

The Highest Level of Brain Activity II

Three States of Cognition

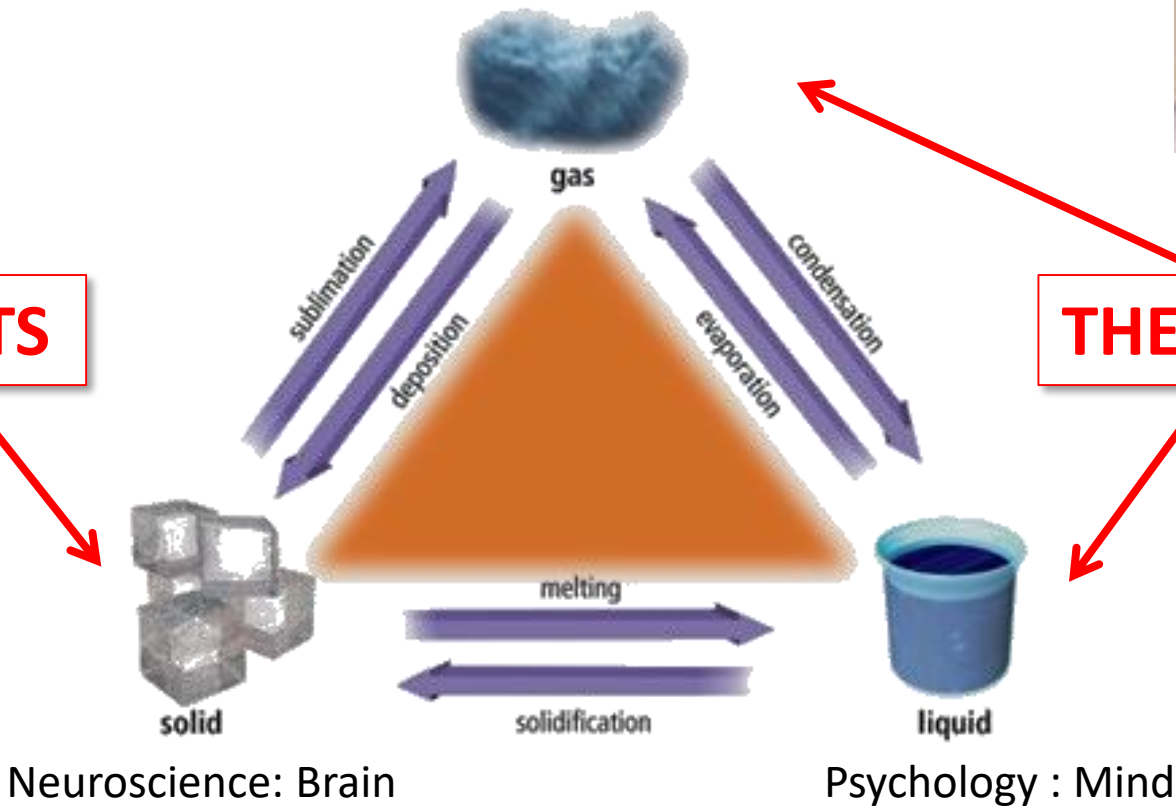
Philosophy : Mind behind Mind

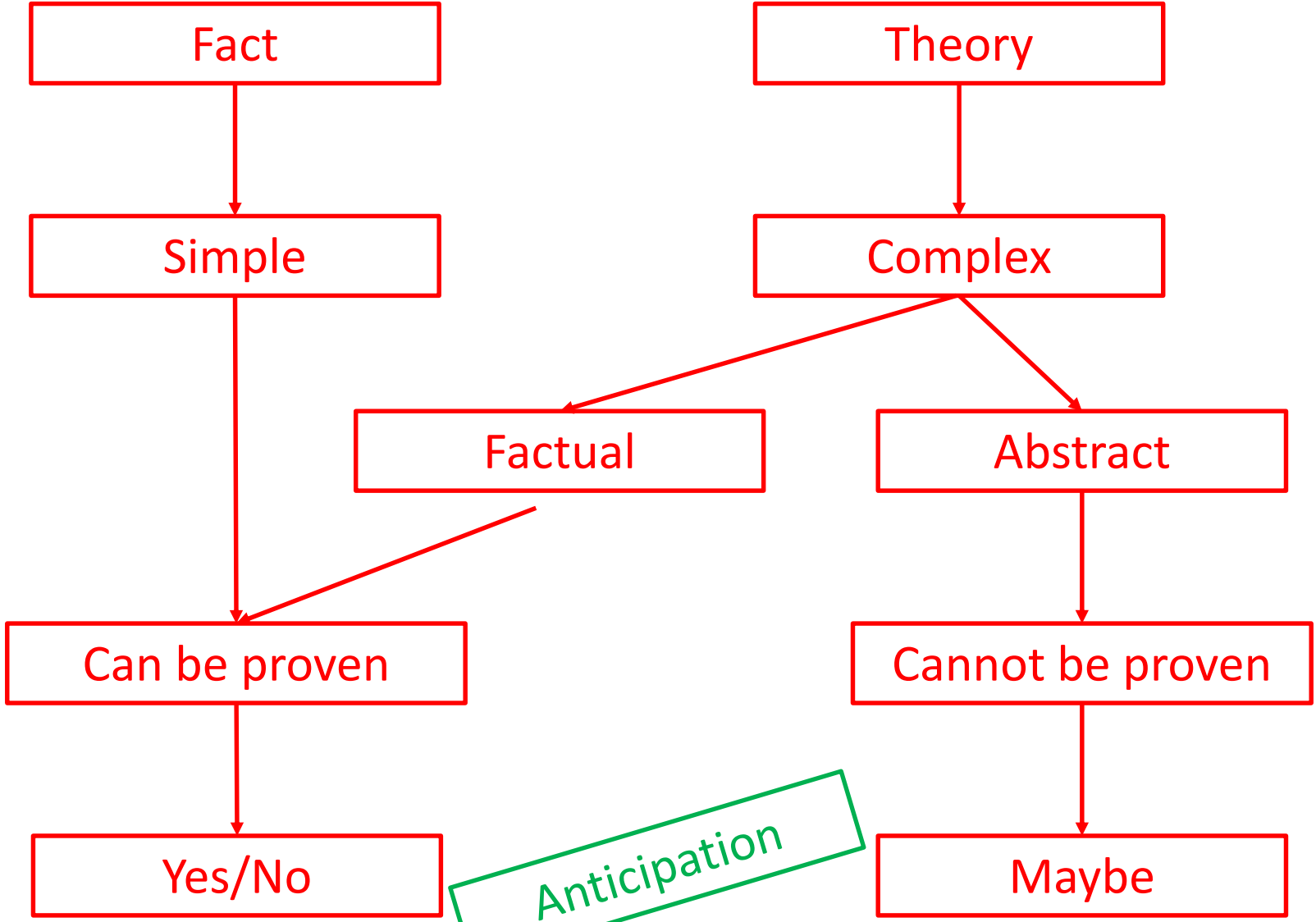


PS Deb

FACTS

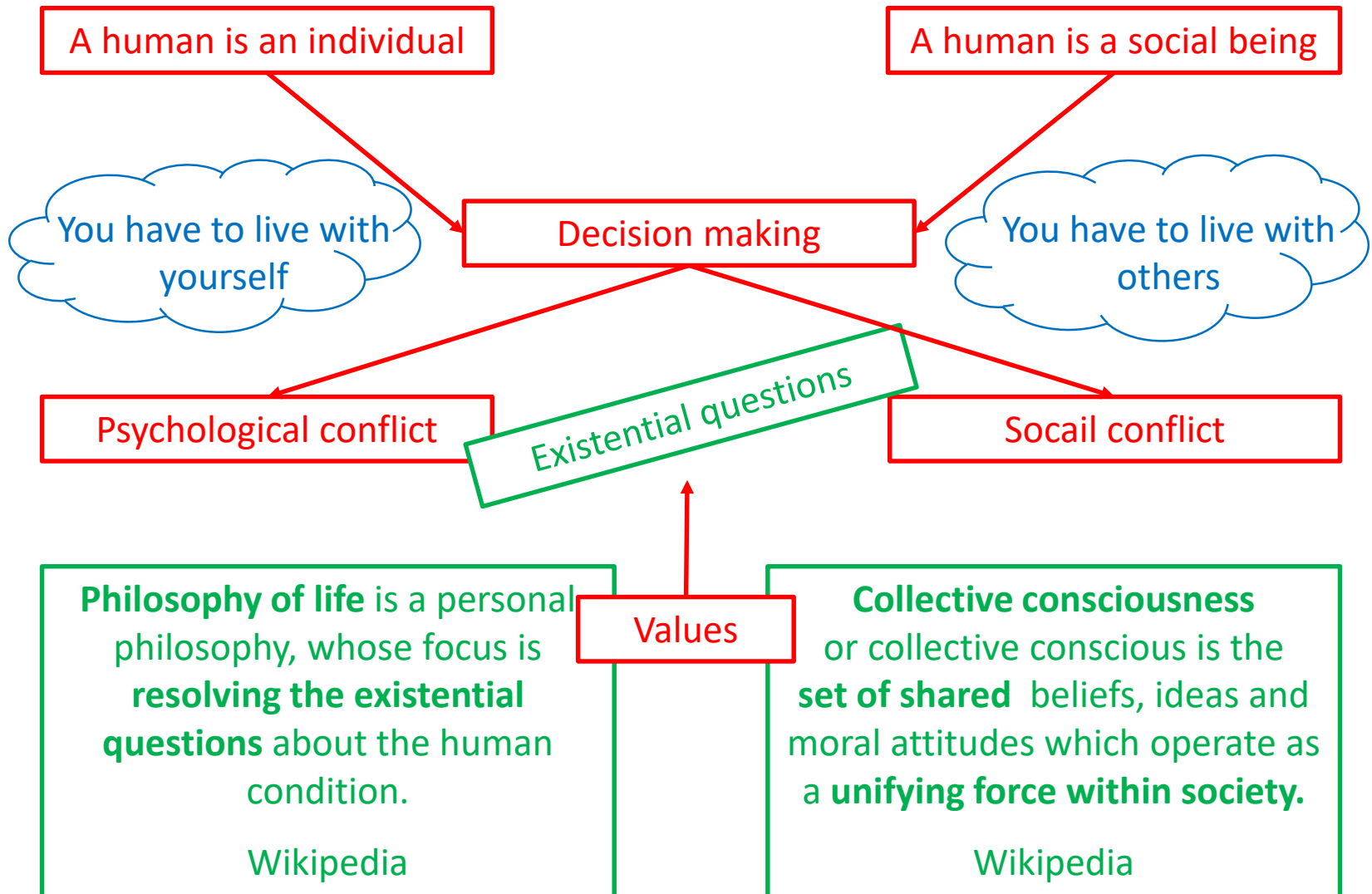
THEORIES





Anticipation

Why?



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

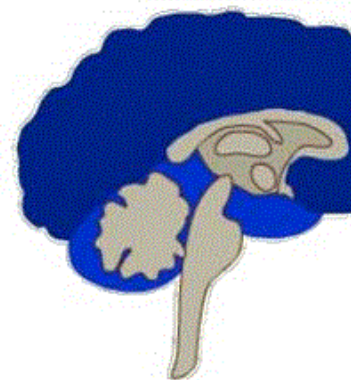
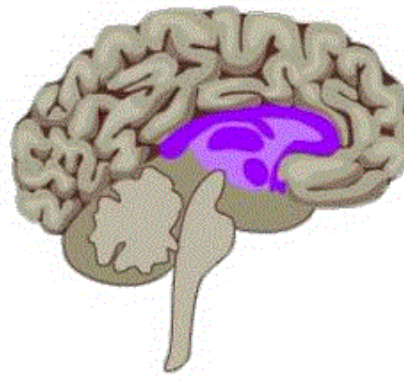
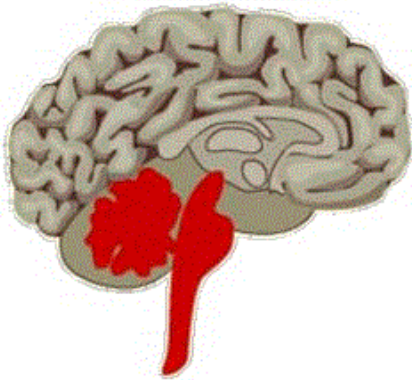
- ✓ Complex
- ✓ Unique
- ✓ Multiple viewpoints

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

Wikipedia

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

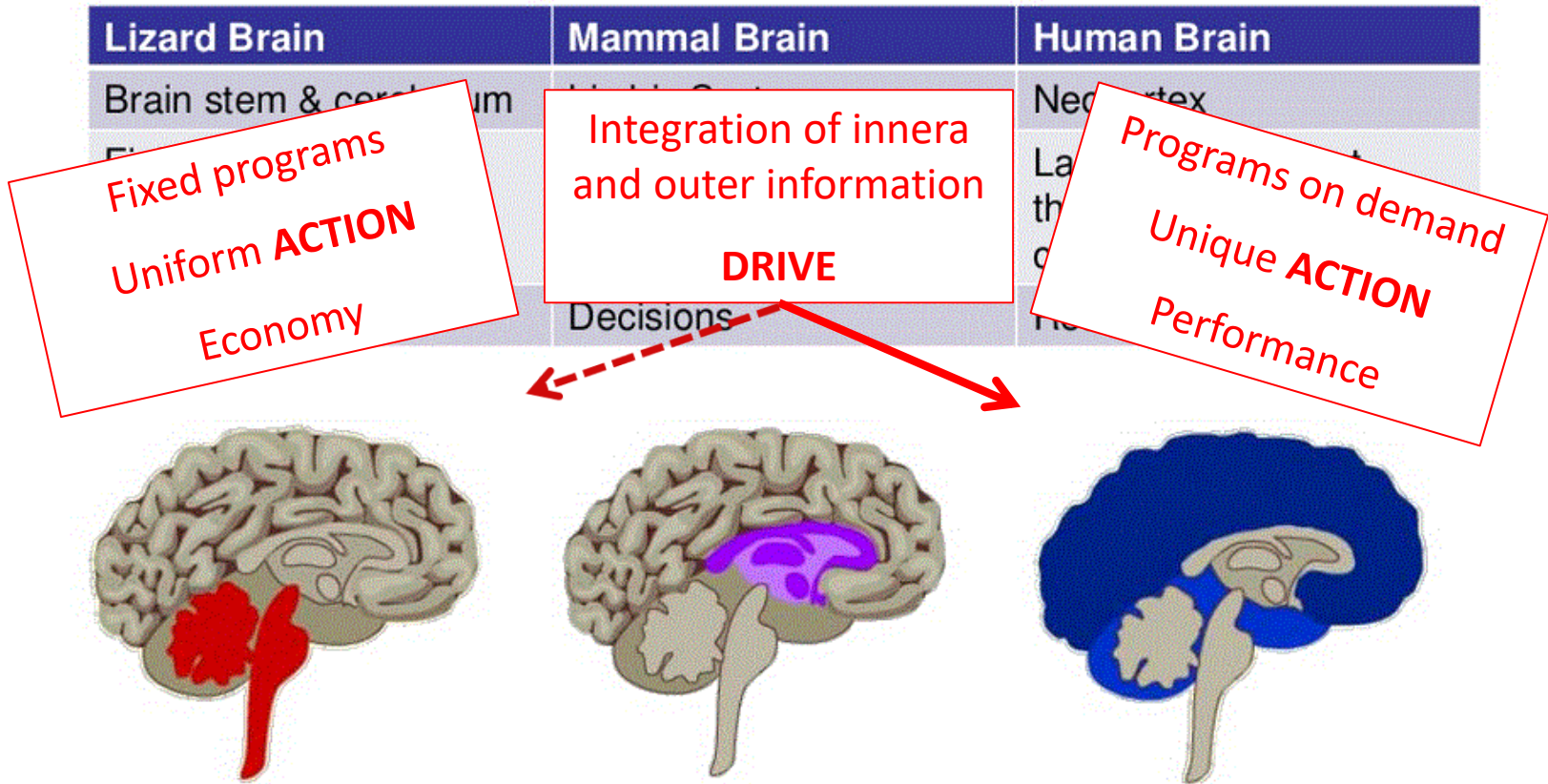


The Triune Brain in Evolution, Paul MacLean, 1960

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

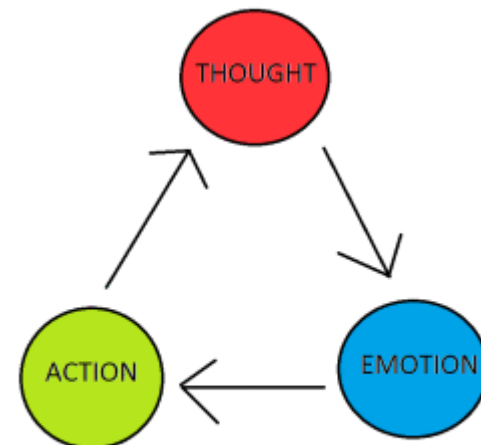
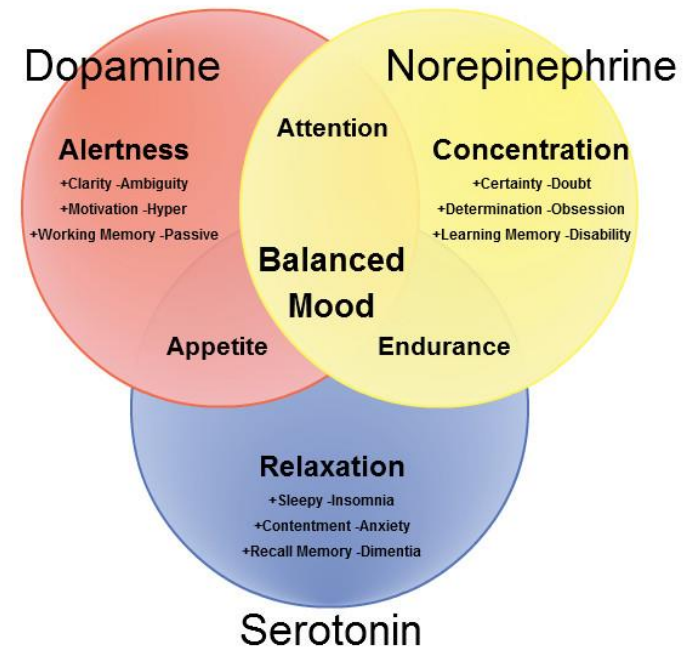
Triune Brain Theory



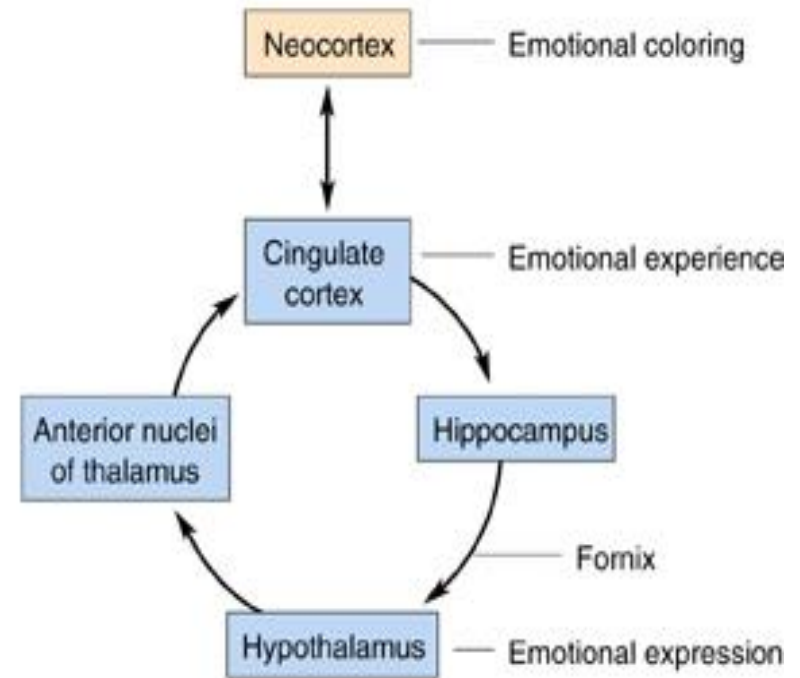
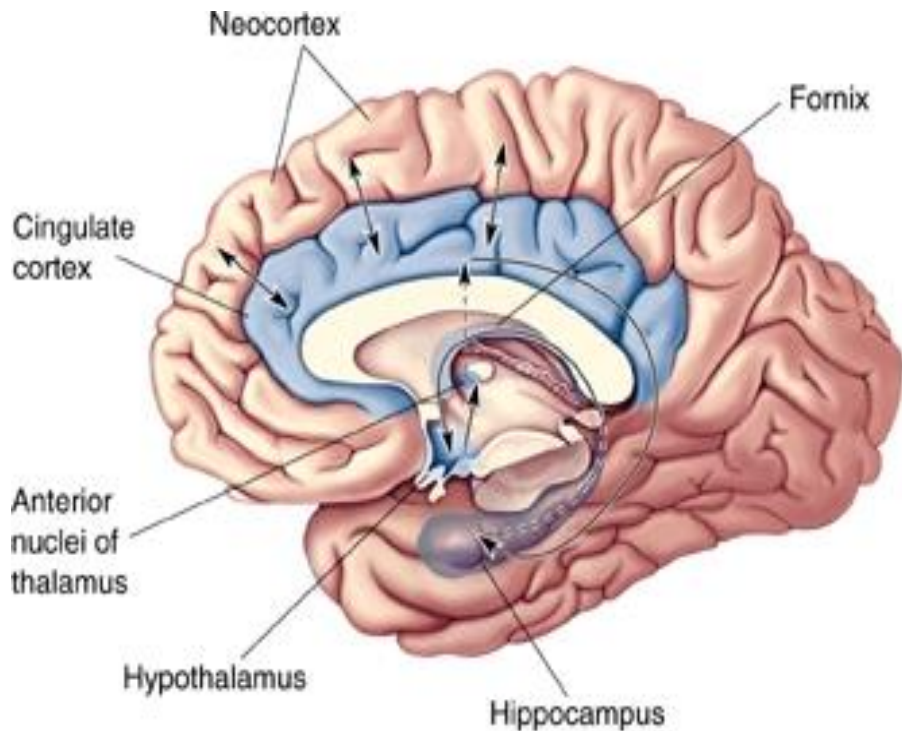
The Triune Brain in Evolution, Paul MacLean, 1960

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



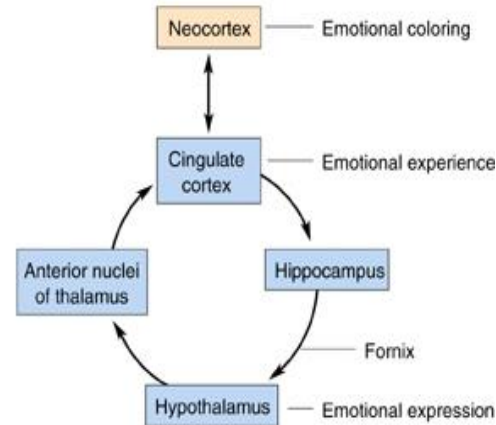
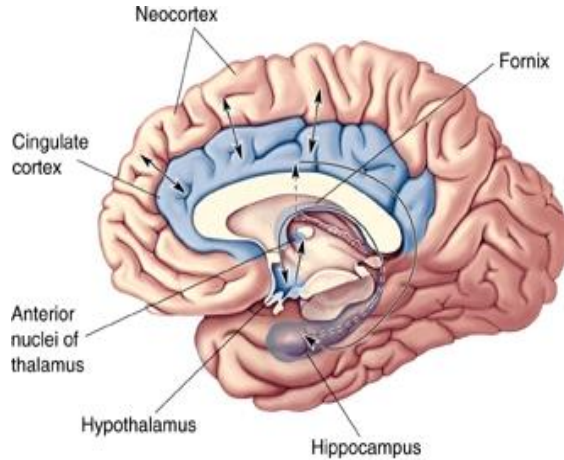
Papez circuit



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

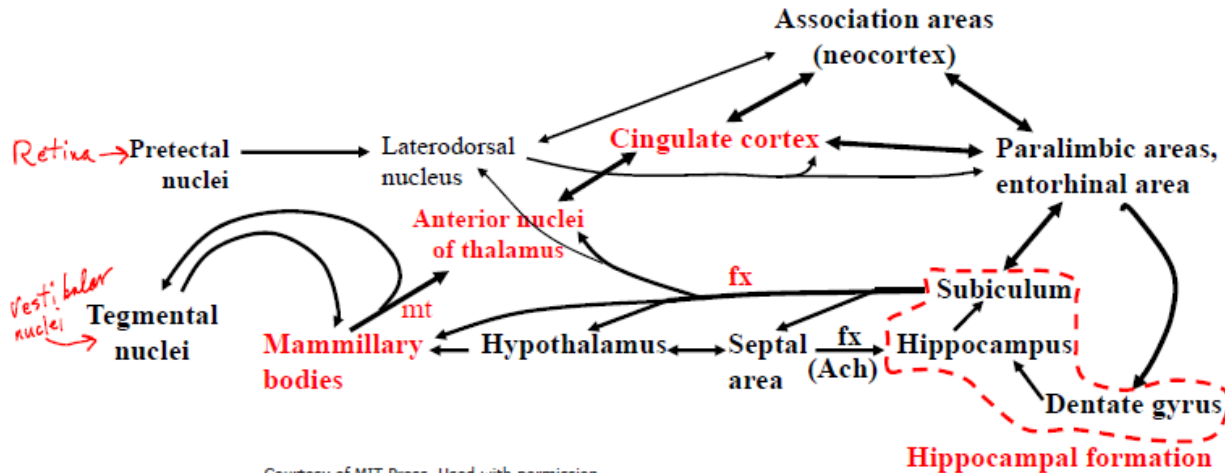
Papez circuit



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mt = mammillothalamic tract

fx = fornix bundle

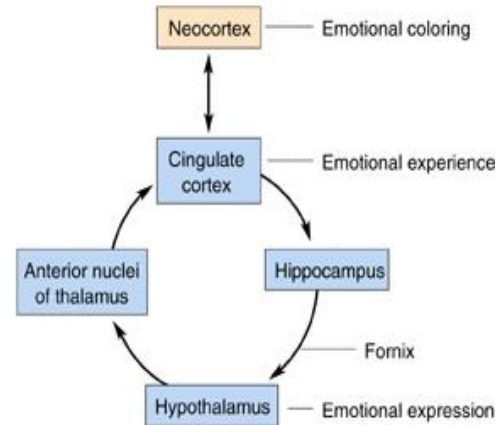
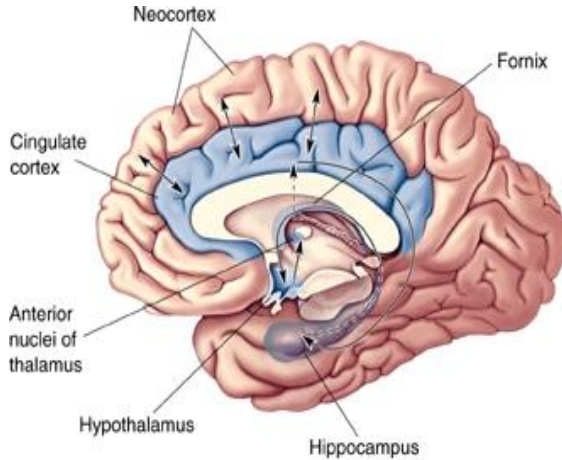


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Schneider, G. E. Brain Structure and its Origins: In the Development and in Evolution of Behavior and the Mind. MIT Press, 2014. ISBN: 9780262026734.



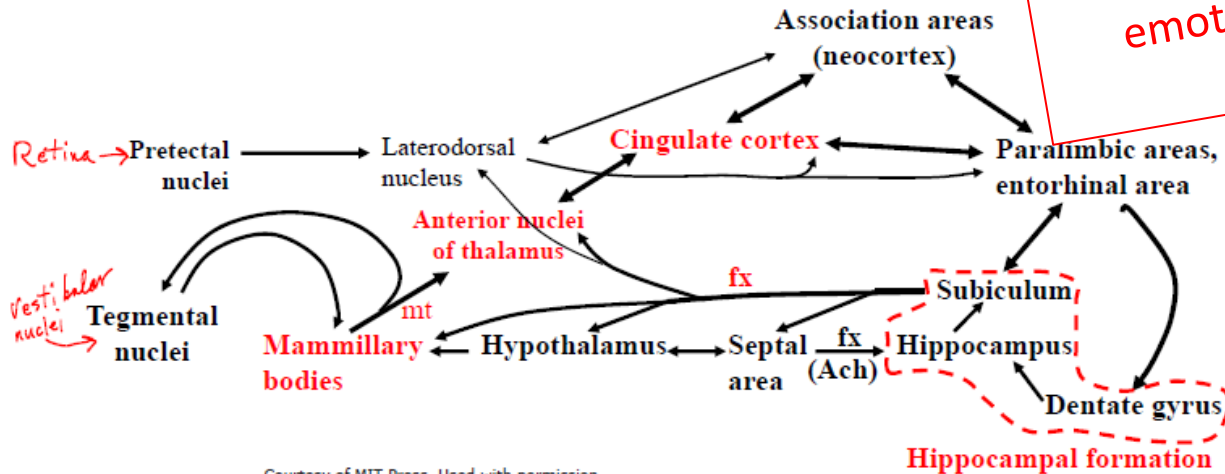
Prof. Gerald Schneider

Papez circuit



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Spatial orientation and emotions associated with particular place

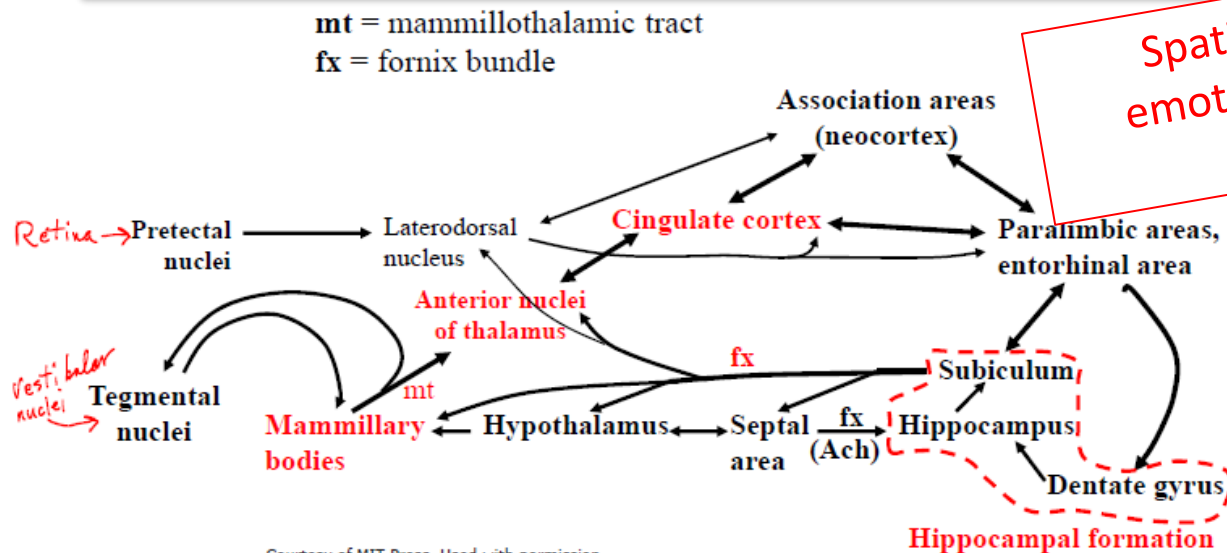


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Gerald Schneider. 9.14 Brain Structure and Its Origins, Spring 2014. (Massachusetts Institute of Technology: MIT OpenCourseWare). <http://ocw.mit.edu> (Accessed). License: Creative Commons BY-NC-SA

- *Suggestion: the ascending axons of this circuit are continuously activating memories of places that lie ahead, in the direction indicated by the current direction of the head.* Thus, decisions about direction of locomotion are influenced by memories of those places, including their good or bad values.
- *Axons in the Papez circuit are of more than one type. Only the ones signaling head direction have been characterized.*
- *What is the hippocampus sending to other parts of the hypothalamus? It may alter motivational levels according to remembered information about locations in the current frame of reference.*



Spatial orientation and emotions associated with particular place

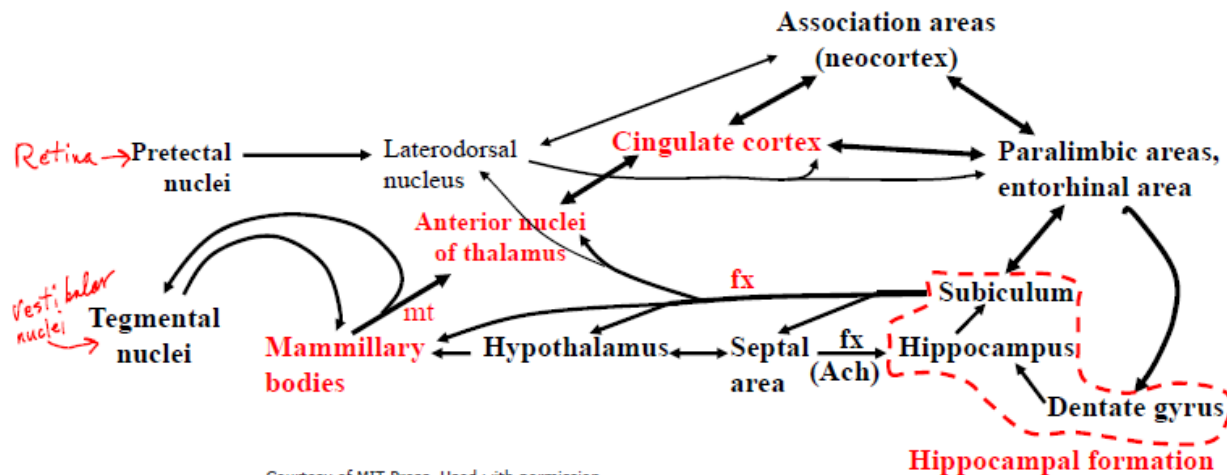


Prof. Gerald Schneider

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

mt = mammillothalamic tract
 fx = fornix bundle



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Prof. Gerald Schneider

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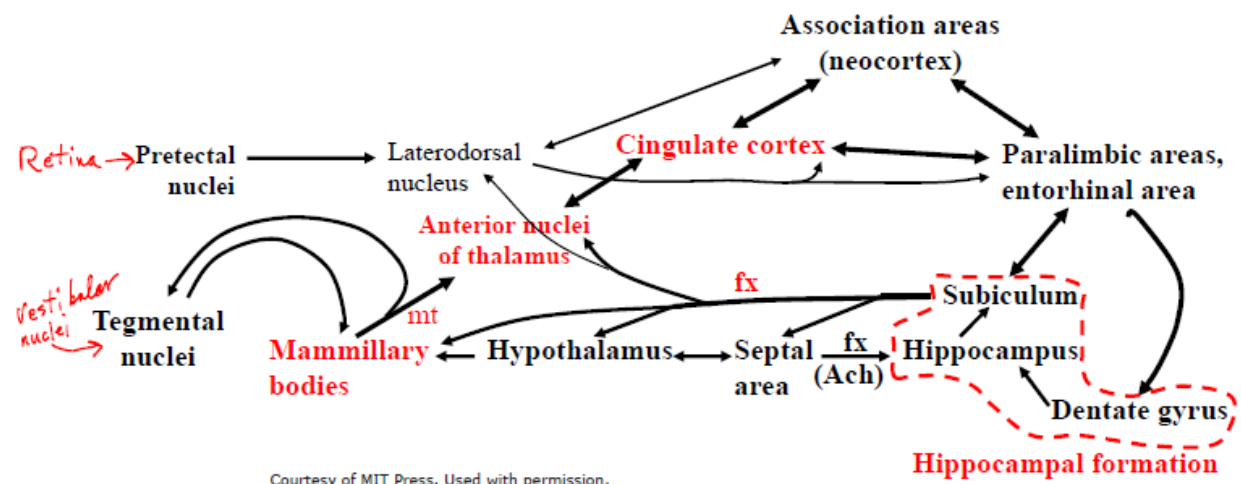
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✓ Object oriented
✓ Implicit

✓ Location oriented
✓ Explicit

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Prof. Gerald Schneider

Learning and memory

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

Working memory
– „RAM“

Long term memory
– „Hard disk“

Learning and memory

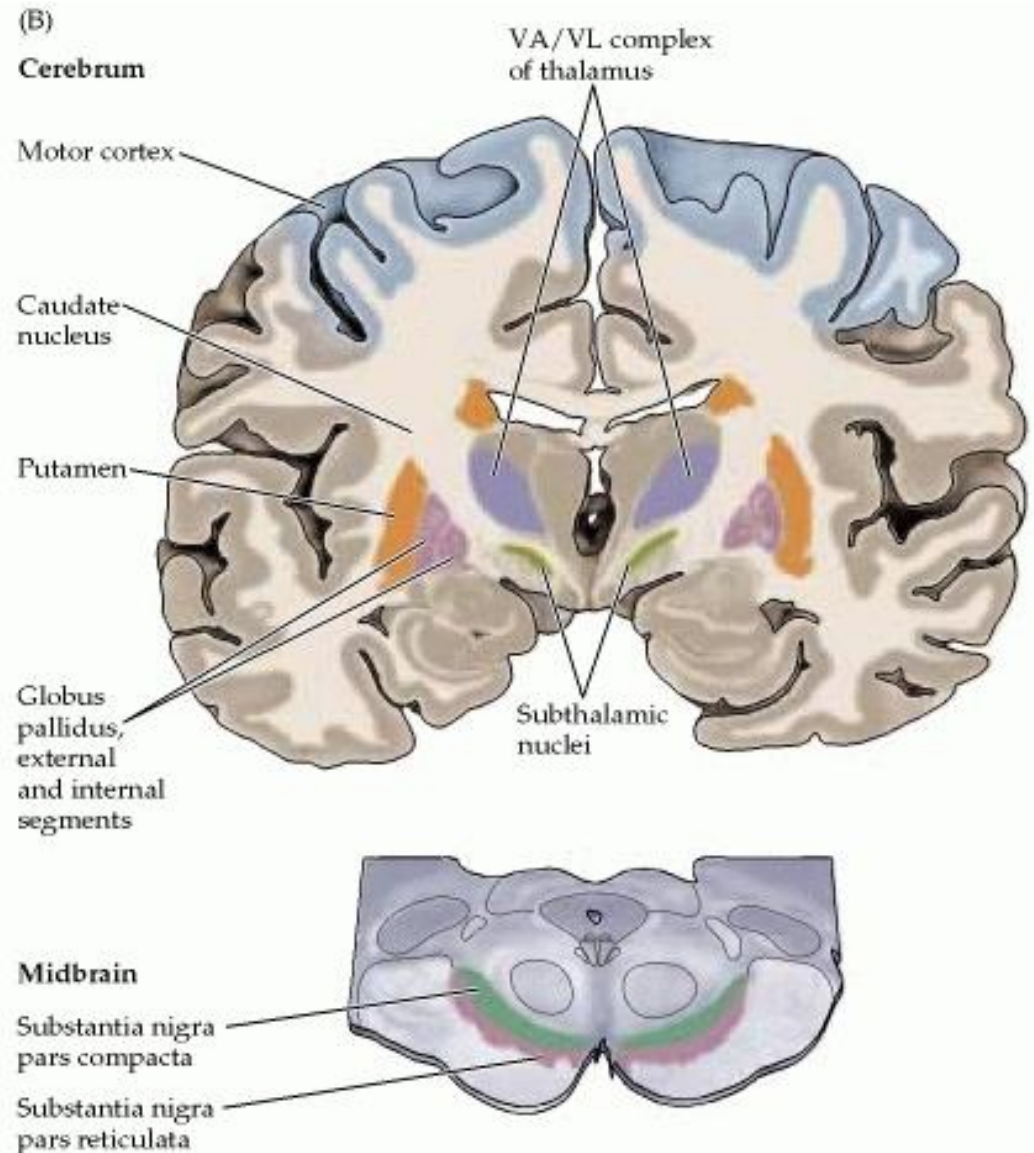
- Connections of striatum and hippocampus are plastic
- Plasticity is a base of learning
- Learning is a forming of long- term memory

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

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

Basal ganglia

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

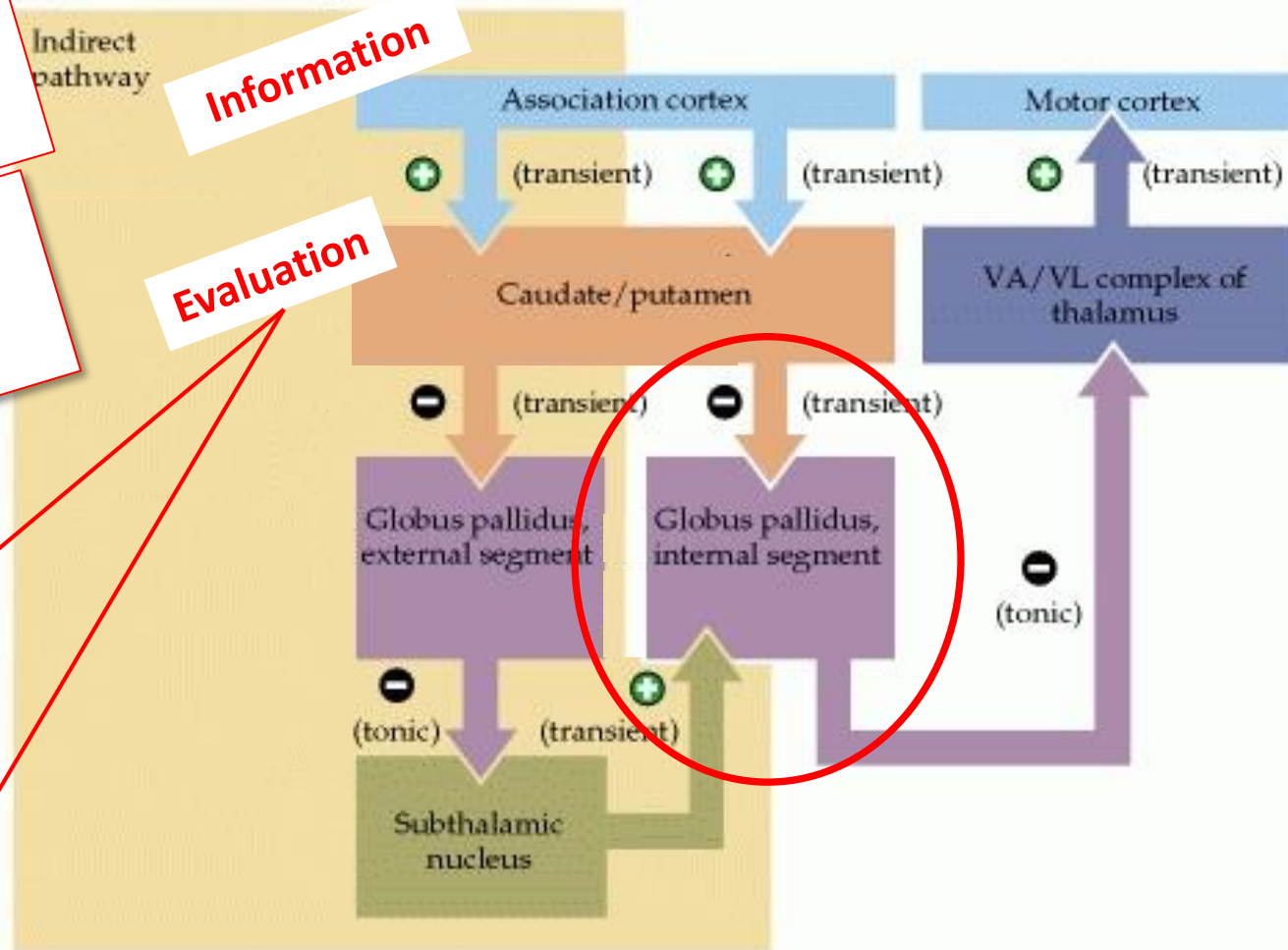


Basal ganglia

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

(B) Indirect and direct pathways



Information

Evaluation

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

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

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

- Procedural memory (implicit)

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

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

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

- ✓ Complex
- ✓ Unique
- ✓ Multiple viewpoints

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

Wikipedia

Cognitive map term definition

Edward C. Tolman

1948



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

Anatomical correalte?

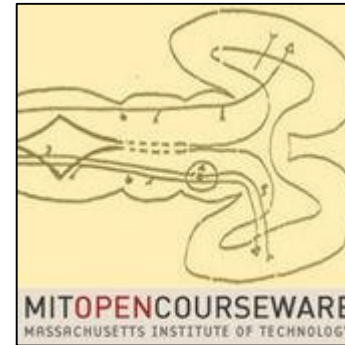
Gerald Schneider



https://www.researchgate.net/profile/Gerald_Schneider

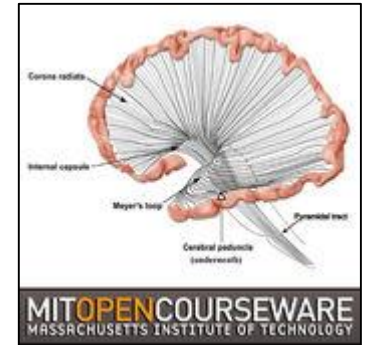
O'Keefe and Nadel
'70s
And others

2009

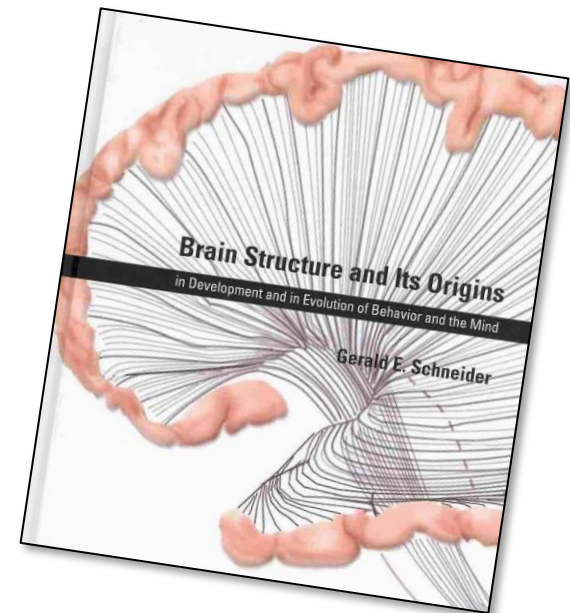


<https://itunes.apple.com/us/podcast/brain-structure-and-its-origins-2009/id385157530?mt=2>

2014

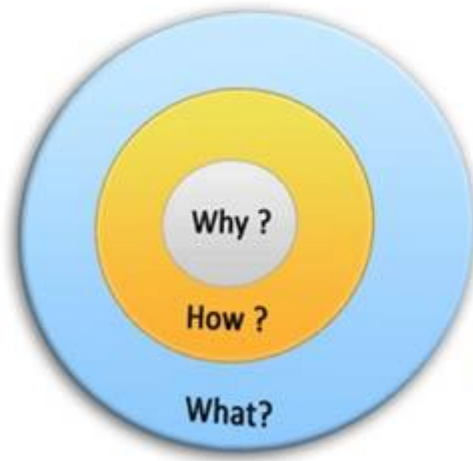


<https://itunes.apple.com/us/podcast/brain-structure-and-its-origins-2014/id944293984?mt=2>



2014

Limbic system and neocortex



Why = The Purpose

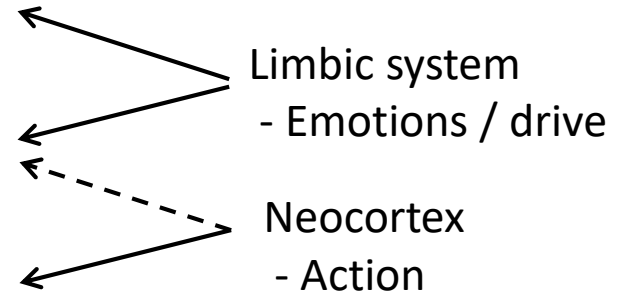
What is your cause? What do you believe?

How = The Process

Specific actions taken to realize the Why.

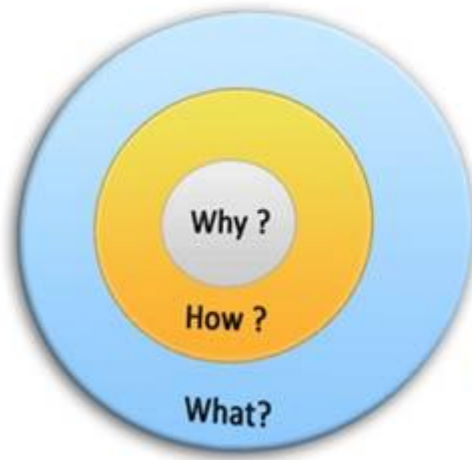
What = The Result

What do you do? The result of Why. Proof.



<https://s-media-cache-ak0.pinimg.com/originals/84/34/b1/8434b124c9fc92003051c56b088906a5.jpg>

Limbic system and neocortex



Why = The Purpose

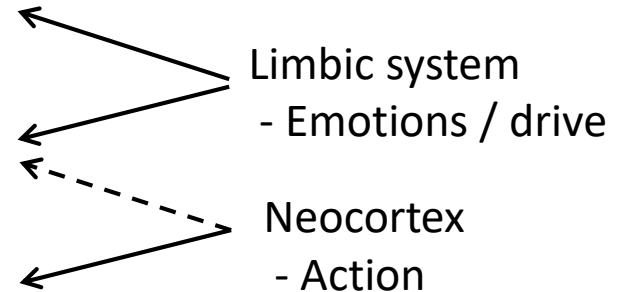
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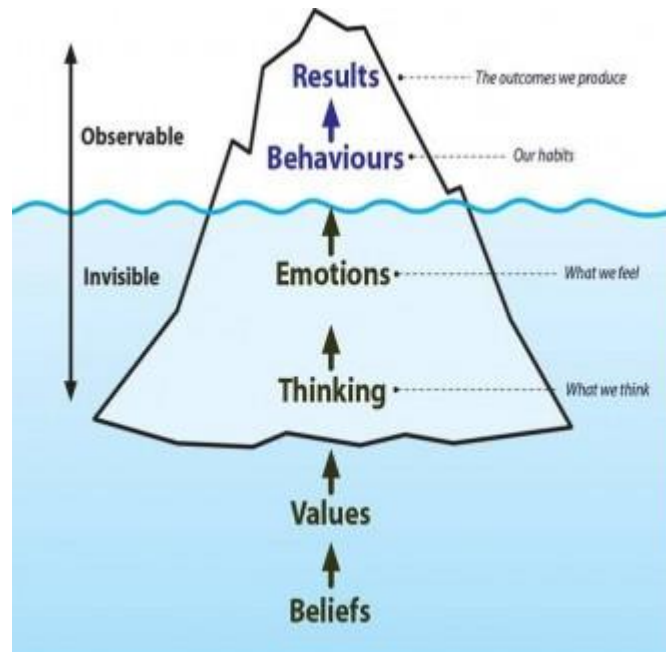
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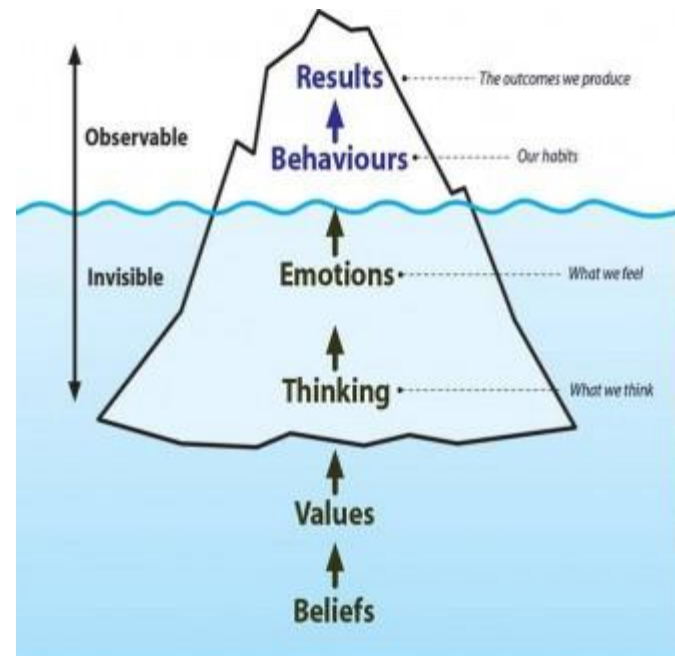


<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-J-e1371521135440.jpg>

Limbic system and neocortex

Instinctive behavior

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



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

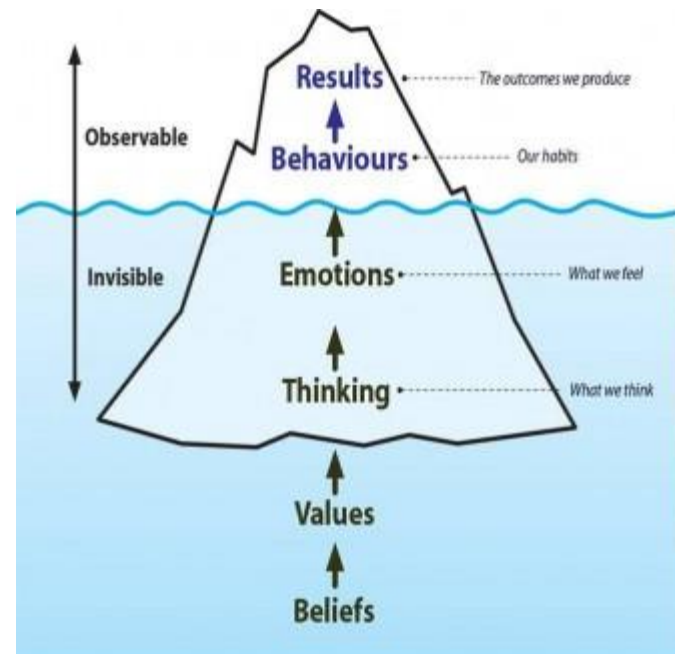
Limbic system and neocortex

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



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Limbic system and neocortex

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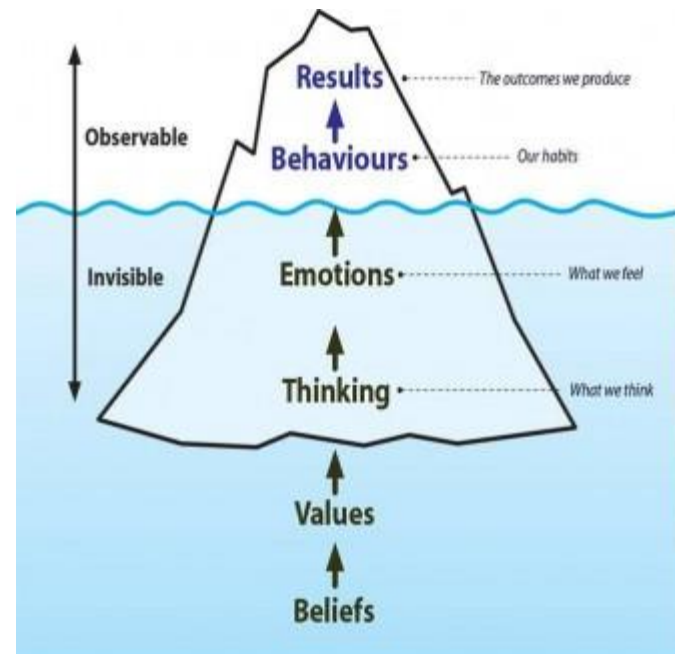
- Limbic system
- ✓ I see a nice thing, so why not to steal it?

Socially enforced behavior

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

Moral behavior

- Legitimate behavior
- Limbic system - 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

Instinctive behavior

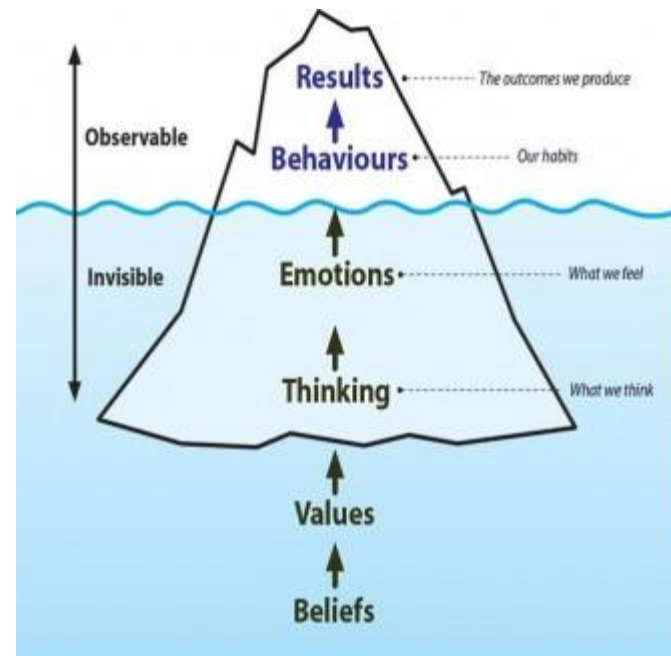
- Limbic system
- ✓ I see a nice thing, so why not to steal it?

Socially enforced behavior

- Legal behavior
- **Fear of punishment** system
- ✓ punishment, and punishment may come

Moral behavior

- **Moral stance**
- ✓ 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

Information

NEOCORTEX

VS

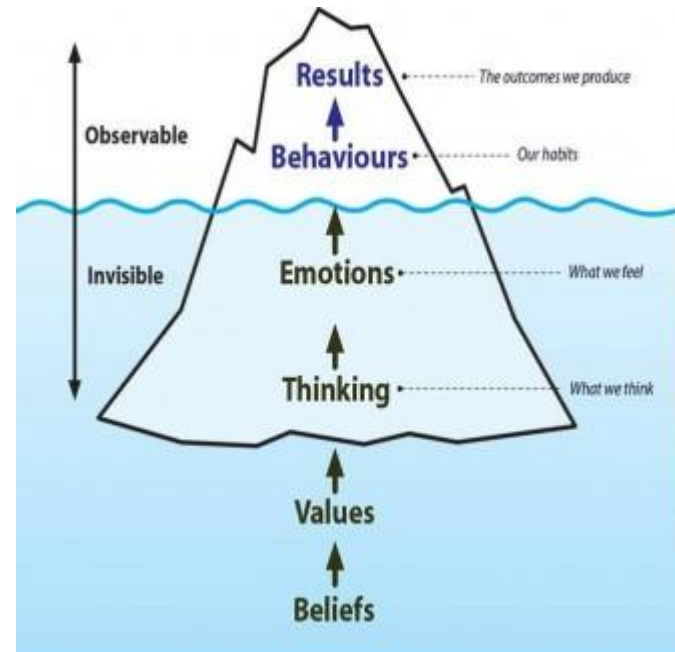
Complex information

NEOCORTEX/limbic system

VS

Values/Philosophy/Faith

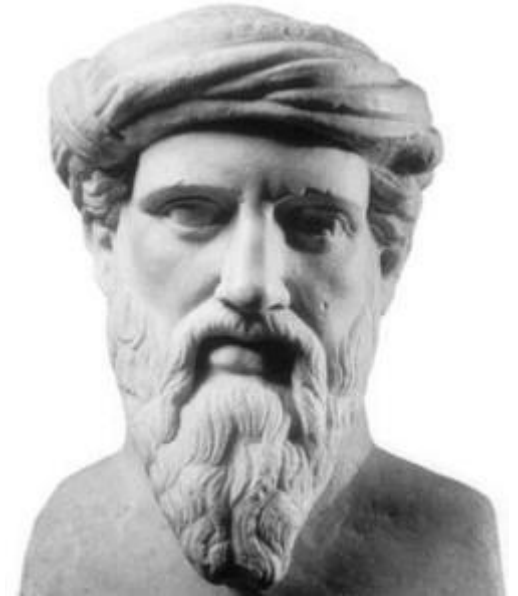
Neocortex/LIMBIC SYSTEM



<http://www.coaching.net.nz/wp-content/uploads/2013/06/Iceberg-for-blog-from-je1371521135440.jpg>

Pythagoras

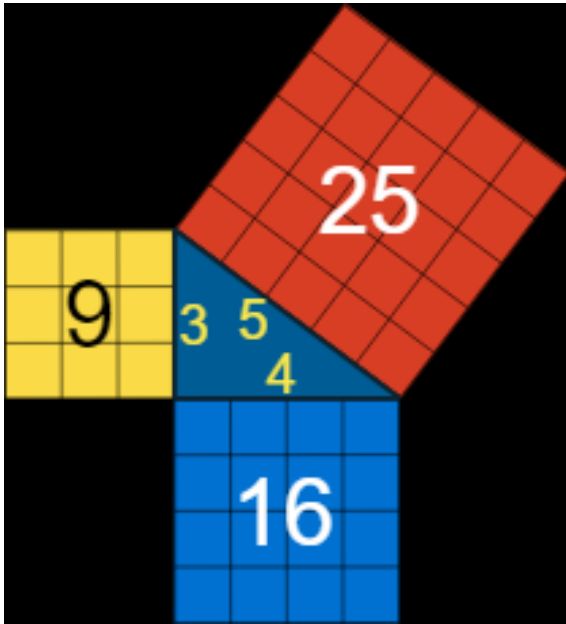
(570-495 BC)



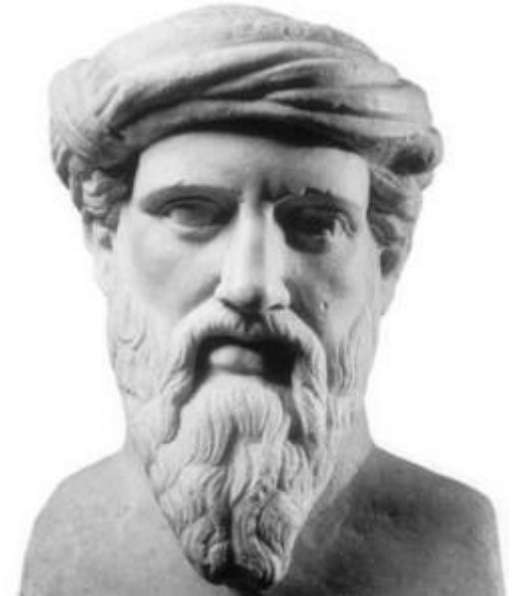
<https://www.goodreads.com/photo/author/203707.Pythagoras>

Pythagoras

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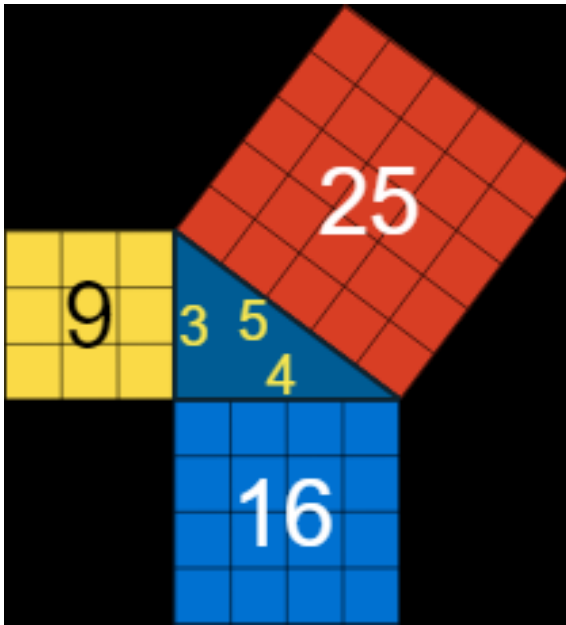
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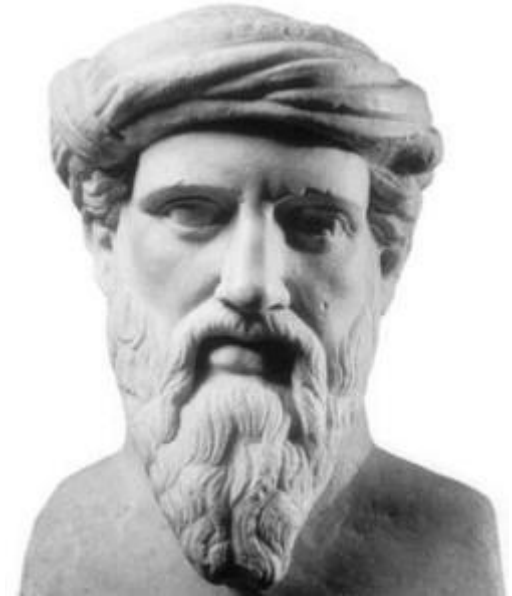
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Pythagoras

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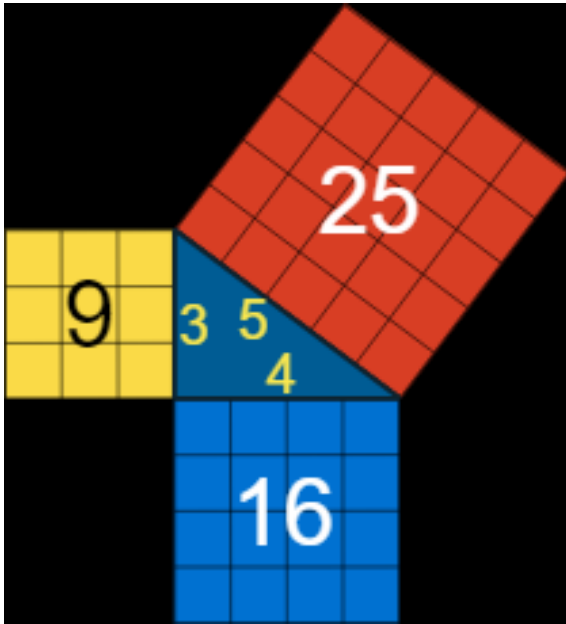


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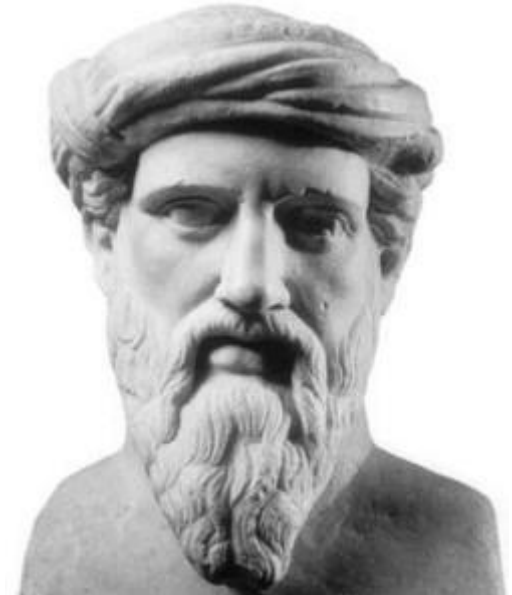
What is philosophical importance of Pythagoras' Theorem?

Pythagoras

(570-495 BC)



<https://www.mathsisfun.com/pythagoras.html>



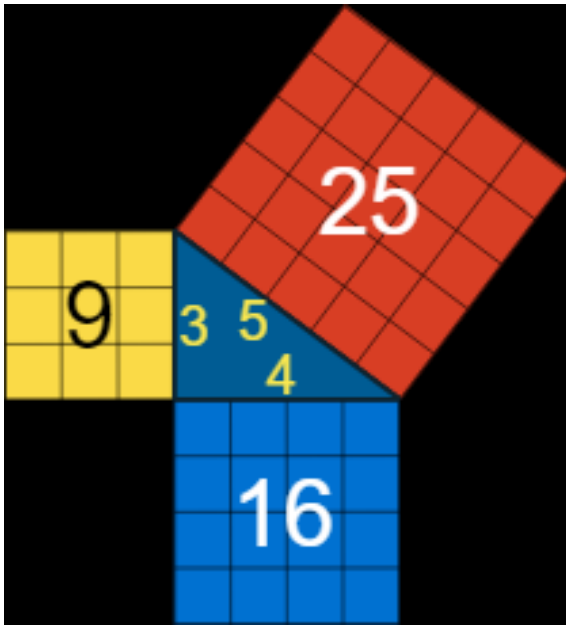
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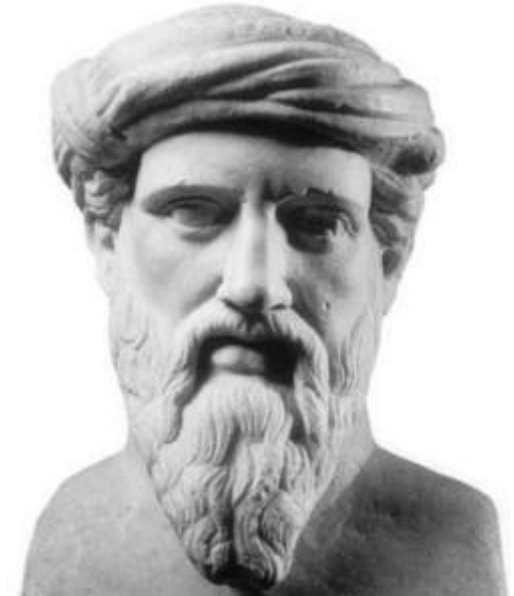
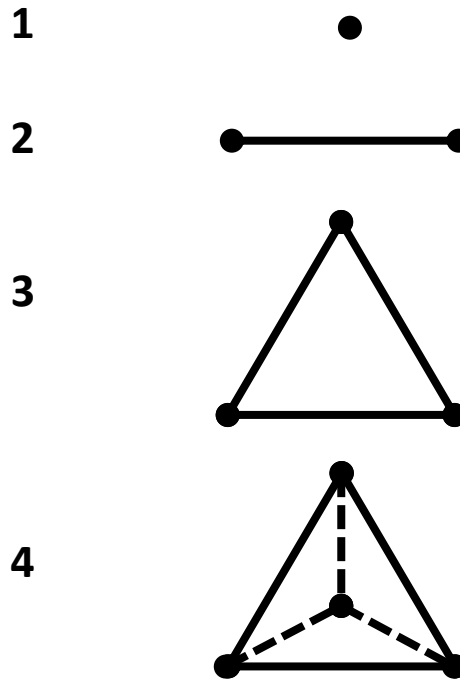
When you go to a higher level, you can find relationships which are not visible on a lower level.

Pythagoras

(570-495 BC)



<https://www.mathsisfun.com/pythagoras.html>



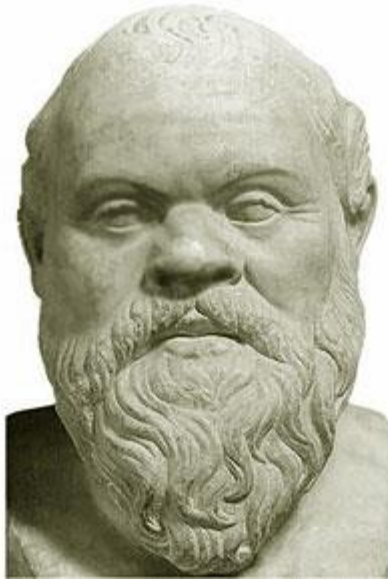
<https://www.goodreads.com/photo/author/203707.Pythagoras>

What is philosophical importance of Pythagoras' Theorem?

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Socrates

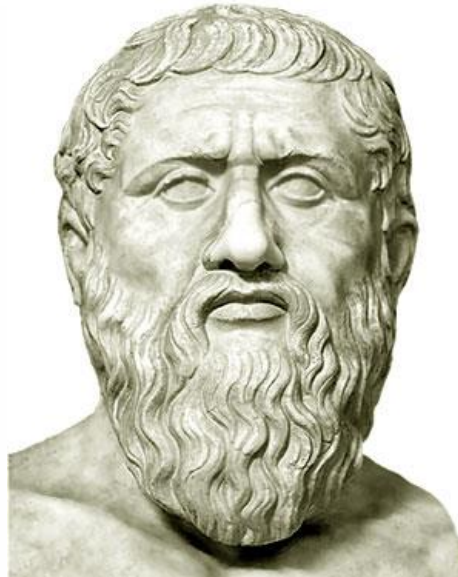
(470-399 BC)



<https://edukalife.blogspot.cz/2015/07/socrates-biography-greek-philosopher-is.html>

Platon

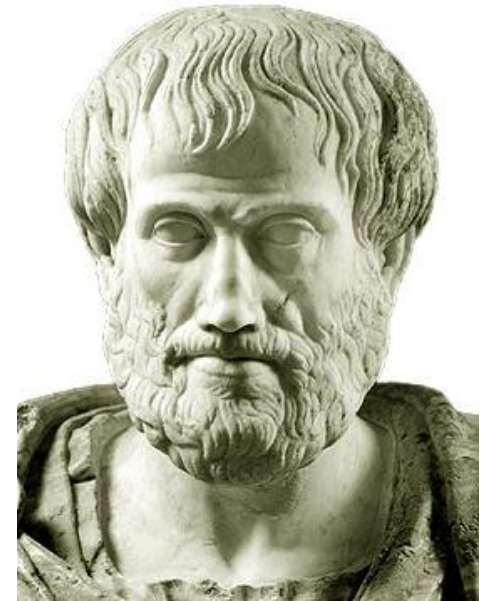
(427-347 BC)



<https://www.biografiasyvidas.com/biografia/p/platon.htm>

Aristoteles

(384-322 BC)



<https://www.biografiasyvidas.com/monografia/aristoteles/>

Material world

Perception

CUP



<https://www.vibranthome.co.uk/rice-dk-apple-green-small-melamine-kids-cup.html>

CUP

Material world

Perception



<http://www.ikea.com/gb/en/products/tableware/glasses-cups-mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/>



<https://www.vibranthome.co.uk/rice-dk-apple-green-small-melamine-kids-cup.html>



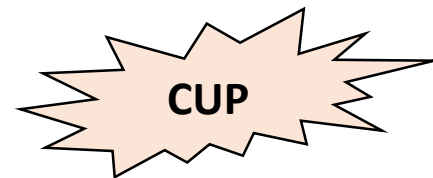
<https://www.dhgate.com/product/minecraft-creeper-face-ceramic-mug-coffee/269525497.html>

Ideas (ideal forms)



Material world

Perception



goldenavenue0518

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Ideas (ideal forms)



Material world

Perception

THING

DISHES

CUP



goldenavenue0518

[http://www.ikea.com/gb/en/products/tableware/glasses-cups mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/](http://www.ikea.com/gb/en/products/tableware/glasses-cups-mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/)

<https://www.vibranthome.co.uk/rice-dk-apple-green-small-melamine-kids-cup.html>

<https://www.dhgate.com/product/minecraft-creeper-face-ceramic-mug-coffee/269525497.html>

Ideas (ideal forms)
Soul



Temporary, unstable
Material world
Perception

THING
DISHES
CUP



<http://www.ikea.com/gb/en/products/tableware/glasses-cups-mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/>

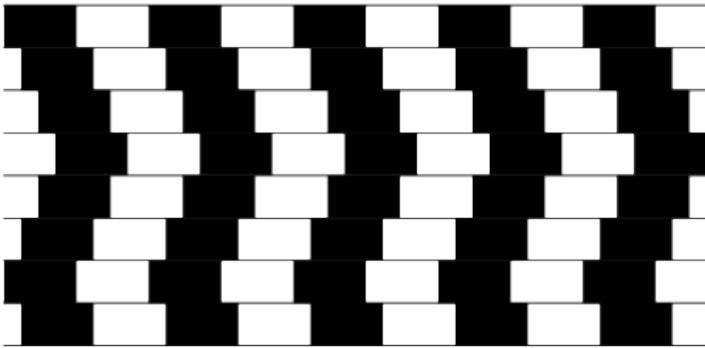
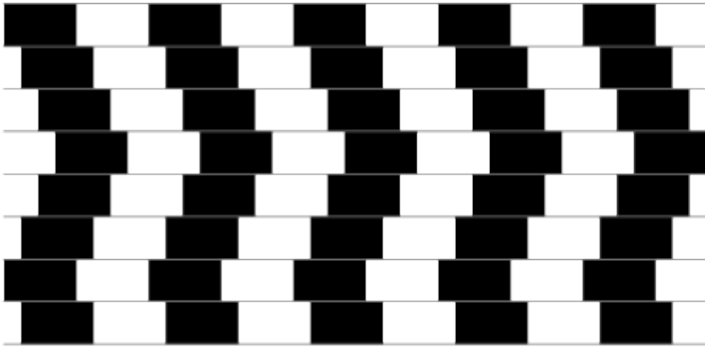


<https://www.vibranthome.co.uk/rice-dk-apple-green-small-melamine-kids-cup.html>



<https://www.dhgate.com/product/minecraft-creeper-face-ceramic-mug-coffee/269525497.html>

We cannot fully trust perception



We cannot fully trust perception

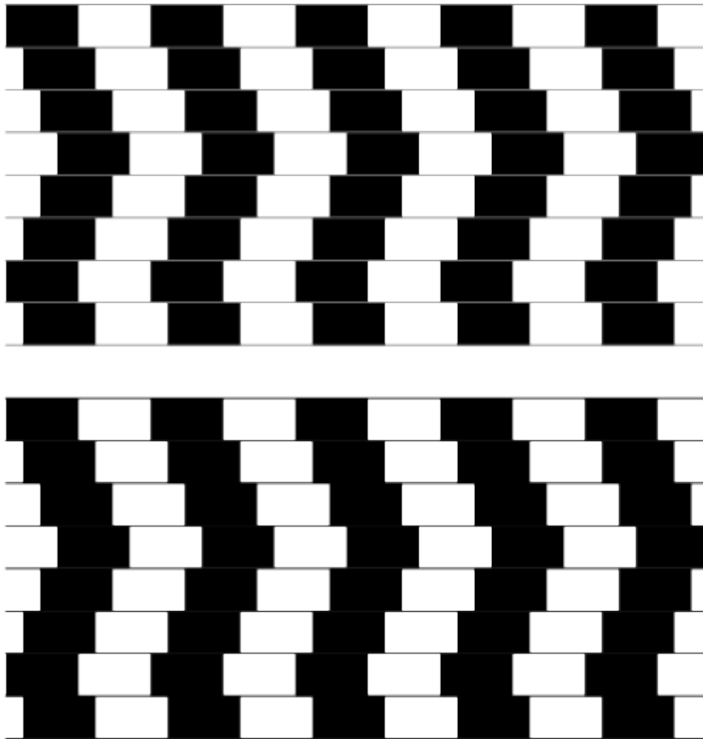


Diagram 1

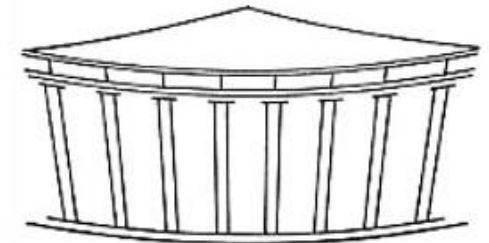
The temple as it visually appears with correction



a

Diagram 2

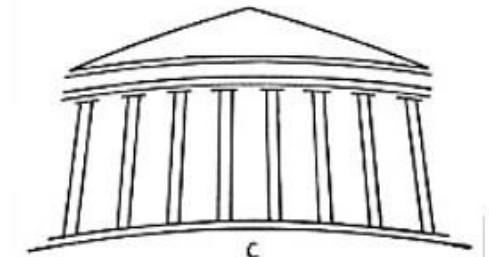
The temple as it would appear without correction



b

Diagram 3

The temple as it is actually built with Correction



c

Optical Correction (Entasis) In Doric Temples

<http://mathworld.wolfram.com/CafeWallIllusion.html>

https://www.google.cz/search?q=parthenon+optical+illusion&tbn=isch&tbs=ring:Cep4xGmedLtojjiYWWxFjsJ55IjhzPYbPG5tLV1luUuT16-LZ8KRO29Z7mDP4TOBE5jXVYVC0VP9zZP0IVWJzUWudSoSCZhZbEWOwnnkEby-liIL8eYiKhIJgmHM9hs8bm0Ri7nPzorVAJ0qEgktXUi5S5PXrxHO7RBEw67e3CoSCYtnwpE7b1nuEWiEjpl24KYOKhIJYM_1hM4ETmNcRxzlwCqBNCPgqEgIVhULRU_13NkxH-8eV8CpFepCoSCfSVVYnNRa51EaaAZpqd1qCm&tbo=u&sa=X&ved=0ahUKEwJxv8K14tzZAhXMAMAKHWiBBqQ9C8IHA&biw=1366&bih=626&dpr=1#imgrc=i2fckTtvWe4qdM:

UNIVERSAL ASPECT OF EVERYTHING

EXISTENCE

SET OF ATOMS

THING

DISHES

CUP

Generalization ↑

Ideas (ideal forms)
Soul



Temporary, unstable
Material world
Perception



<http://www.ikea.com/gb/en/products/tableware/glasses-cups-mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/>

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One
Indeterminate Pair of big and small
Spirit



Ideas (ideal forms)
Soul



Temporary, unstable
Material world
Perception

UNIVERSAL ASPECT OF EVERYTHING

EXISTENCE **SET OF ATOMS**

THING

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<https://www.dhgate.com/product/minecraft-creeper-face-ceramic-mug-coffee/269525497.html>

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Spirit

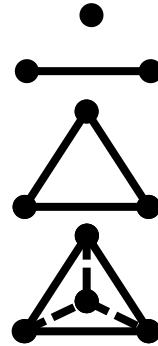


Ideas (ideal forms)
Soul



Temporary, unstable
Material world
Perception

1
2
3
4



✓ One is the universal principle forming everything else
✓ One is both the smallest part and altogether

↑
Generalization

THING
DISHES
CUP



<http://www.ikea.com/gb/en/products/tableware/glasses-cups-mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/>



<https://www.vibranthome.co.uk/rice-dk-apple-green-small-melamine-kids-cup.html>



<https://www.dhgate.com/product/minecraft-creeper-face-ceramic-mug-coffee/269525497.html>

Eternal
One
Indeterminate Pair of big and small
Spirit

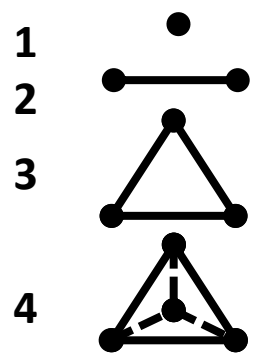


Eternal, created
Ideas (ideal forms)
Soul



Temporary, unstable
Material world
Perception

$1 \times 1 = 1$



✓ One is the universal principle forming everything else
✓ One is both the smallest part and altogether

Generalization ↑

THING
DISHES
CUP



<http://www.ikea.com/gb/en/products/tableware/glasses-cups-mugs/f%C3%A4rgrik-mug-turquoise-art-50234803/>



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goldenavenue0518

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EXISTENCE **SET OF ATOMS**

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<https://www.vibranthome.co.uk/rice-dk-apple-green-small-melamine-kids-cup.html>

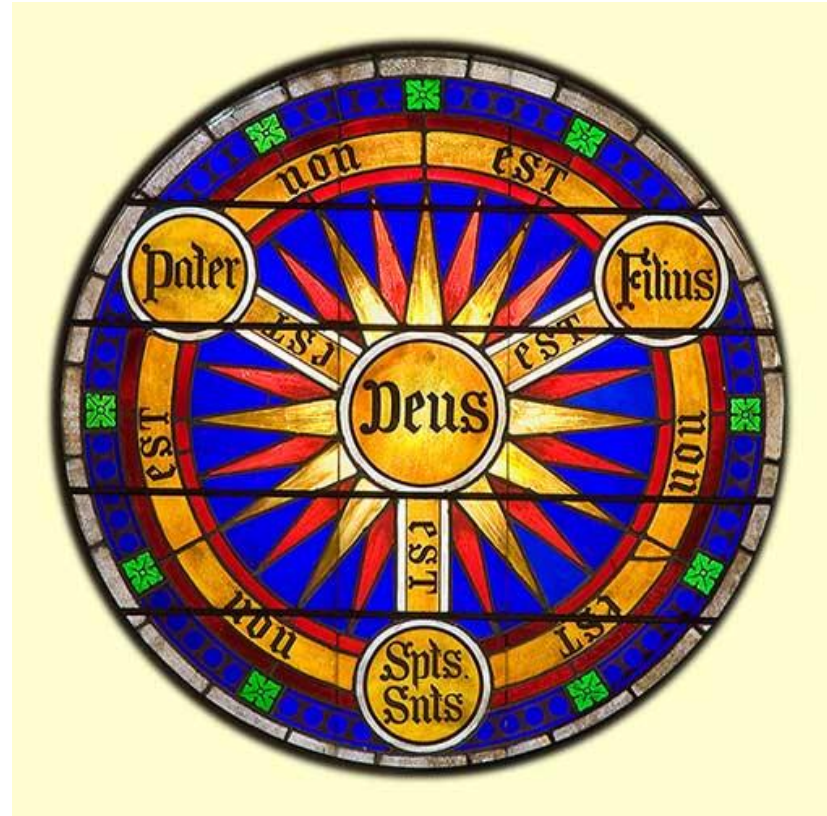
<https://www.dhgate.com/product/minecraft-creeper-face-ceramic-mug-coffee/269525497.html>

Active principle Passive principle Principle of cognition

Western Christian Tradition



<https://www.wikiart.org/en/el-greco/the-holy-trinity-1577>

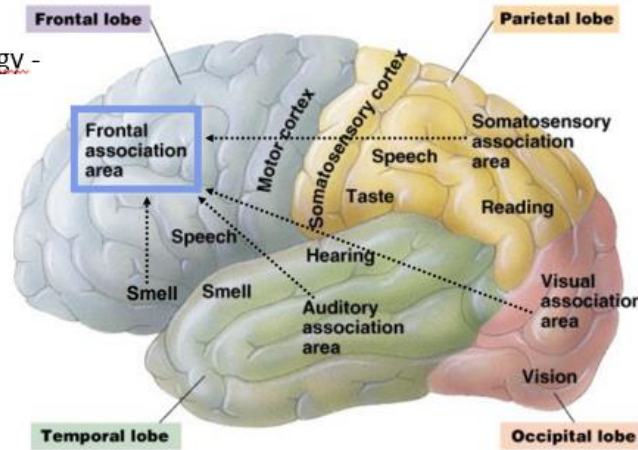


<https://pastorfergus.files.wordpress.com/2011/06/the-holy-trinity.png>

Frontal association area

Executive functions

- 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/tr>

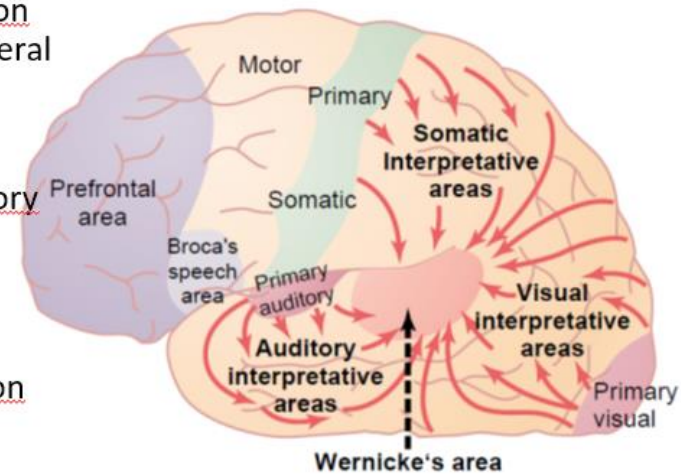
Complementary ways of thinking

- Analysis
- Categorization
- Anticipation
- Expectation

Parieto-occipito-temporal association area

Analytical functions

- Linking and interpretation of information from several sensory modalities
- Visual – acoustic – sensory analysis
- Object recognition and categorization
- Language comprehension
- Attention

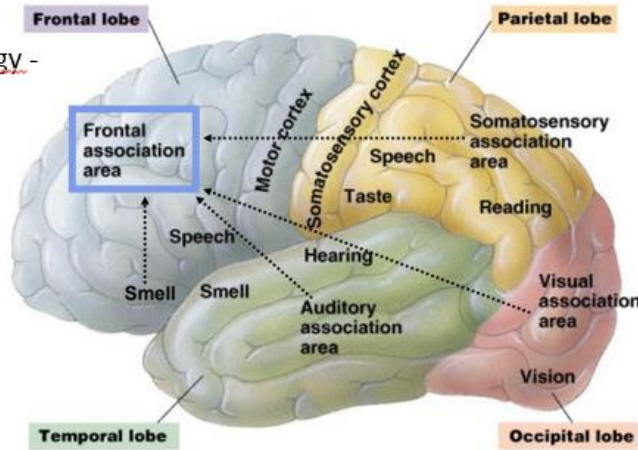


<http://www.slideshare.net/drpsdeb/presentations>

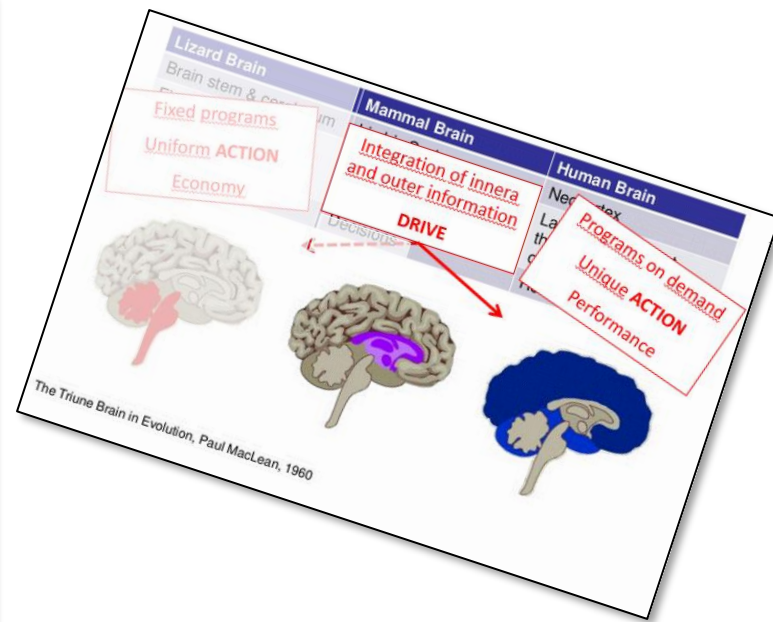
Frontal association area

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<https://www.slideshare.net/tr>



Complementary ways of thinking

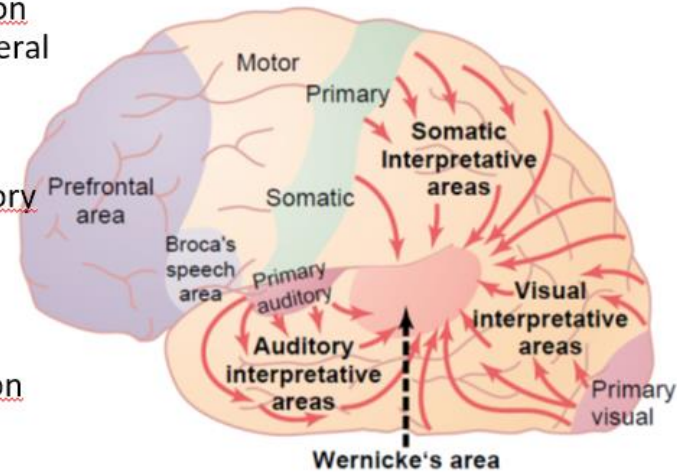
- Analysis
- Categorization
- Anticipation
- Expectation

Drive

Parieto-occipito-temporal association area

Analytical functions

- Linking and interpretation of information from several sensory modalities
- Visual – acoustic – sensory analysis
- Object recognition and categorization
- Language comprehension
- Attention

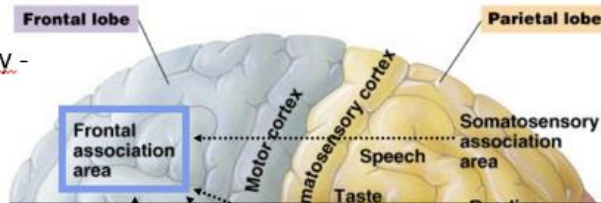


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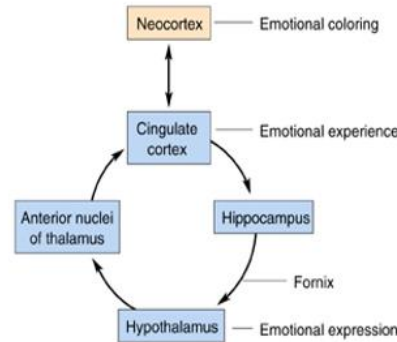
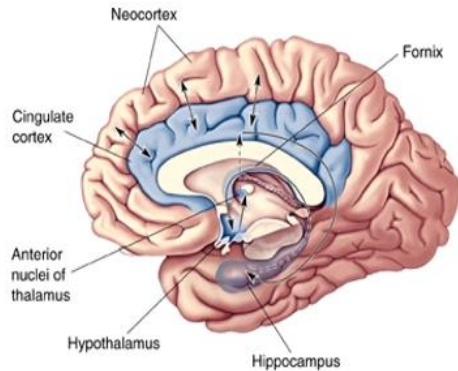
Frontal association area

Executive functions

- Motor/non-motor planning/organization - strategy - anticipation
- Thinking – mental models processing
- Attention – „information filtering“
- Behavioral control
 - Facilitation of „wanted“
 - Inhibition of „unwanted“



Papez circuit



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

Complementary ways of thinking

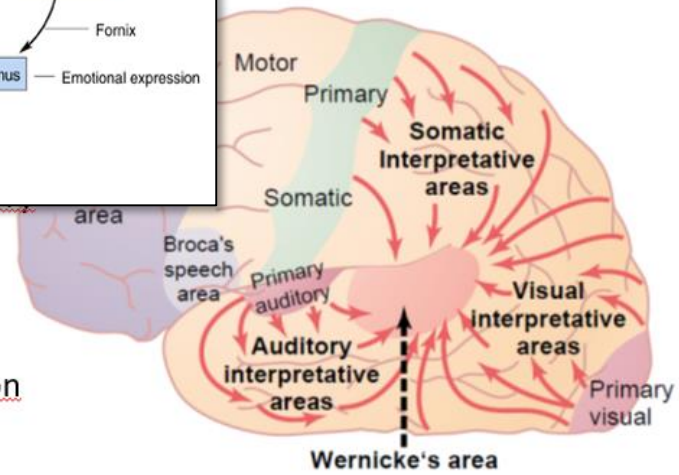
Analysis
Categorization

Anticipation
Expectation

Drive

Analytical functions

association area



analysis

- Object recognition and categorization
- Language comprehension
- Attention

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

Limbic system and neocortex

Information

NEOCORTEX

VS

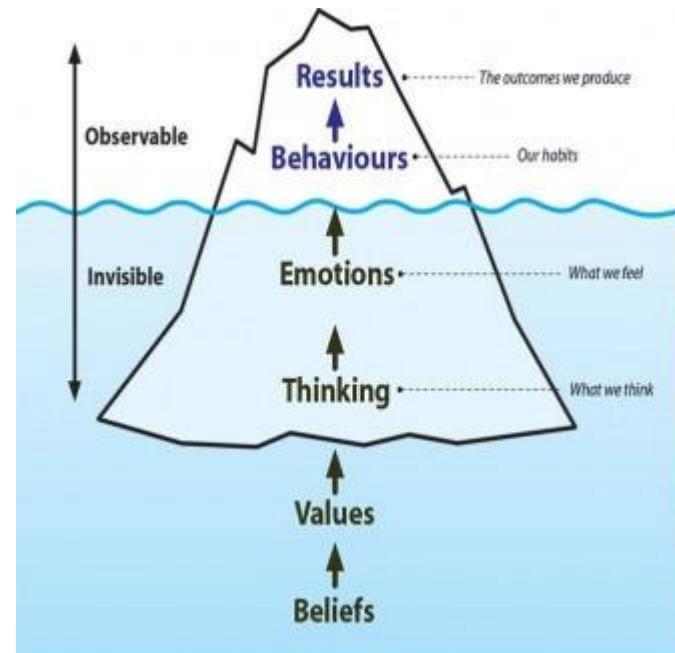
Complex information

NEOCORTEX/limbic system

VS

Values/Philosophy/Faith

Neocortex/LIMBIC SYSTEM



<http://www.coaching.net.nz/wp-content/uploads/2013/06/Iceberg-for-blog-from-je1371521135440.jpg>

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

Aristoteles

Society



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>
<http://previews.123rf.com/images/dja65/dja651107/dja65110700341/10025966-Stone-age-axe-Stock-Photo-tools-ancient-stone.jpg>

[http://www.thebushcraftstore.co.uk/ekmps/shops/bduimportsltd/images/condor-greenland-pattern-axe-\[2\]-12105-p.jpg](http://www.thebushcraftstore.co.uk/ekmps/shops/bduimportsltd/images/condor-greenland-pattern-axe-[2]-12105-p.jpg)

Complementary ways of thinking

Analysis
Categorization

Knowledge

Rationalism

Anticipation
Expectation

Belief

Spiritualism

