philosophy/faith enable coexistence within the larger group/society

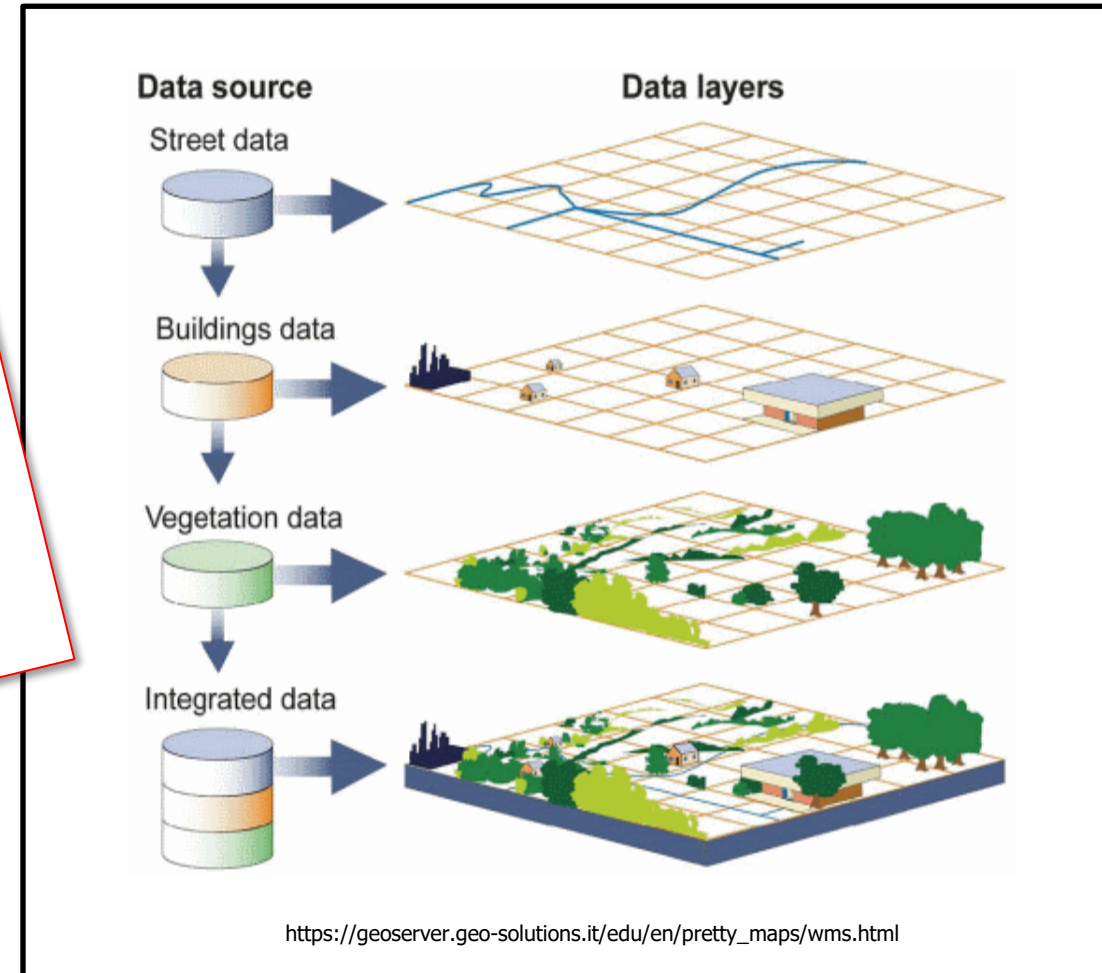


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Cognitive maps

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- ✓ Values/philosophy/faith enable coexistence within the larger group/society
- ✓ These systems represent RULES



86. The basic characterization of neocortical functions – language and social brain, basic overview of functional diagnostic methods used in neurology

- Communication and language
 - Language areas – localization and function including lobulus parietalis inferior, aphasia...
 - Lateralization of language functions, gender differences
- Social brain
 - Human is a social being, so the brain has to be designed accordingly
 - Frontal lobe and limbic system in behavioral control
 - Triune brain theory, whole brain model, mentalization.
- Functional diagnostic methods (EEG, SPECT, PET , fMRI)

M U N I

M E D