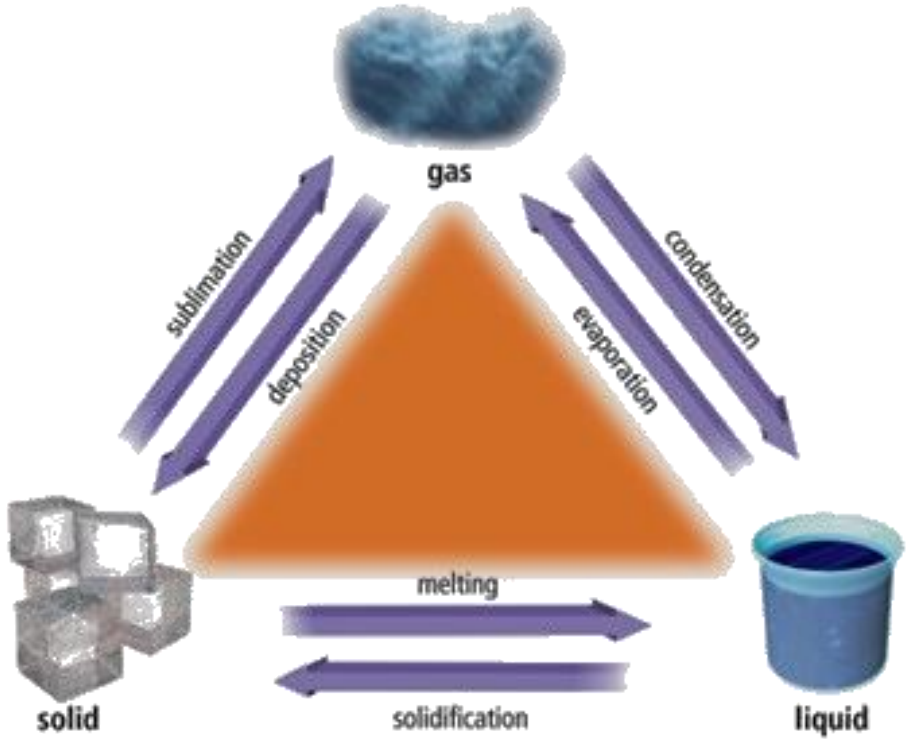
The Highest Level of Brain Activity I

Three States of Cognition

PS Deb

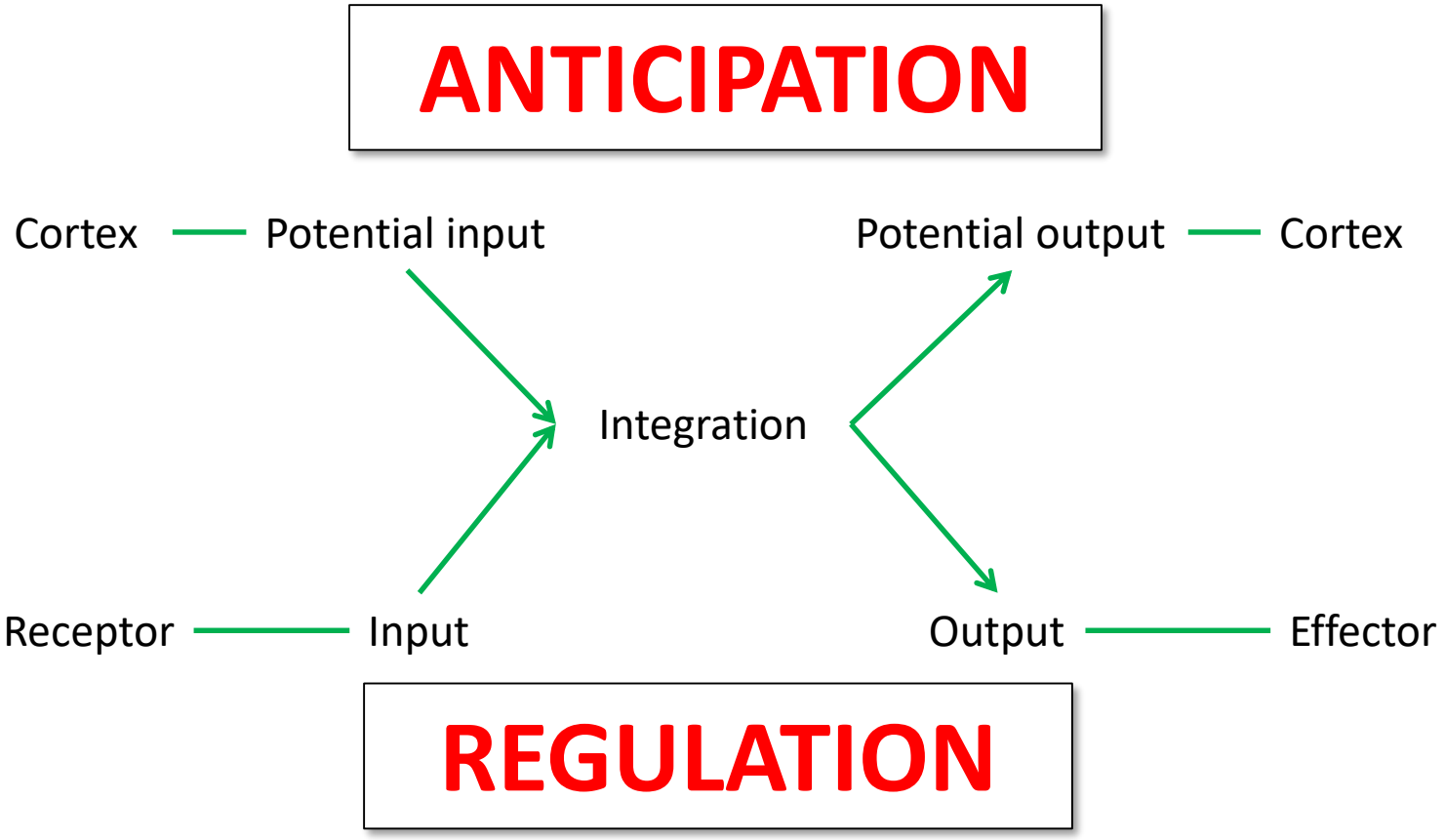
Philosophy : Mind behind Mind



Neuroscience: Brain

Psychology : Mind

The role of nervous system



Three States of Cognition

PS Deb

Philosophy : Mind behind Mind

Neuroscience: Brain

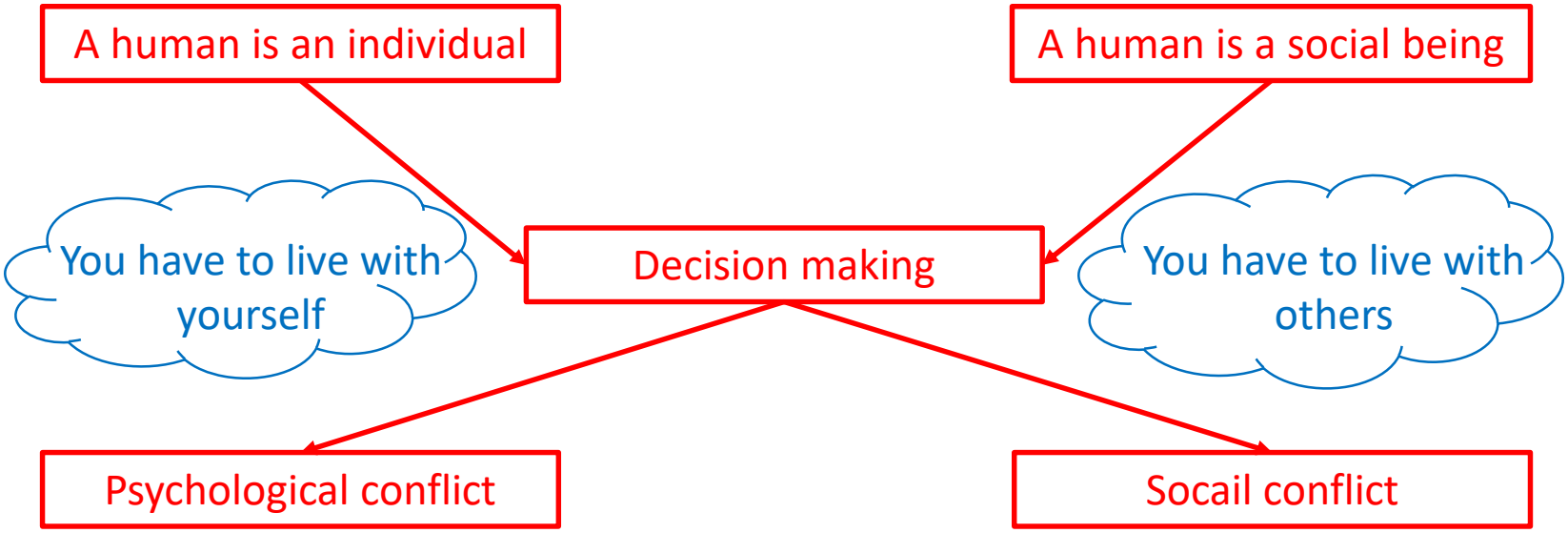
Psychology : Mind

Sociology : Social Mind

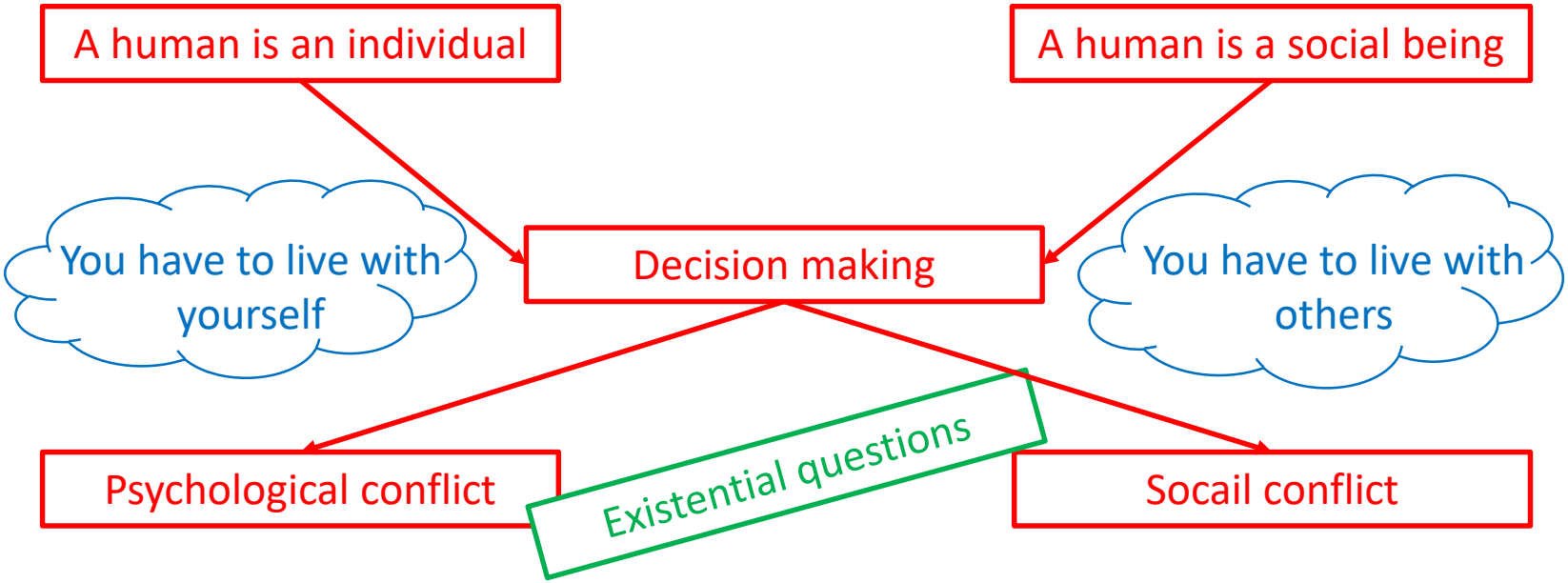
Why?


A human is an individual
A human is a social being
Decision making

Why?


A human is an individual
A human is a social being
You have to live with yourself
Decision making
You have to live with others
Psychological conflict
Socail conflict

Why?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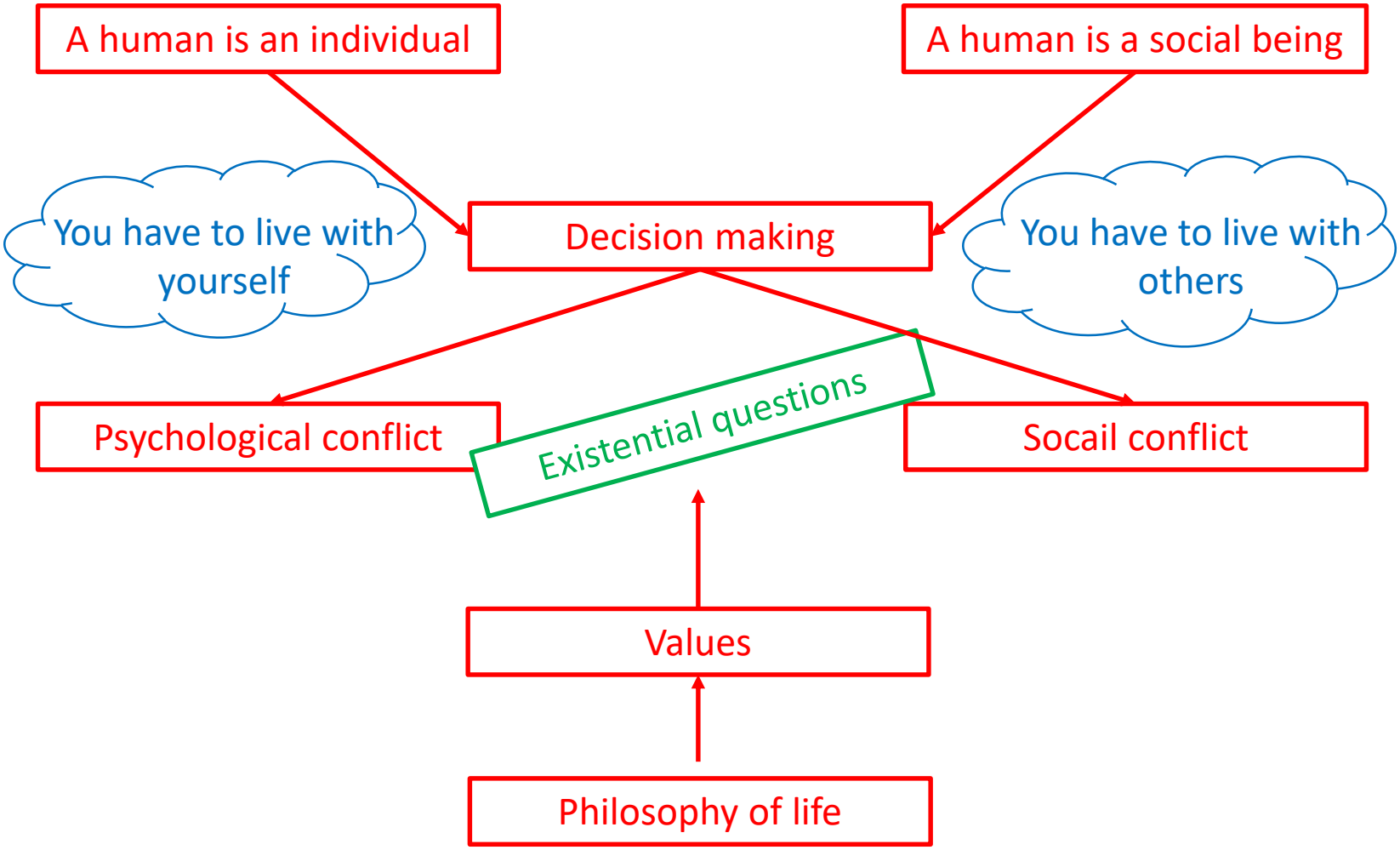
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Values
Philosophy of life

Philosophy

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

Wikipedia

Philosophy

FORMAL PHILOSOPHY

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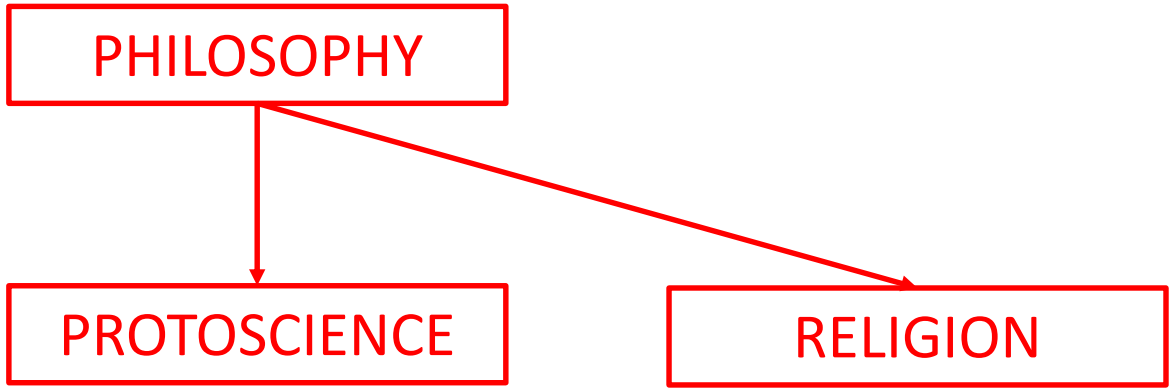
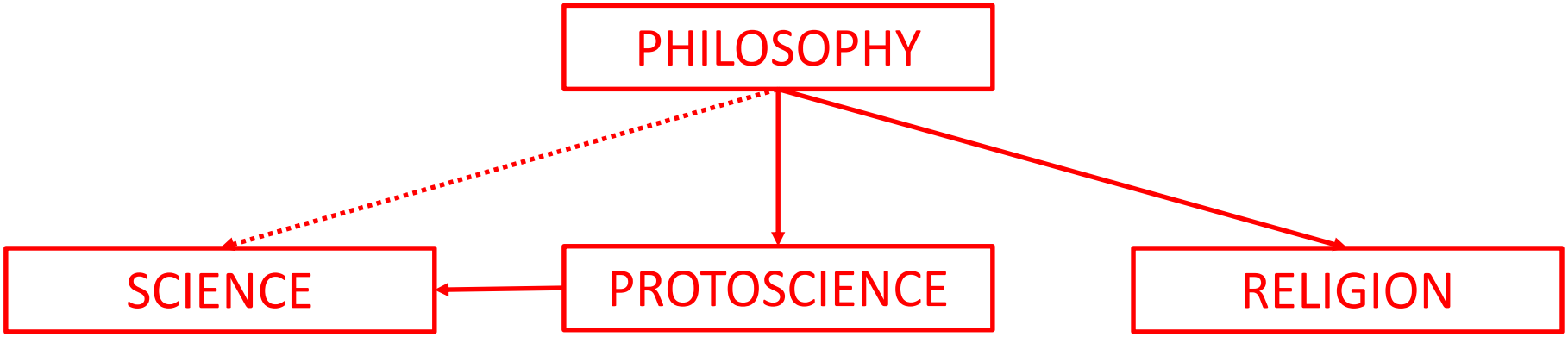

PHILOSOPHY
PROTOSCIENCE
RELIGION


PHILOSOPHY
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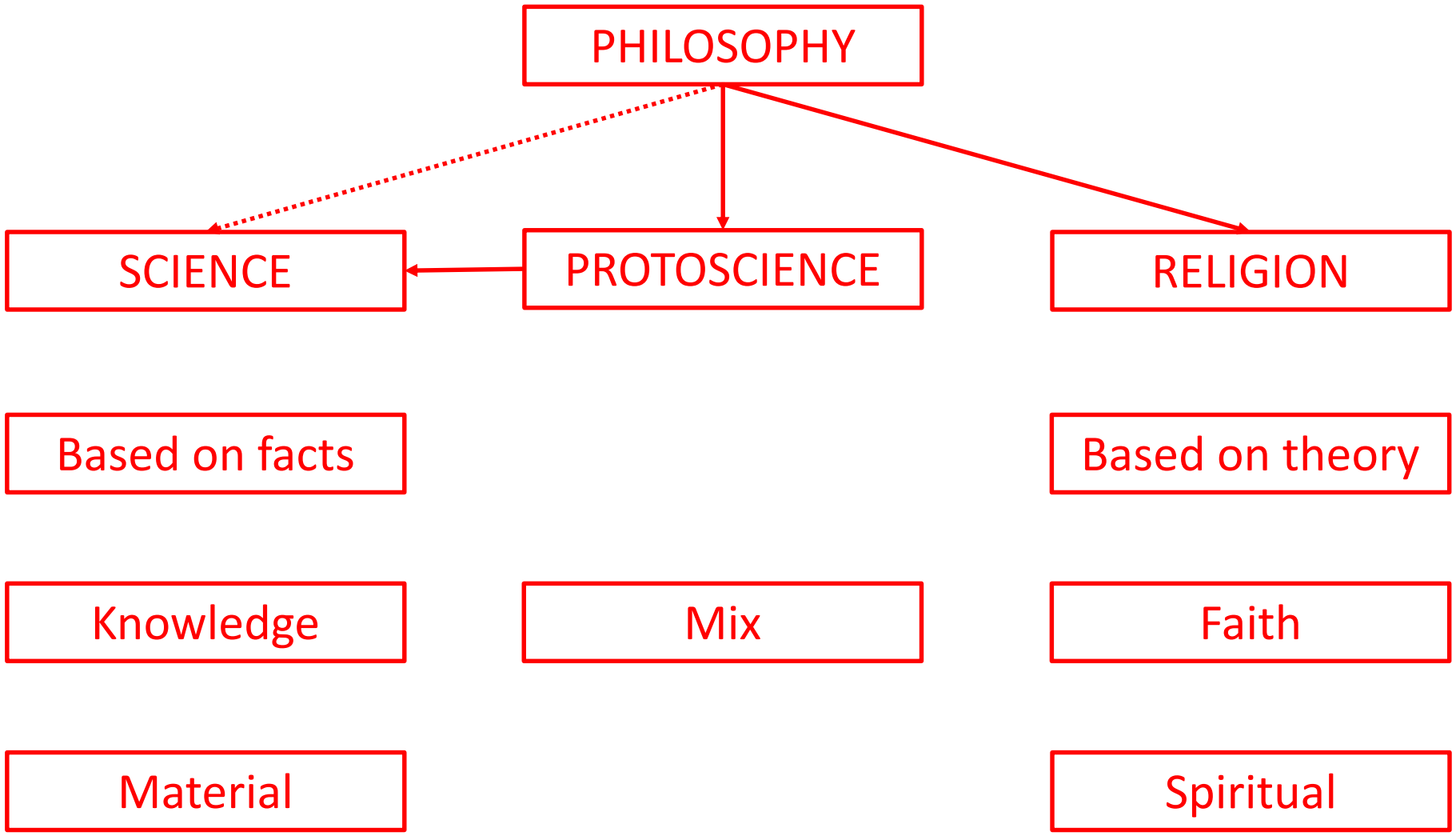
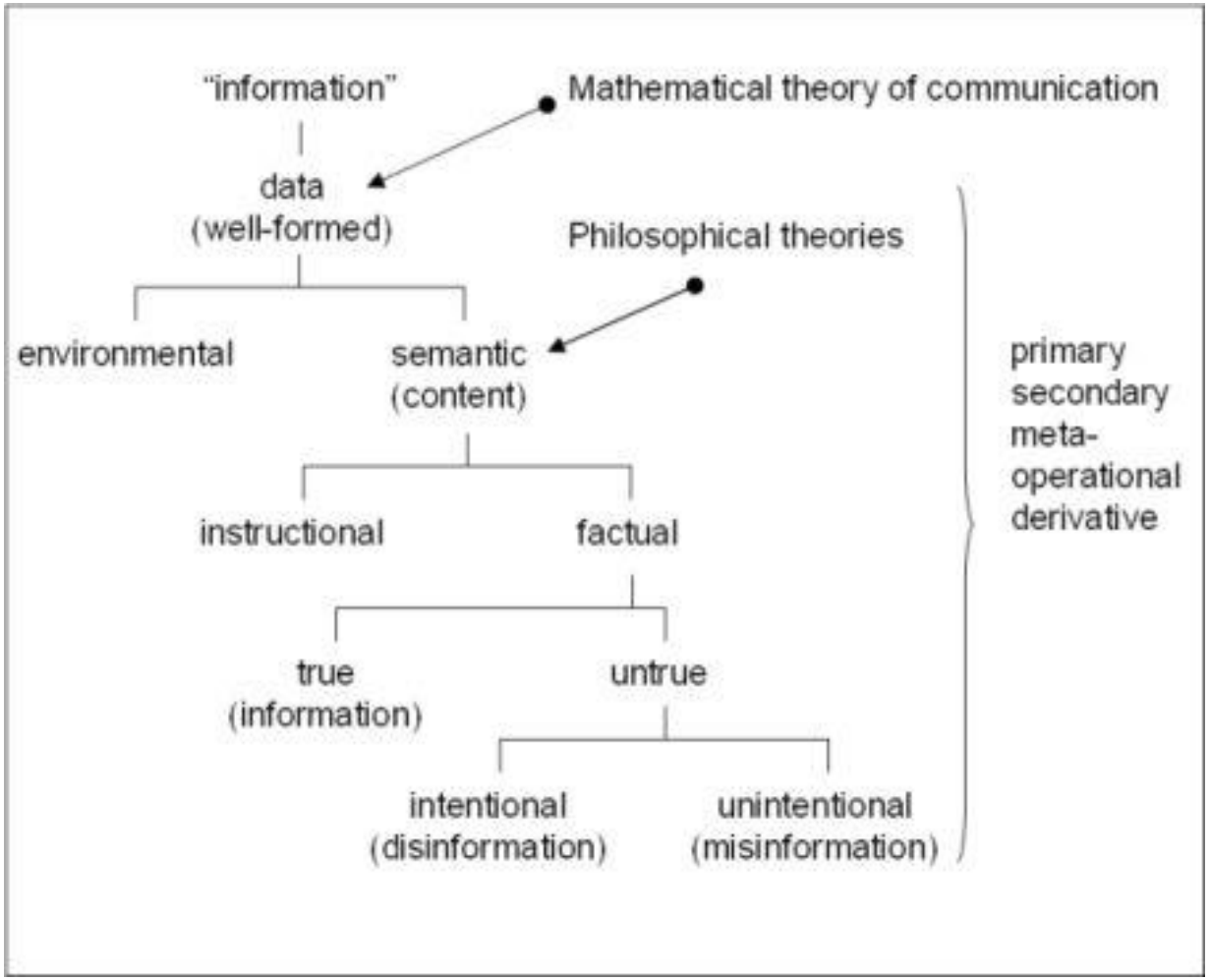
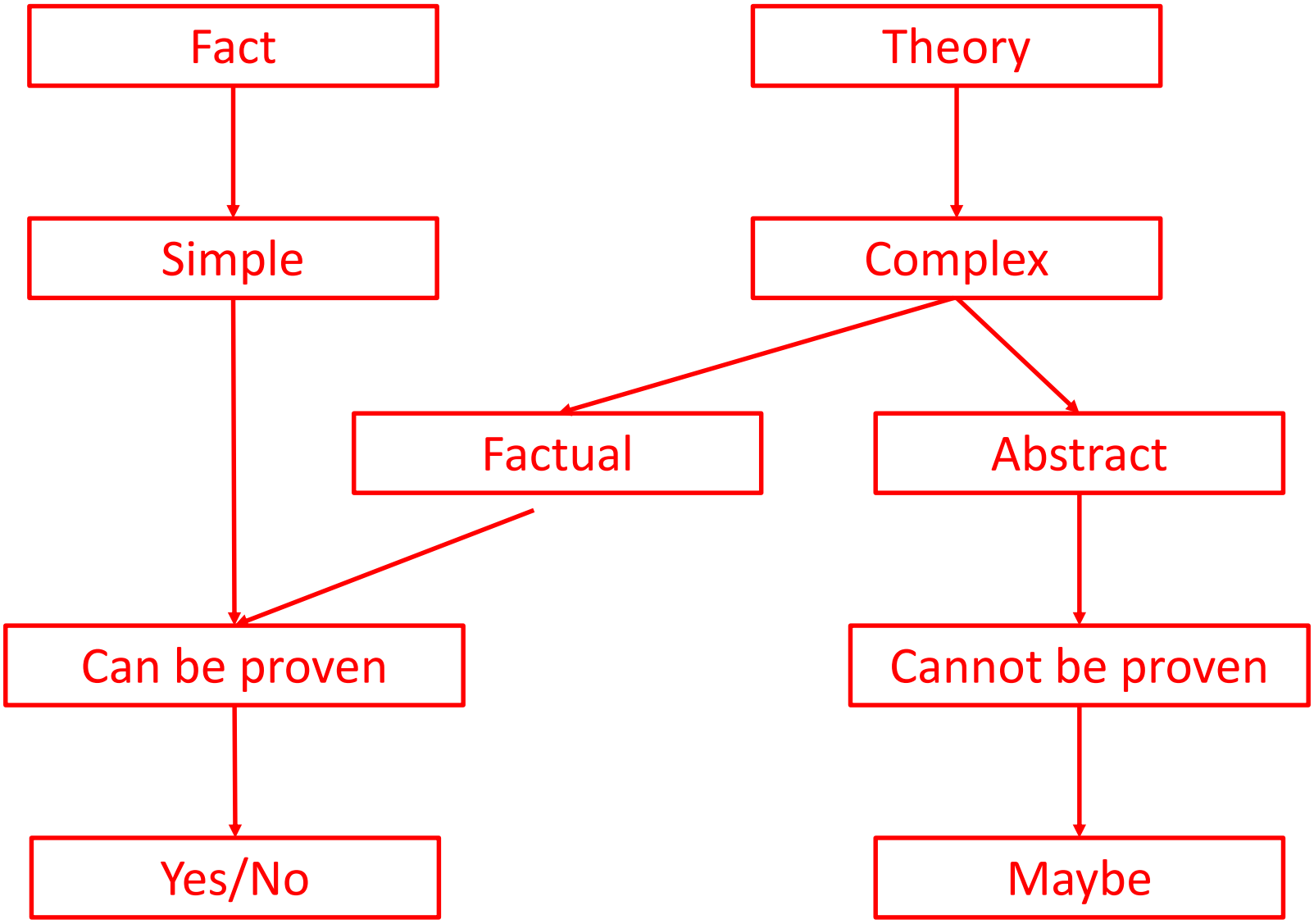

PHILOSOPHY
SCIENCE
PROTOSCIENCE
RELIGION
Based on facts
Based on theory
Knowledge
Mix
Faith
Material
Spiritual

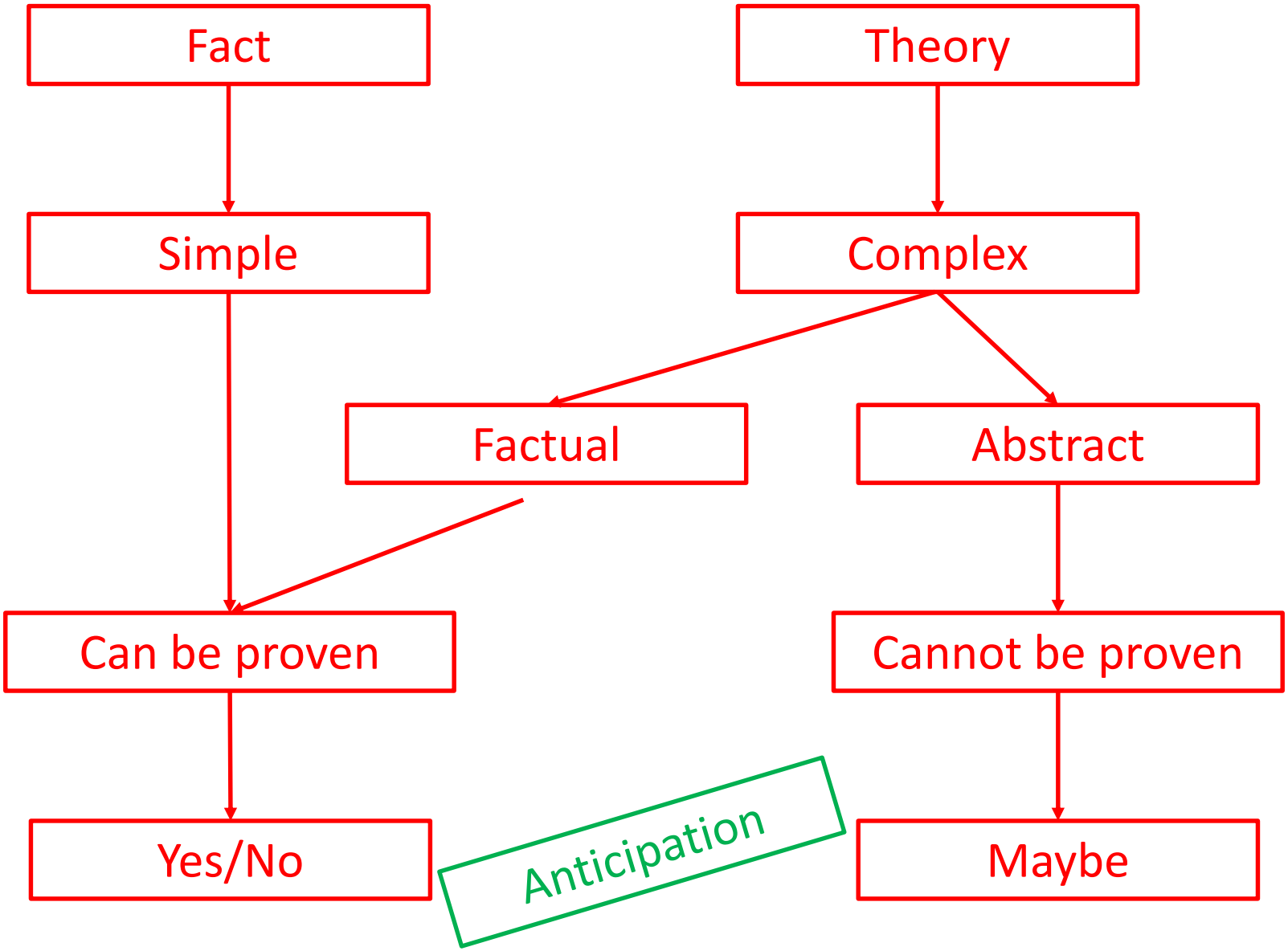
Information processing



https://plato.stanford.edu/entries/information-semantic/figure1.jpg


Fact
Simple
Theory
Complex


Fact
Theory
Simple
Complex
Factual
Abstract
Can be proven
Cannot be proven
Yes/No
Maybe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Simple
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Factual
Abstract
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Cannot be proven
Yes/No
Anticipation
Maybe

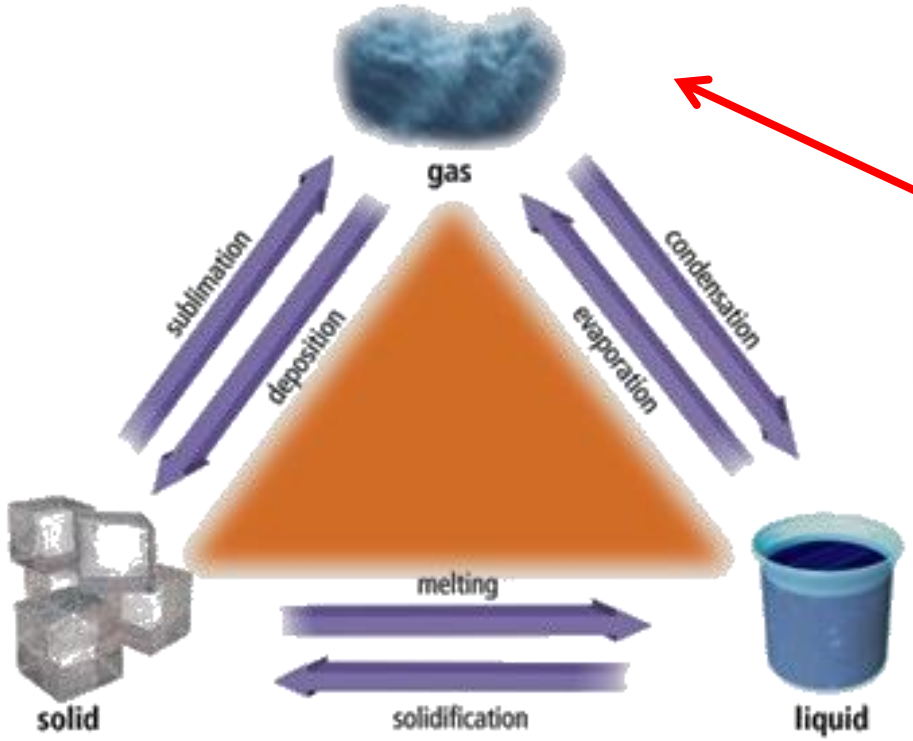
Three States of Cognition

PS Deb

Philosophy : Mind behind Mind

FACTS

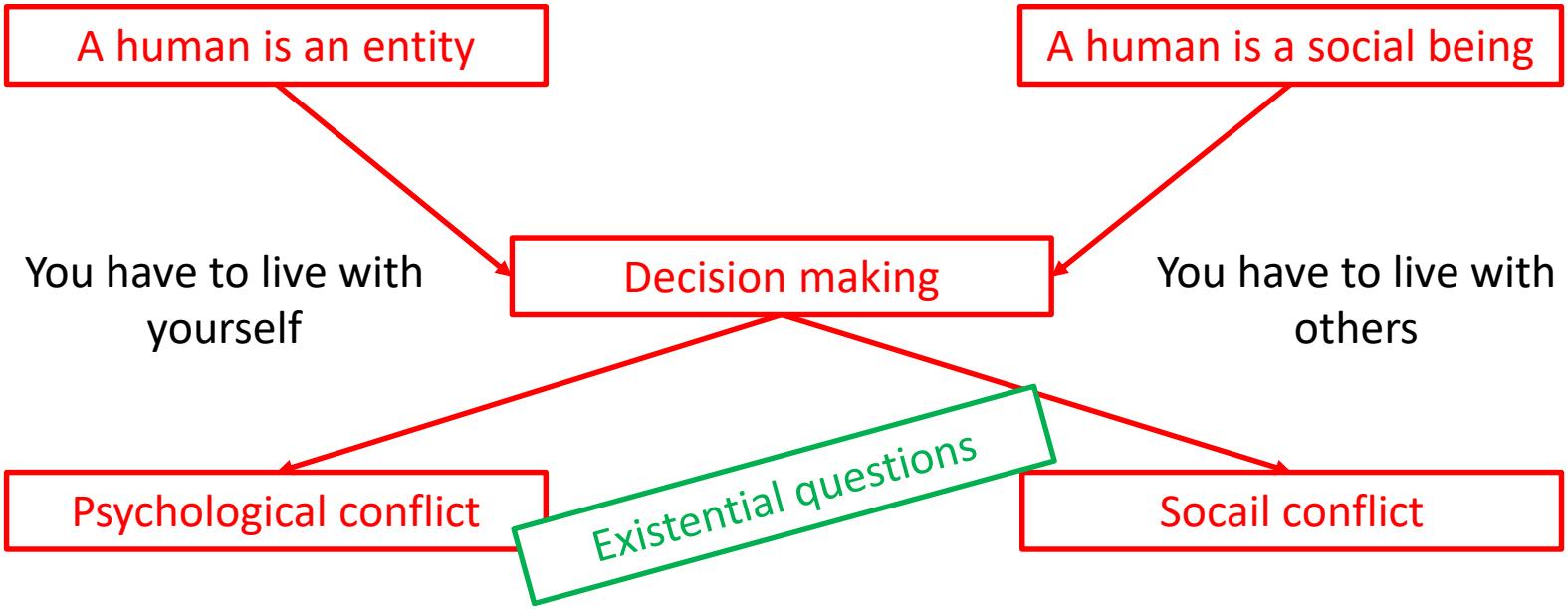
THEORIES



Neuroscience: Brain

Psychology : Mind

Why?



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Cognitive map

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.

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

Wikipedia

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Wikipedia

- ✓ Comlex
- ✓ Unique
- ✓ Multiple viewpoints

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

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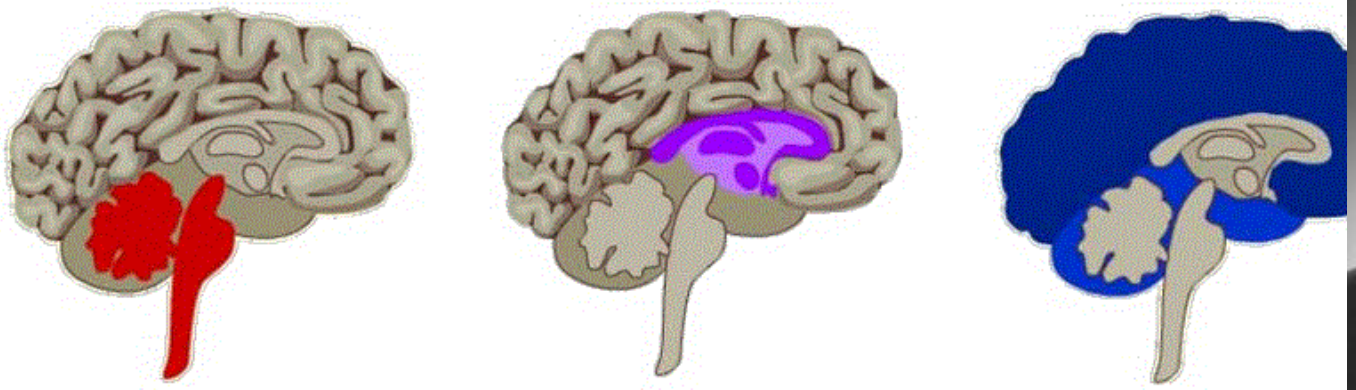
Triune Brain Theory

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



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

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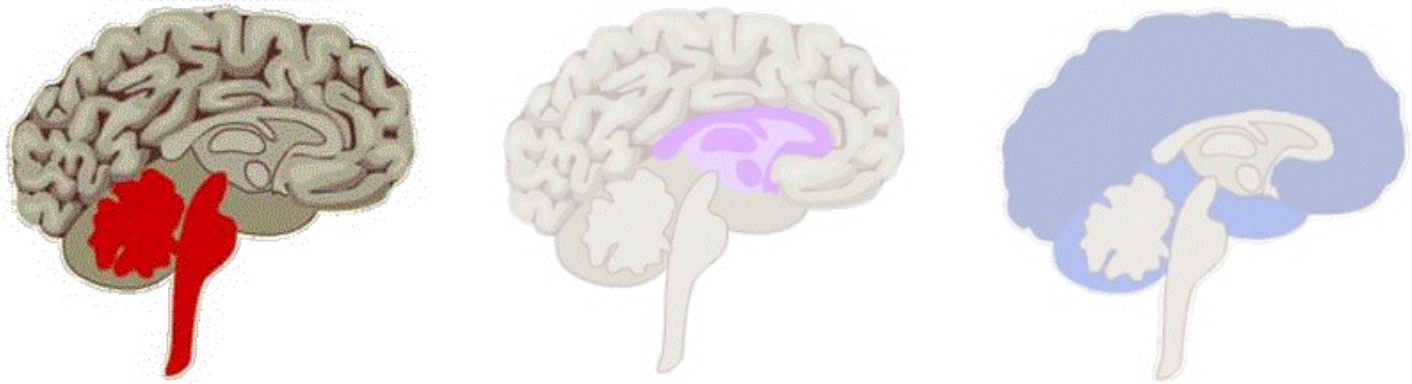

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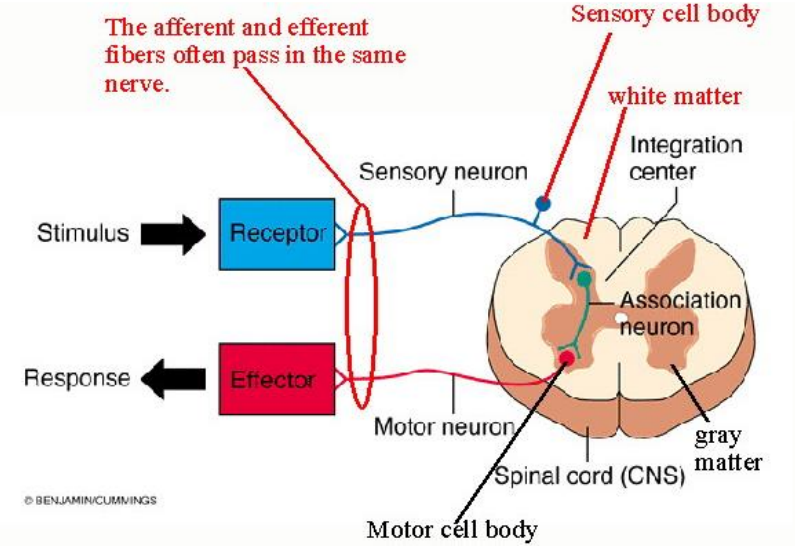
Spinal cord and brain stem

Uniform response

- Reflex activity – „hardware“
- Speed / economy



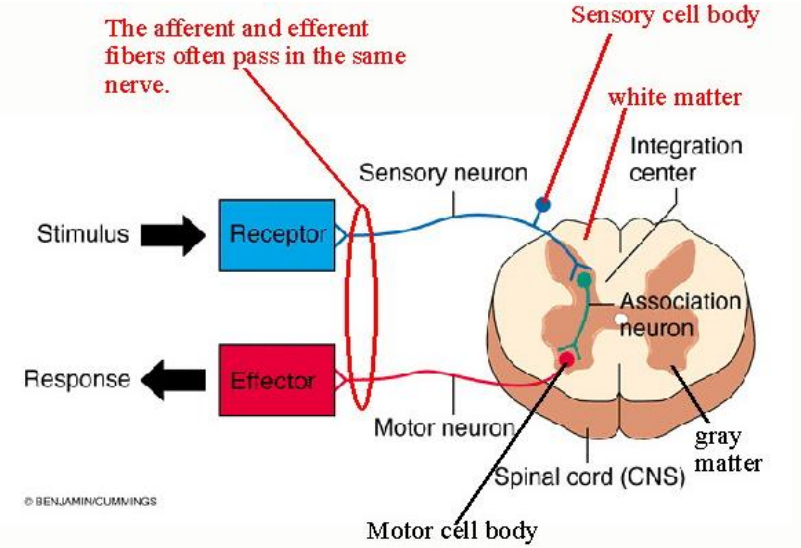
http://www.slideshare.net/CsillaEgri/presentations

on

Spinal cord and brain stem

Uniform response

- Reflex activity – „hardware“
- Speed / economy
- Fixed action patterns (FAP) - the highes level of reflex activity
- FAP activity may be controlled if it does not threat to bodily functions (e.g. Holding the breath)



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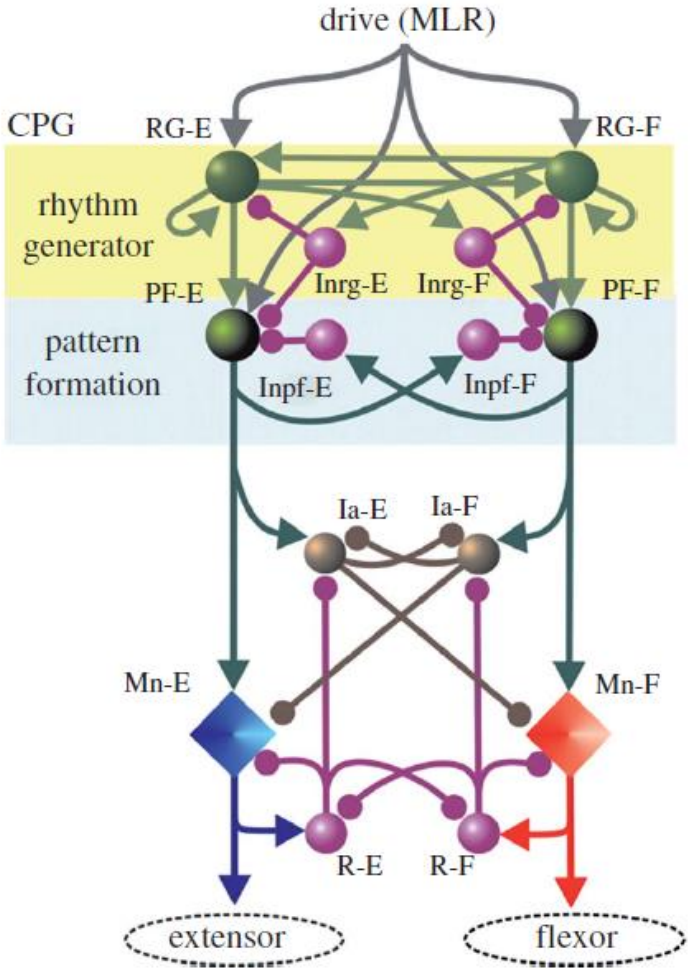

Whelan PJ. Shining light into the black box of spinal locomotor networks. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*. 2010;365:2383–2395.

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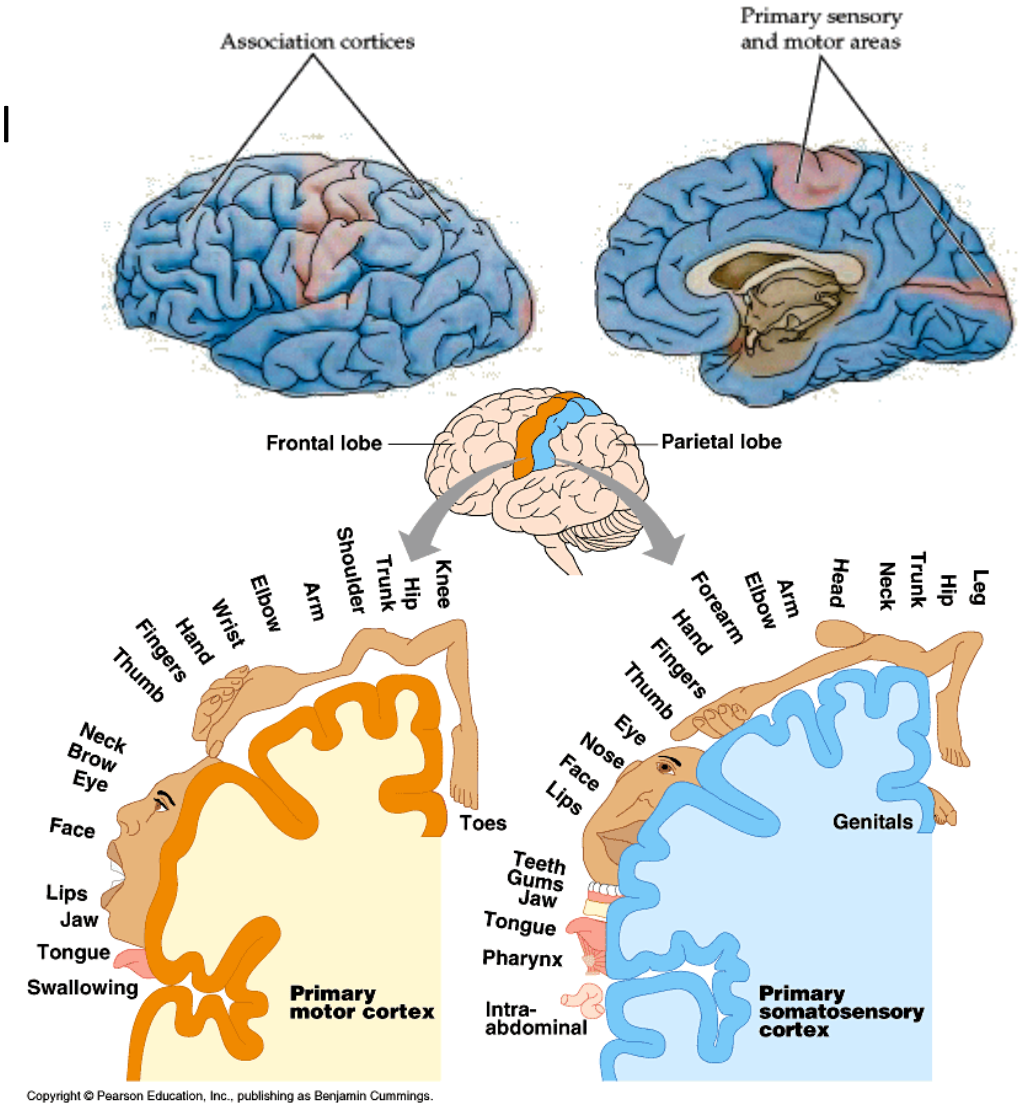
Neocortex

„Unique“ response

- Relatively slow / non-economical

- The highest analytic functions
- The highest executive functions
- Most developed in humans



http://www.emunix.emich.edu

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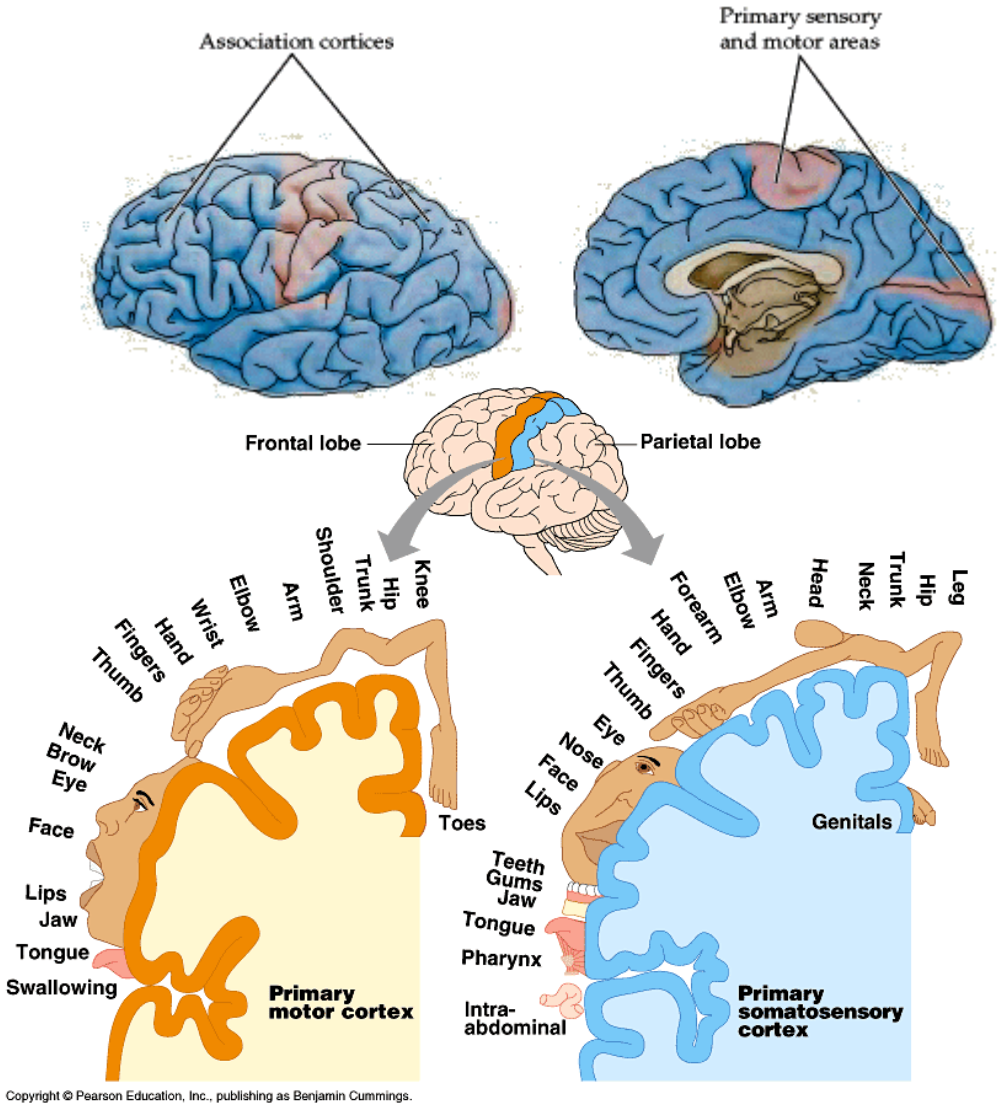
Primary areas
✓Somatotopic organisation

Association areas
✓Do not have somatotopic organisation
✓Unimodal
✓Polymodal



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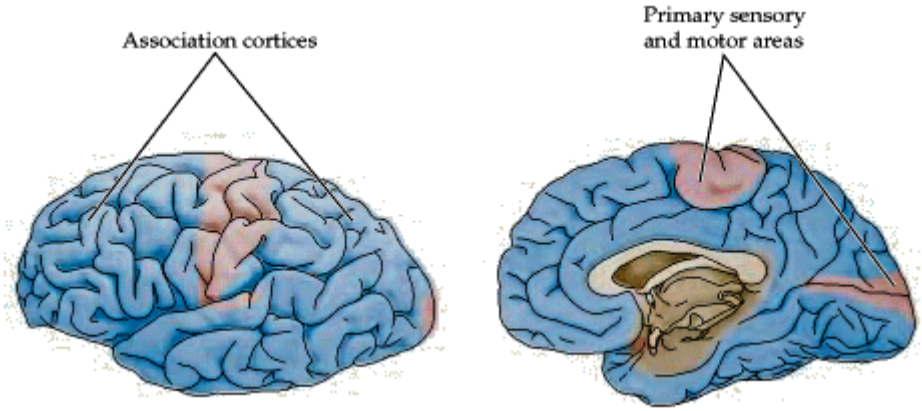
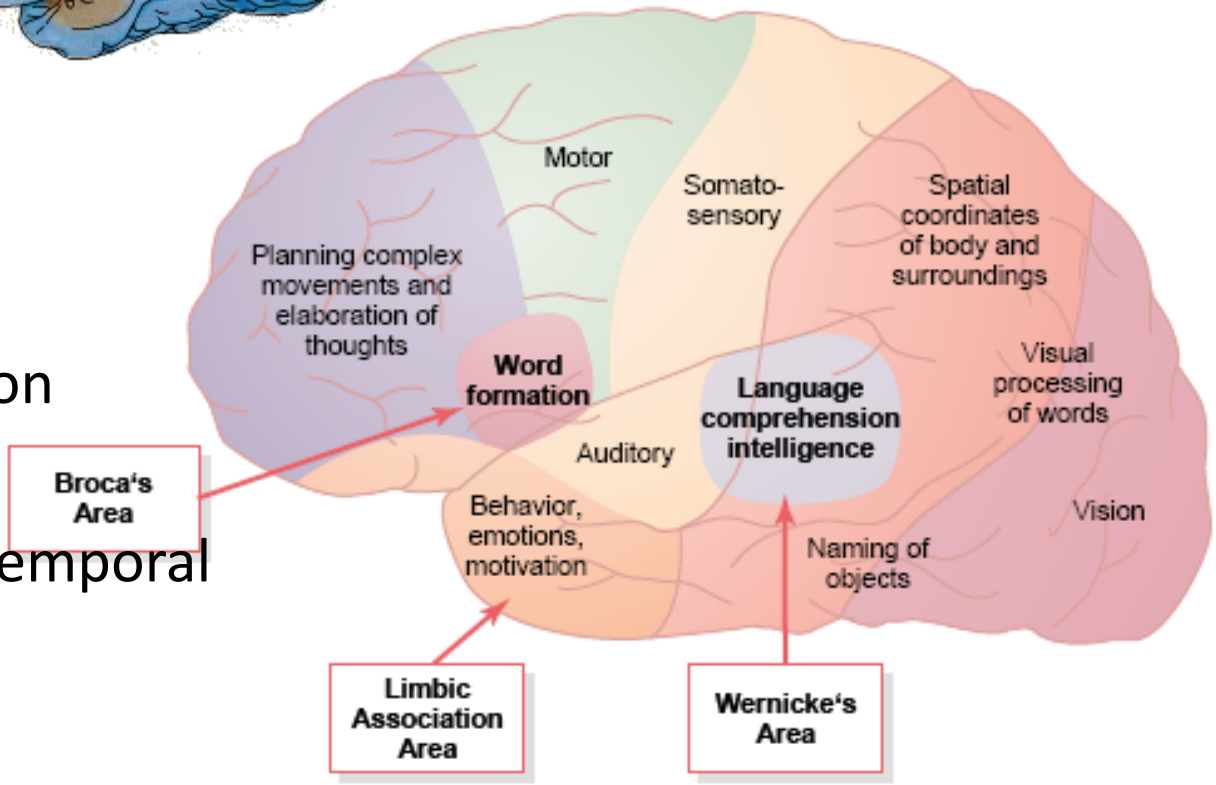
Association areas



- Neither receptive
- Nor effector
- Integrative function
- Parieto-occipito-temporal
- Frontal
- Limbic

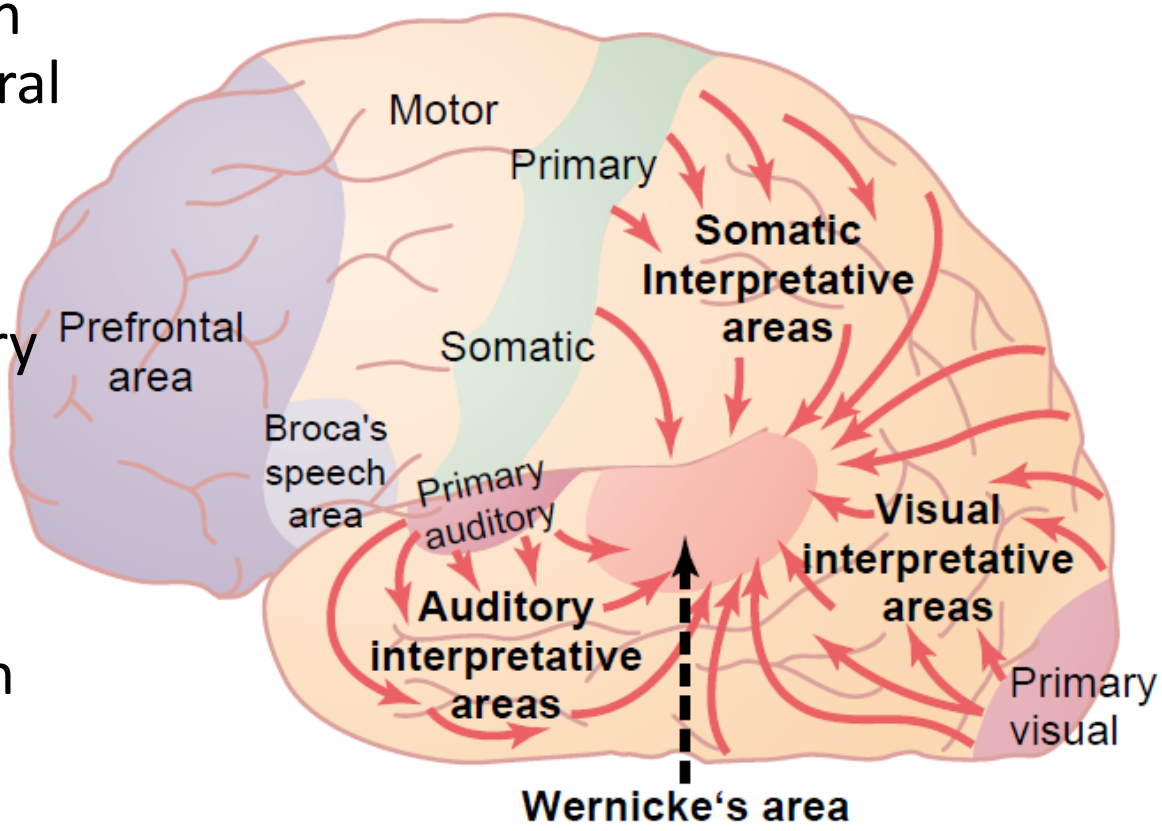


Analytical functions

Parieto-occipito-temporal association area

- Linking and interpretation of information from several sensory modalities

- Visual – acoustic – sensory analysis
- Object recognition and categorization
- Language comprehension
- Attention

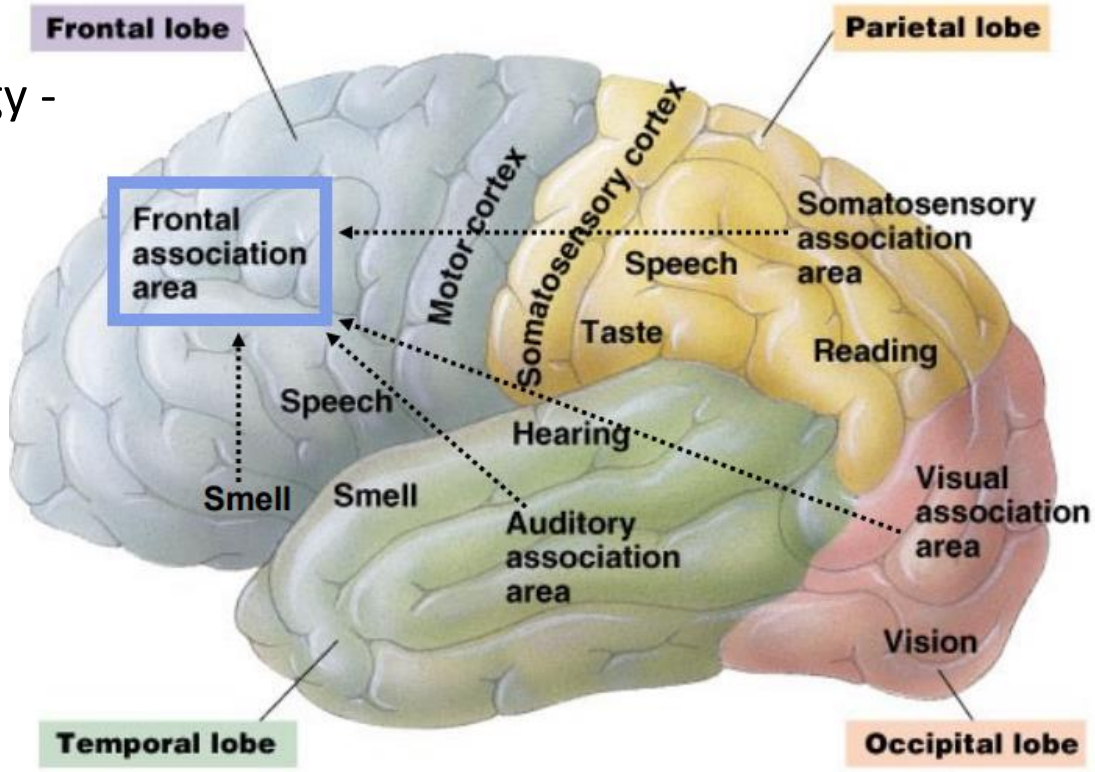


http://www.slideshare.net/drpsdeb/presentations

Executive functions

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“



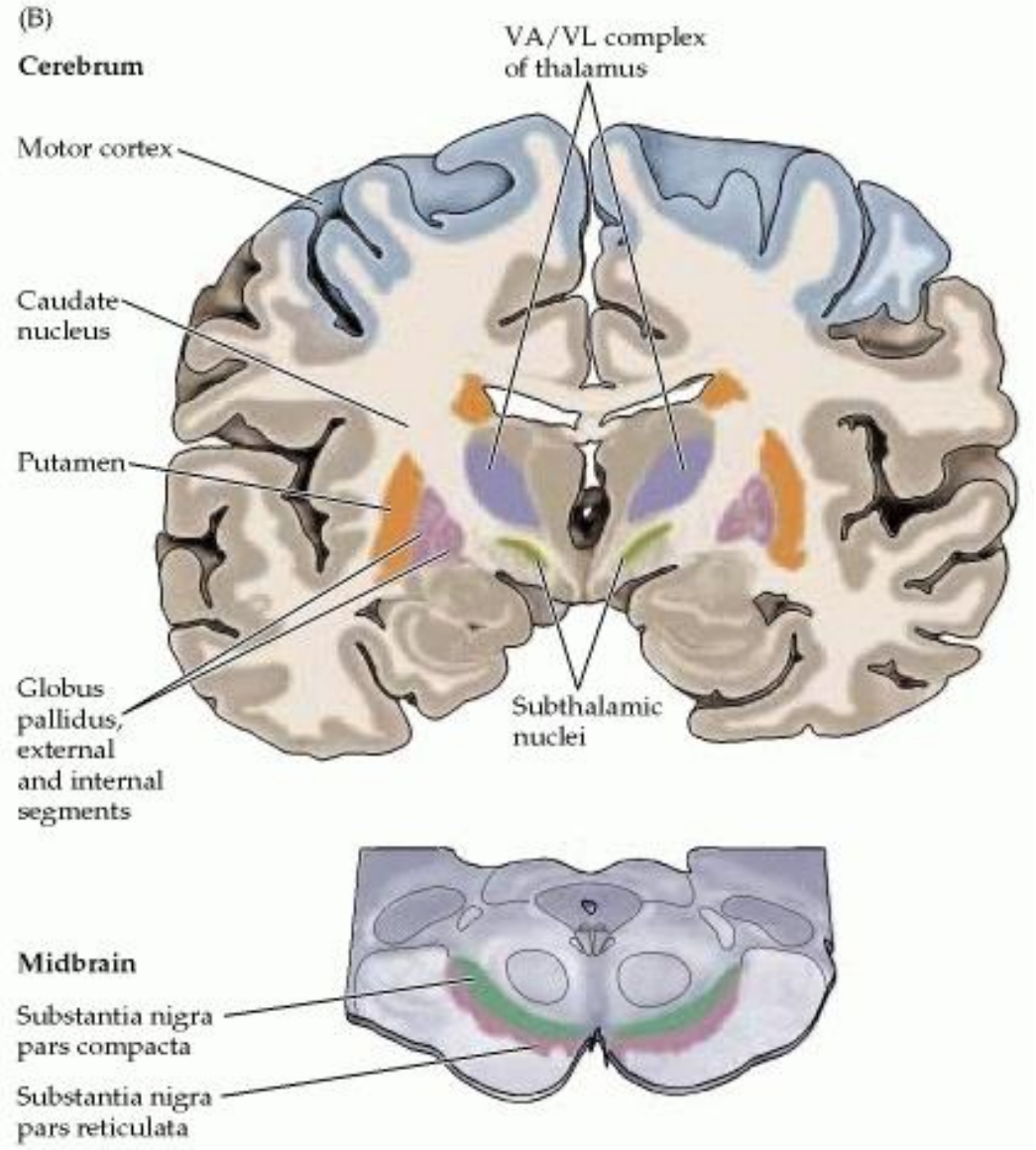
https://www.slideshare.net/thelawofscience/cns-13256395

Basal ganglia

- Corpus striatum
  - Nucleus [illegible]s
    - [illegible]num
- Nucleus sub[illegible]us
  - [illegible]reticulata
- Thalamic motor nuclei

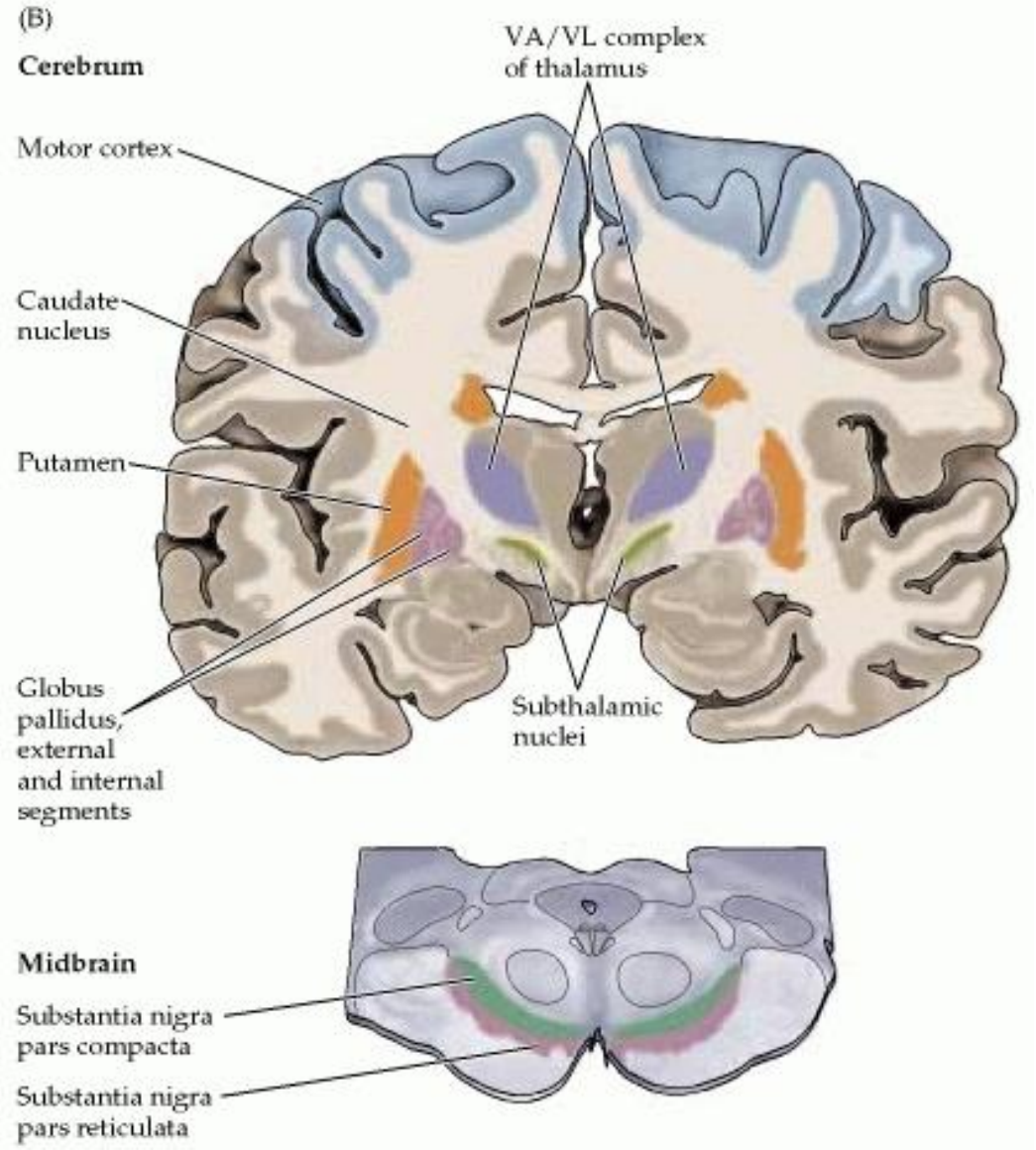
The activity of the basal ganglia might give us a rough idea about the highest functions of the neocortex

Neocortex and subcortical structures work as a one unit



Basal ganglia

- Corpus striatum
  - Nucleus caudatus
  - Putamen
- Globus pallidus (Pallidum)
  - Externum
  - Internum
- Nucleus subthalamicus
- Substantia nigra
  - Pars compacta
  - Pars reticulata
- Thalamic motor nuclei



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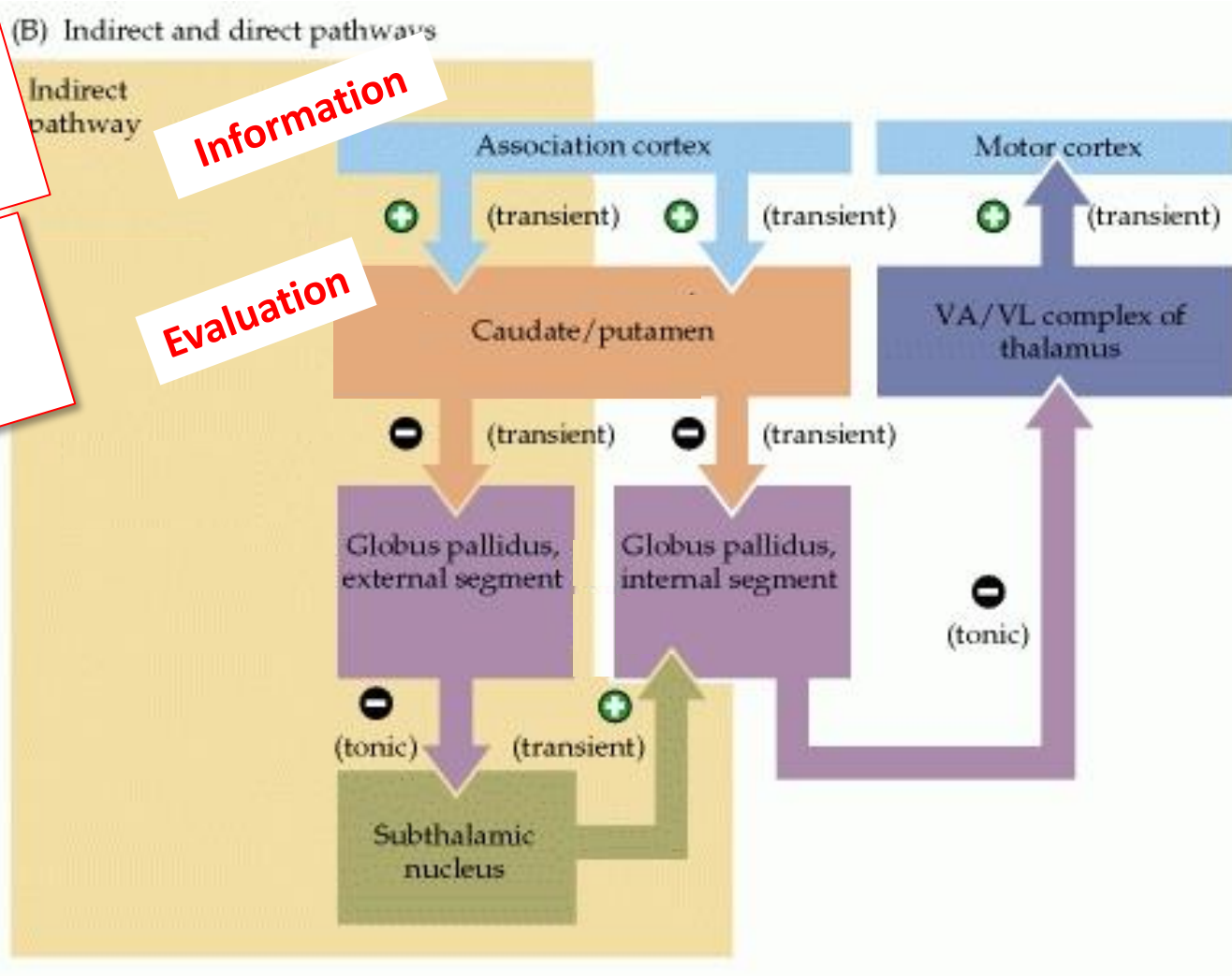

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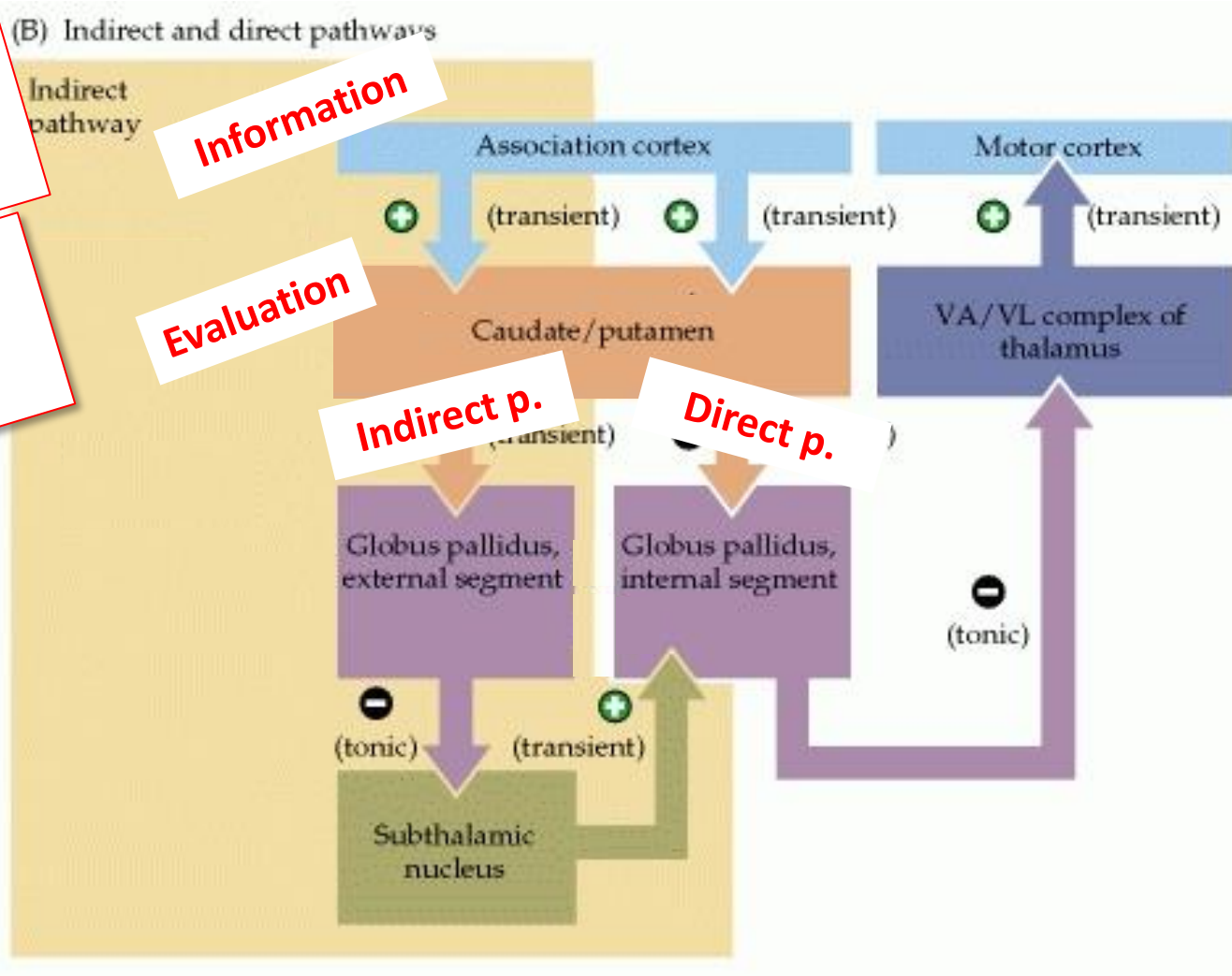

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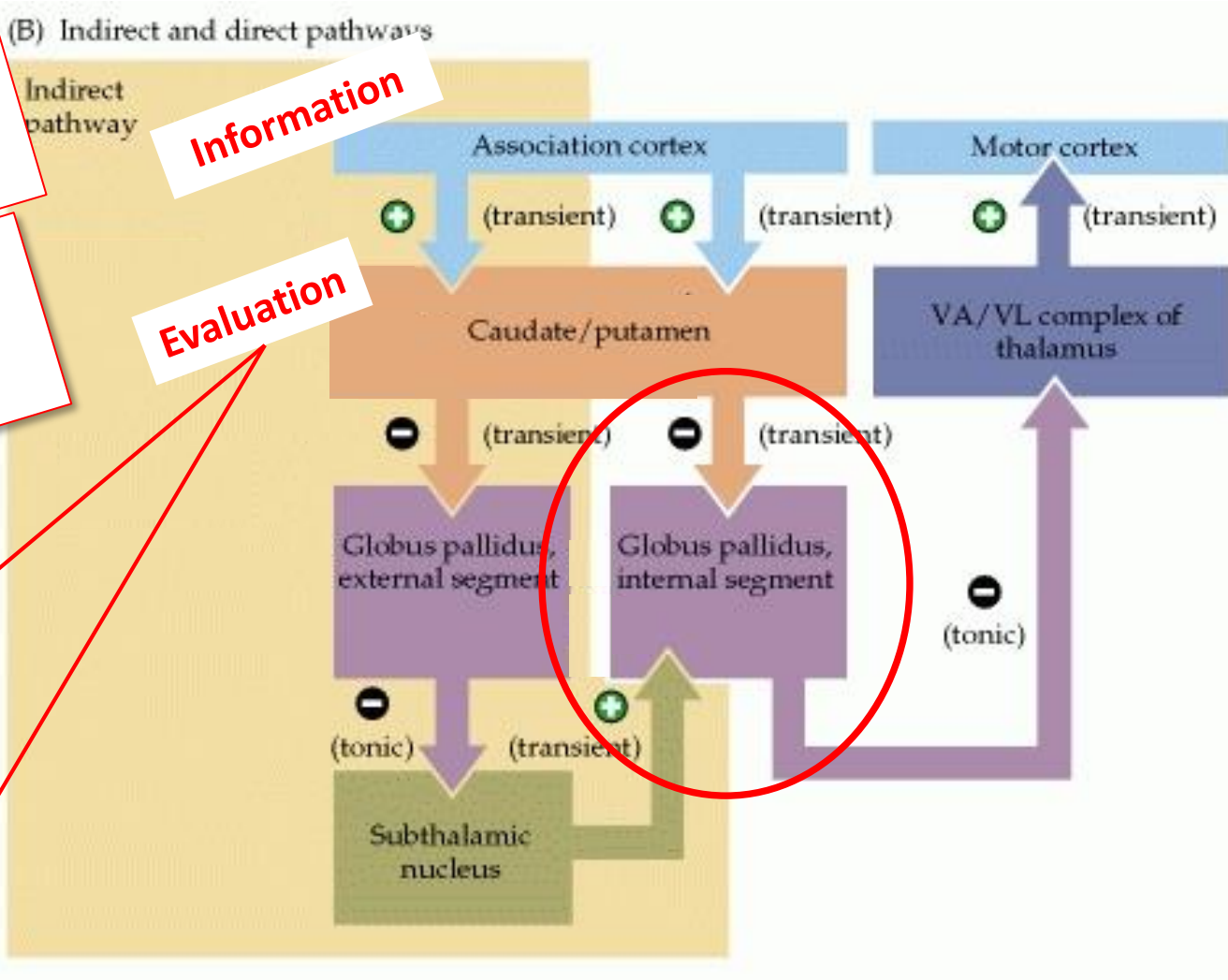

- Direct pathway
  - ➢ Motor cortex activation
- Indirect pathway
  - ➢ Motor cortex inhibition

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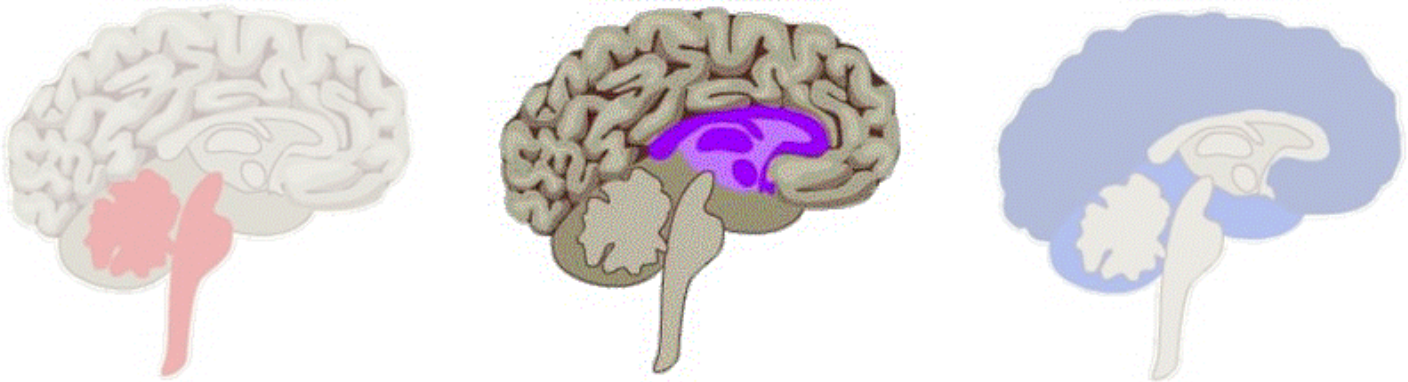

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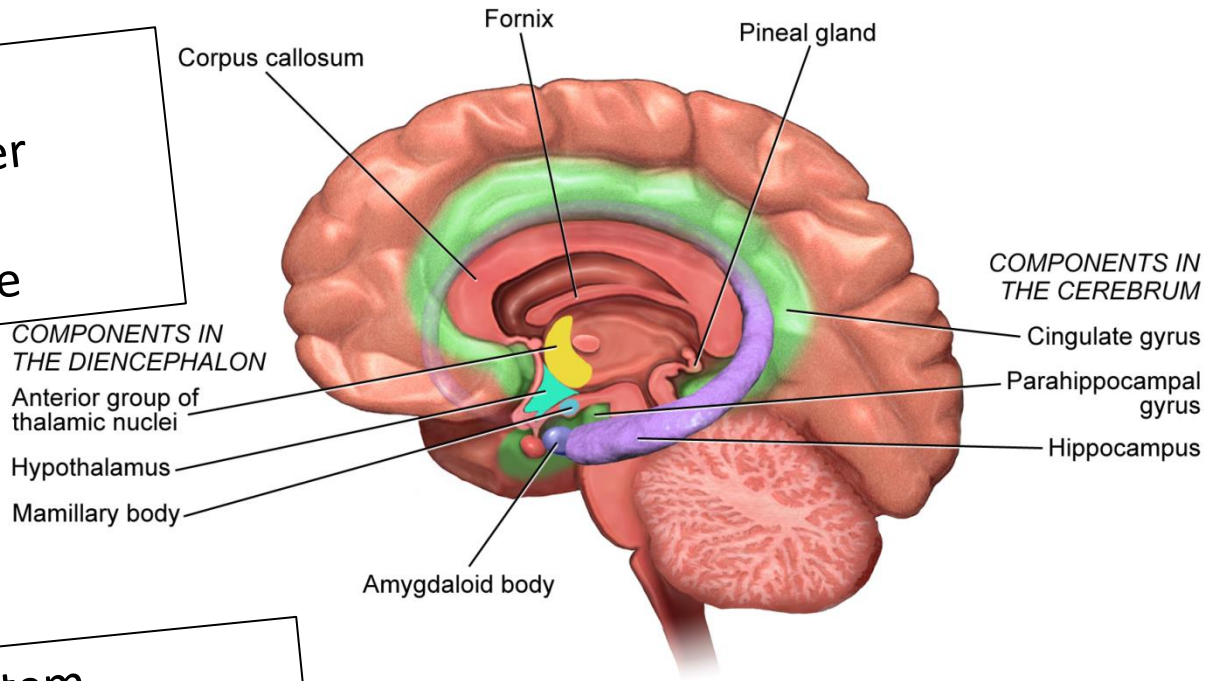
Concept of the limbic system

- Voluntary

Somatic nervous system
Inputs – mainly from outer environment
Control – skeletal muscle



- Automatic

Autonomic nervus system
Inputs – mainly inner environment
Control – smooth/cardiac m., glands

https://upload.wikimedia.org/wikipedia/commons/d/d1/Blausen_0614_LimbicSystem.png

Concept of the limbic system

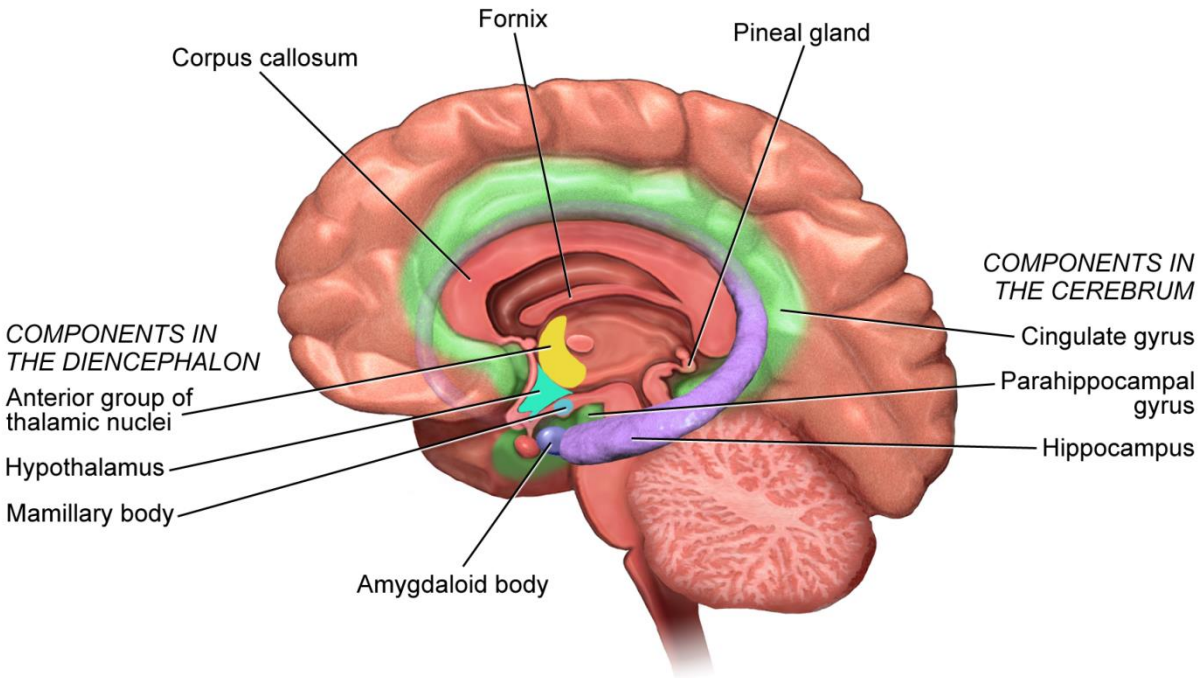
- Voluntary

Modulation

Limbic system

Control

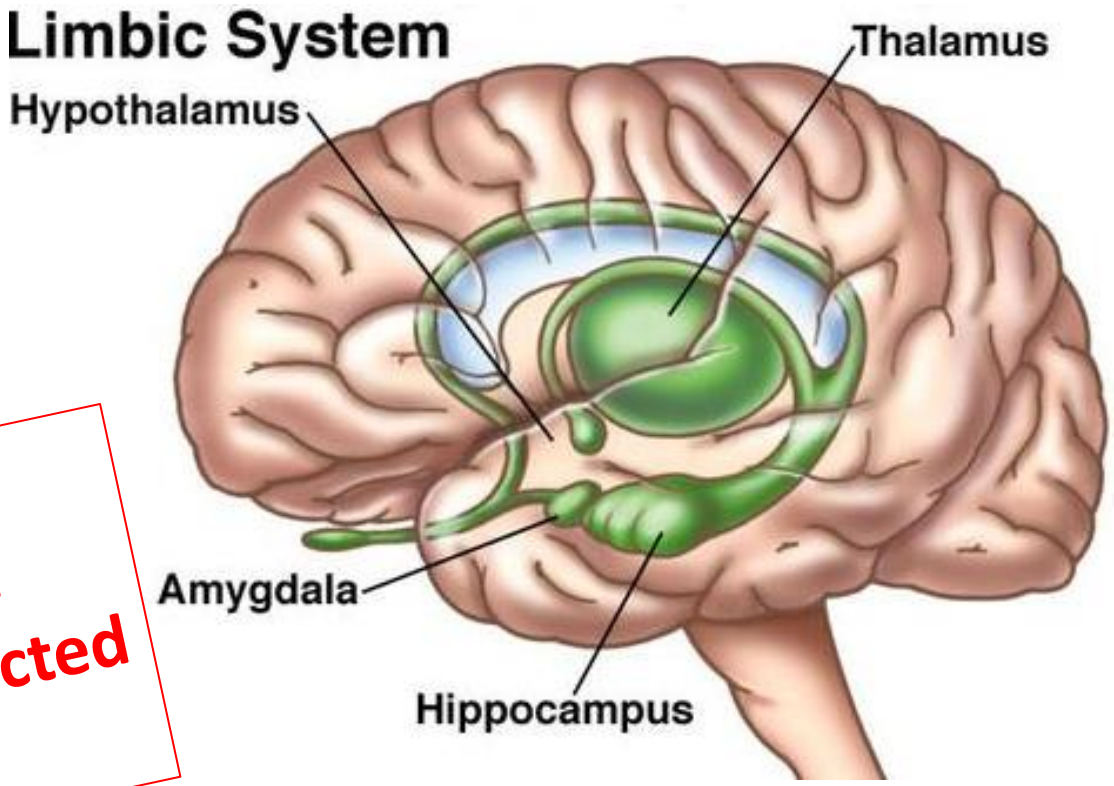
- Automatic



https://upload.wikimedia.org/wikipedia/commons/d/d1/Blausen_0614_LimbicSystem.png

Concept of the limbic system

- Integration of information from inner and outer environment
- Hypothalamus
- Emotions
- Motivation
- Instinct behavior



Limbic system – hypotalamus and the structures closely connected to hypothalamnus

http://www.mhhe.com/biosci/genbio/enger/student/olc/art_quizzes/genbiomedia/0665.jpg

Triune Brain Theory

Lizard Brain	Mammal Brain	Human Brain
Brain stem & cor[illegible]um	Limbic System	Neo[illegible]rtex
[illegible]	Emotions, memories, habits	La[illegible] th[illegible] c[illegible]
[illegible]	Decisions	[illegible]

Fixed programs

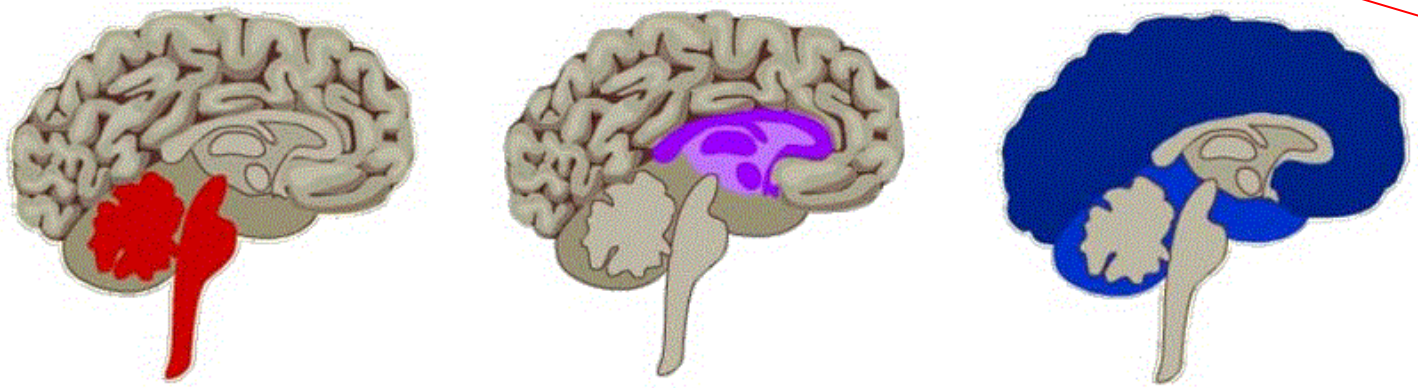
Uniform **ACTION**

Economy

Programs on demand

Unique **ACTION**

Performance



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Triune Brain Theory

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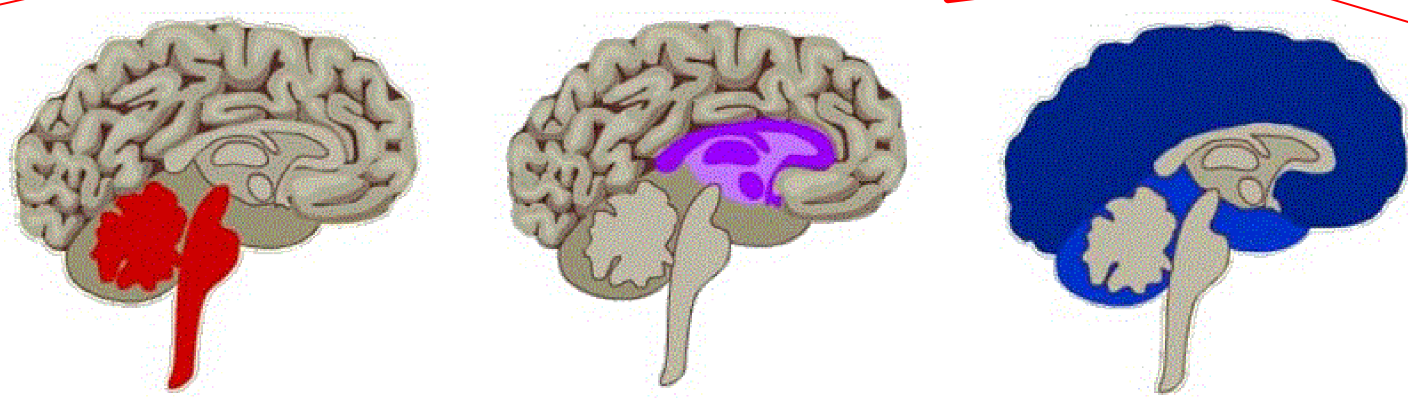
Brain stem & cer[illegible]um	[illegible]	Ne[illegible]rtex
[illegible]	[illegible]	La[illegible] th[illegible] c[illegible]
[illegible]	Decisions	[illegible]

Fixed programs
Uniform **ACTION**
Economy

Integration of innera and outer information
DRIVE

Programs on demand
Unique **ACTION**
Performance



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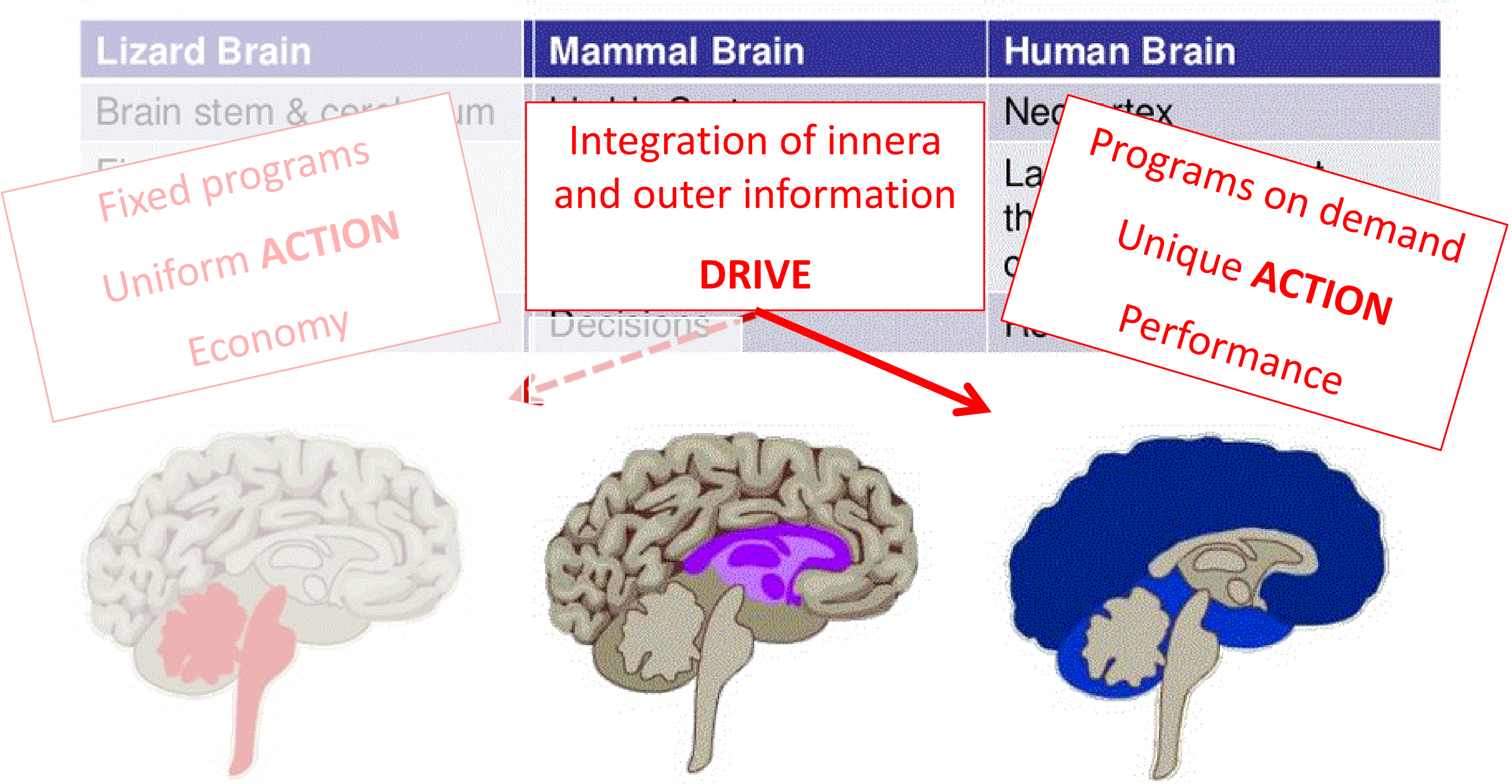

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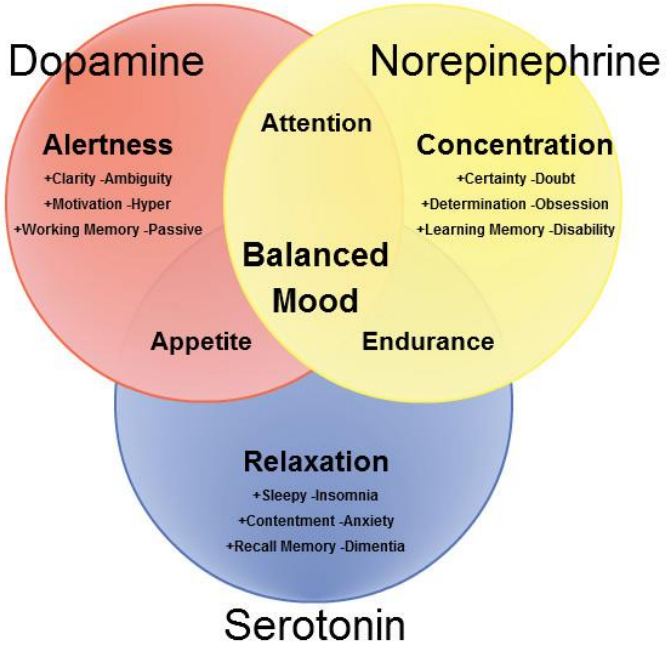
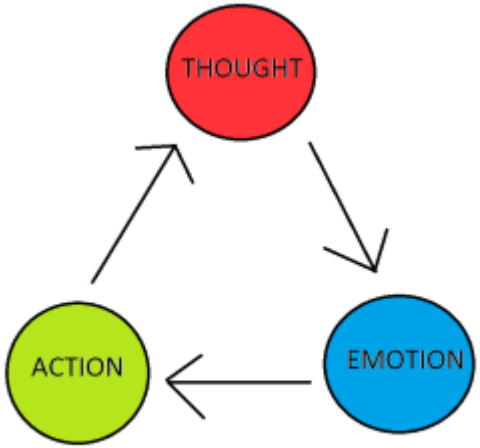
Influence of hypothalamus on neocortex

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





https://decodingfilm.files.wordpress.com/2014/09/tea.png?w=272&h=300

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