

M U N I

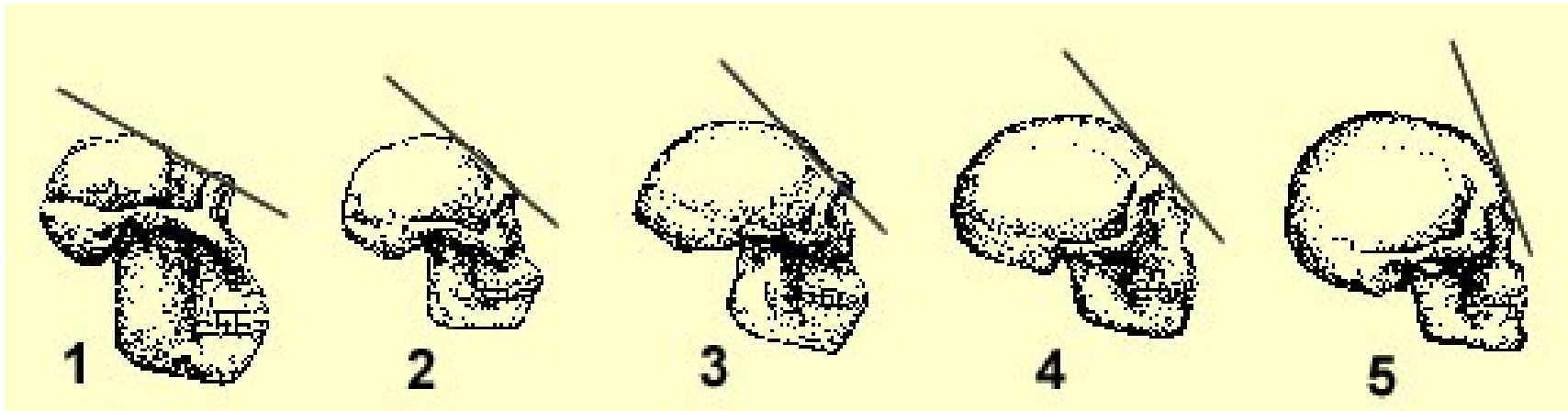
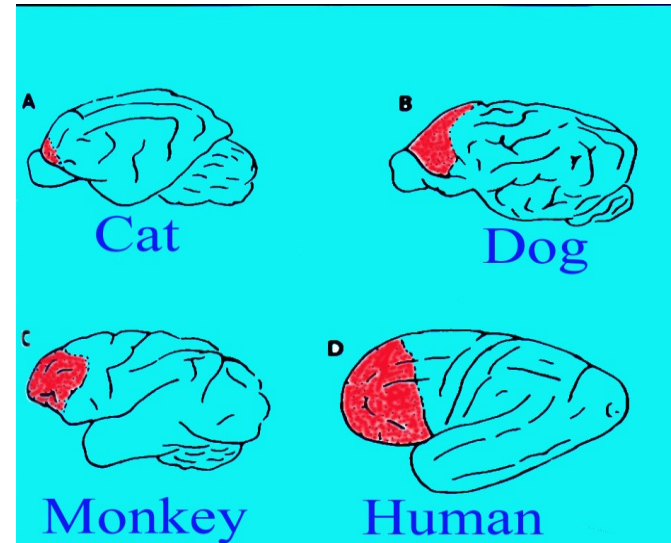
M E D

**17**

# **The Highest Functions of Nervous System - Psychological and Social Aspects of Brain Activity I**

# 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**



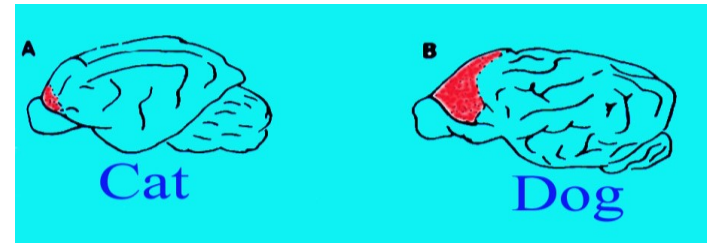
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<http://thenextweb.com/wp-content/blogs.dir/1/files/2015/03/jerry1.jpg>

# 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>

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

[https://en.wikipedia.org/wiki/Society#/media/File:Canis\\_lupus\\_pack\\_surrounding\\_Bison.jpg](https://en.wikipedia.org/wiki/Society#/media/File:Canis_lupus_pack_surrounding_Bison.jpg)

# 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>



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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>



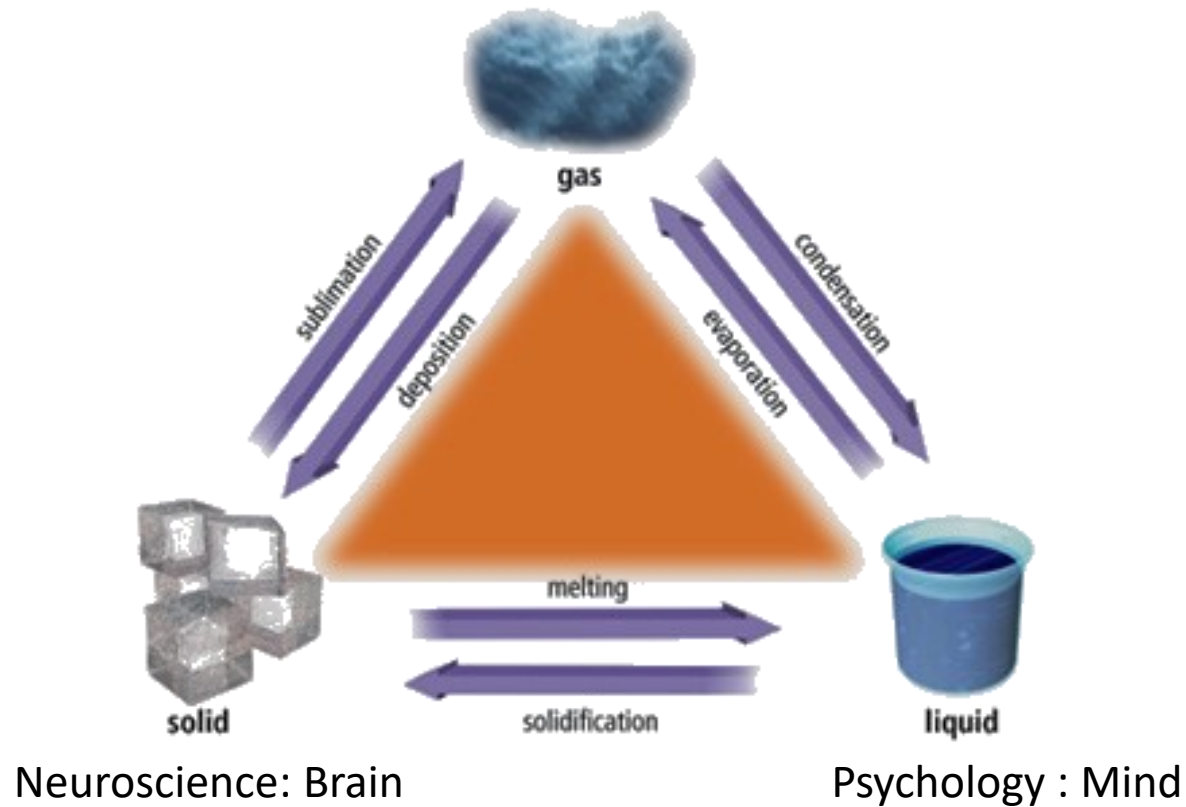
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# Three States of Knowledge and Cognition

Philosophy : Mind behind Mind



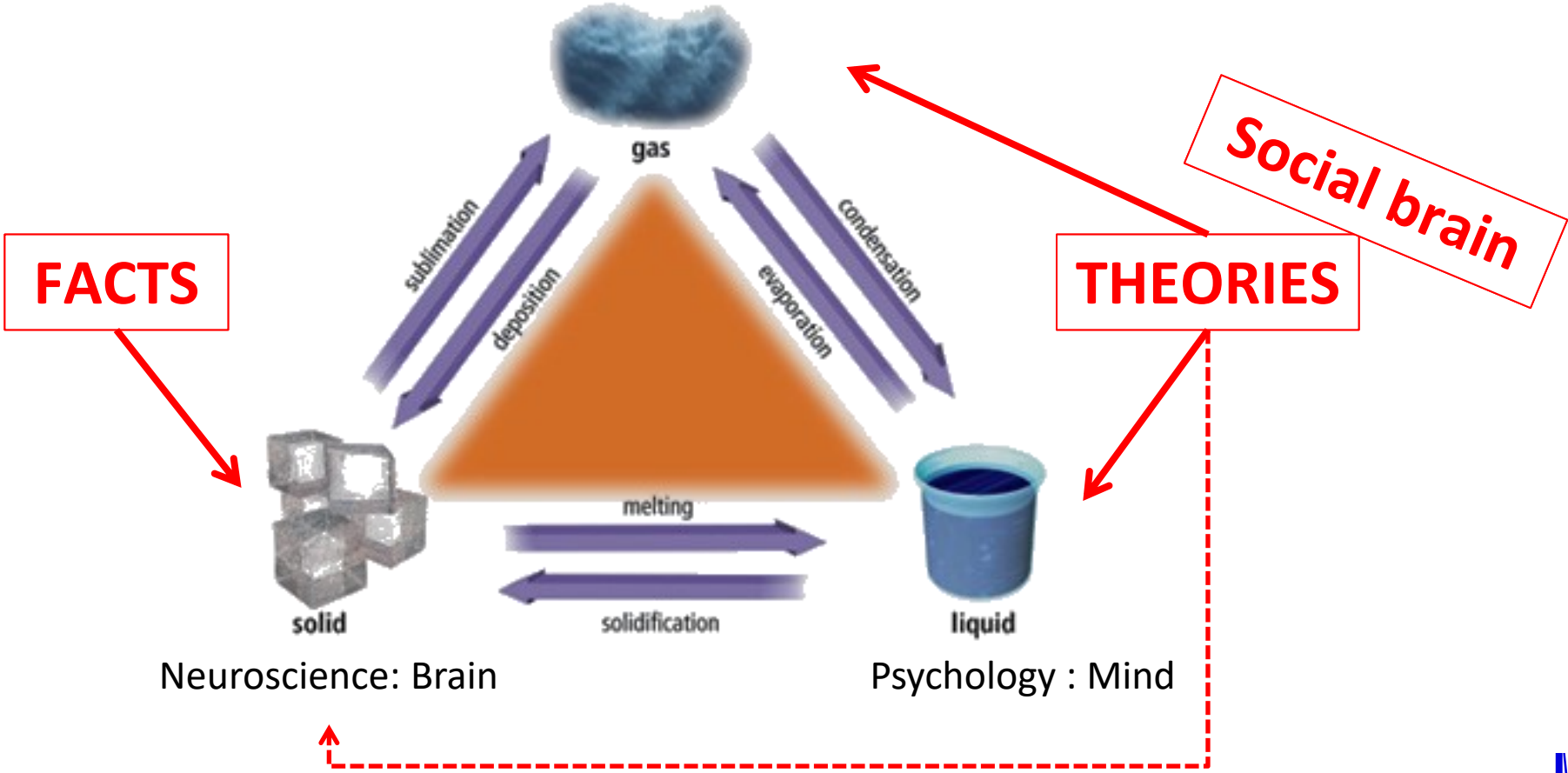
PS Deb





# Three States of Knowledge and Cognition

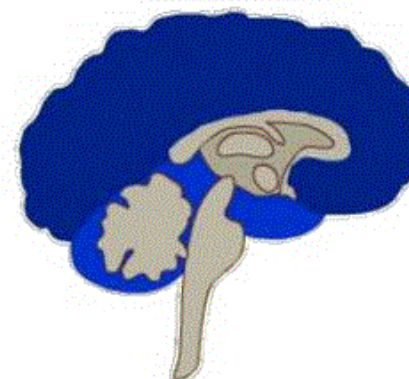
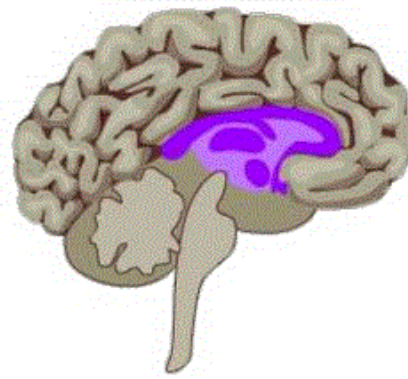
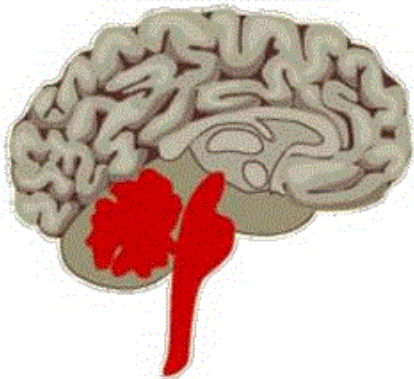
Philosophy : Mind behind Mind



# 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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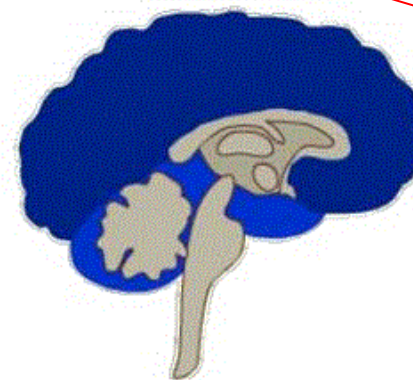
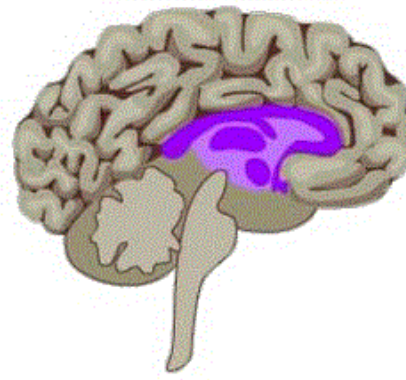
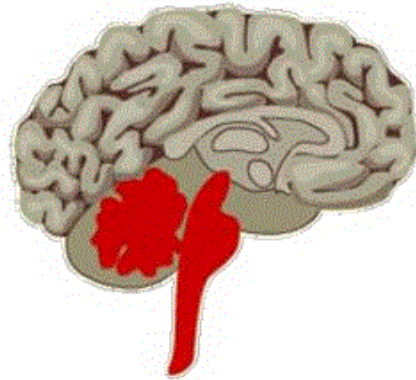
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# Triune Brain Theory

Lizard Brain	Mammal Brain	Human Brain
Brain stem & cerebellum	Limbic System	Neocortex
Fixed programs	Emotions, memories, habits	Learning, thinking, planning
Uniform <b>ACTION</b>	Decisions	Performance
Economy		

Fixed programs  
Uniform **ACTION**  
Economy

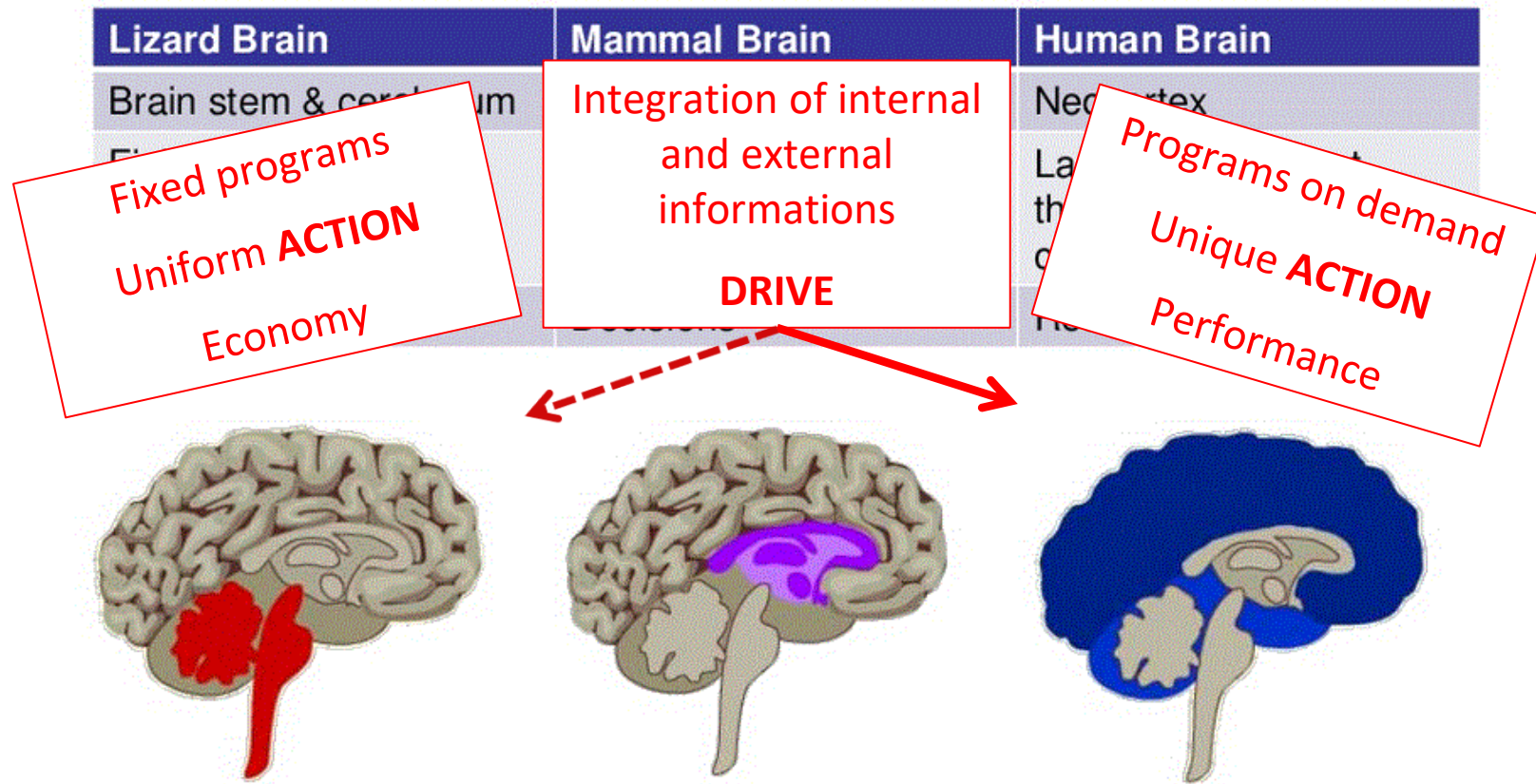
Programs on demand  
Unique **ACTION**  
Performance



The Triune Brain in Evolution, Paul MacLean, 1960

<https://s-media-cache-ak0.pinimg.com/originals/2f/60/99/2f609962e23fdce7a008fb224d316256.gif>

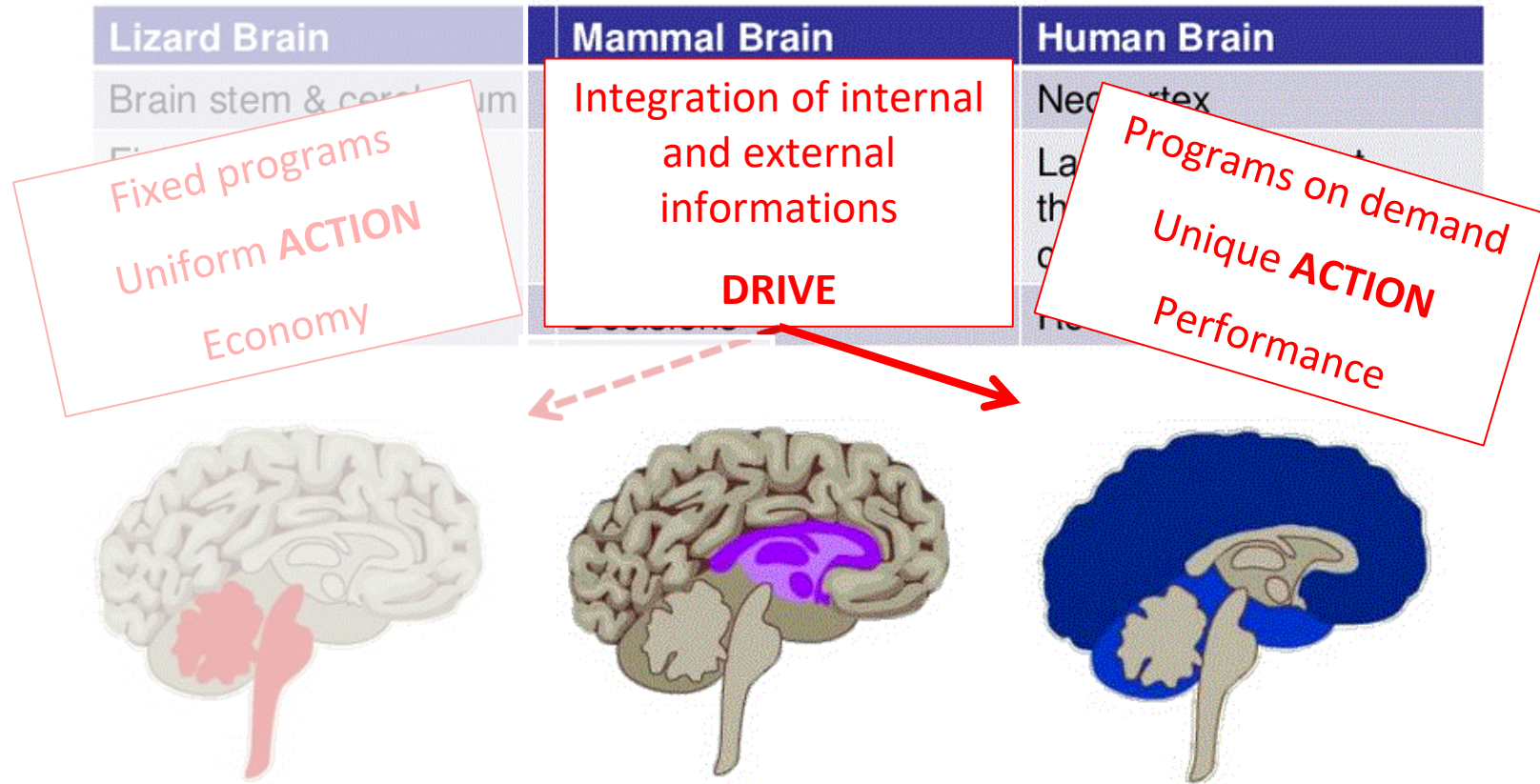
# Triune Brain Theory



The Triune Brain in Evolution, Paul MacLean, 1960

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# Triune Brain Theory

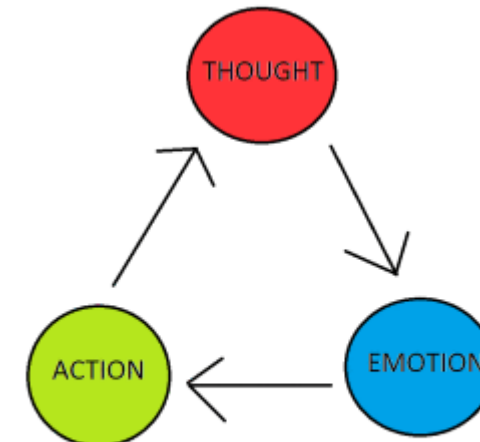
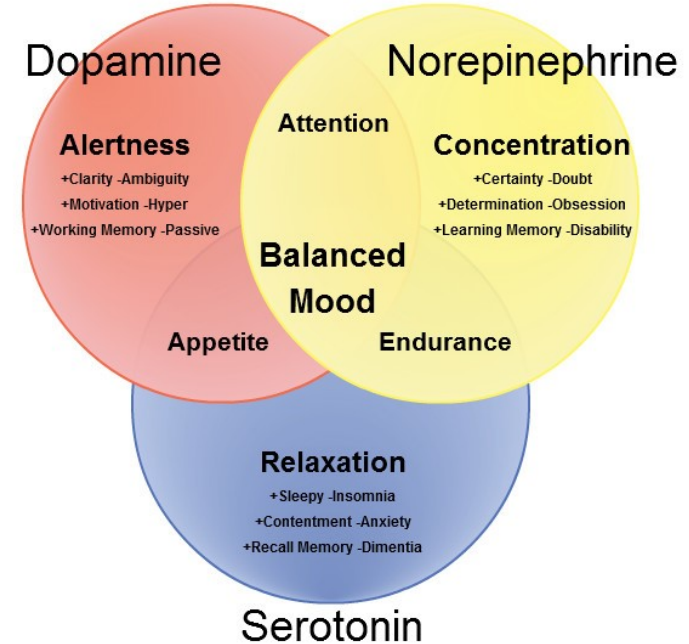


The Triune Brain in Evolution, Paul MacLean, 1960

<https://s-media-cache-ak0.pinimg.com/originals/2f/60/99/2f609962e23fdce7a008fb224d316256.gif>

# Influence of hypothalamus on neocortex

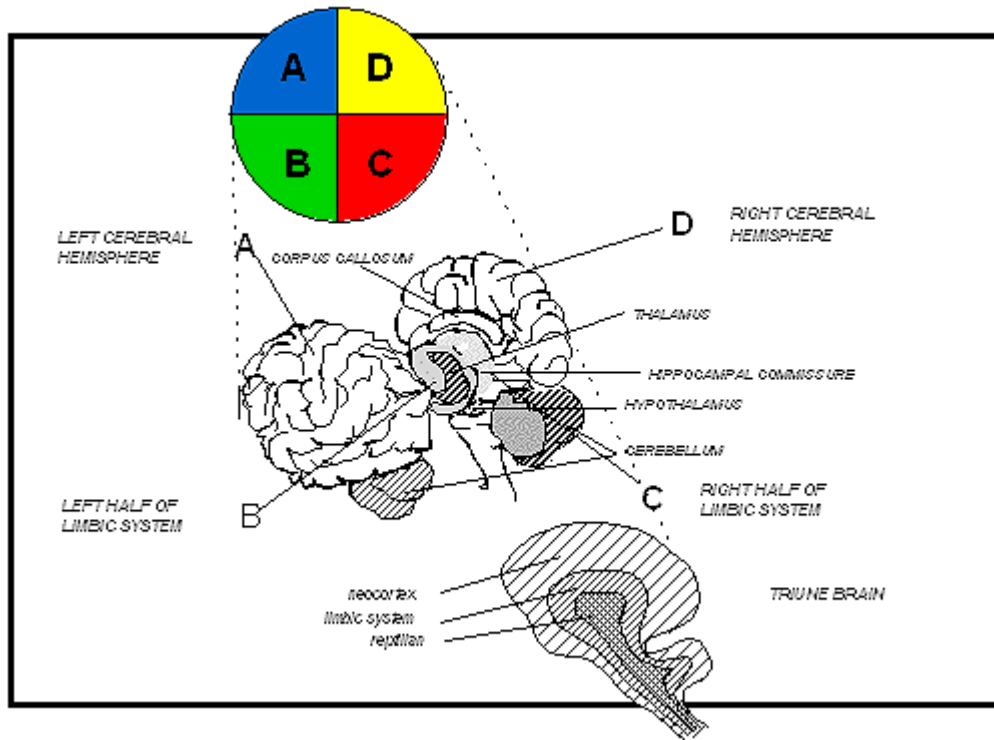
- Papez circuit
- Via neuromodulating systems
  - Consciousness
  - Mood
- Via thalamus
  - Via nucleus mediodorsalis to orbitofrontal cortex (influence on decision making)
  - Influence gating function of other thalamic nuclei



[http://ausm.org.uk/wp-content/uploads/2015/02/Dopamine\\_Norepinephrine\\_Serotonin.jpg](http://ausm.org.uk/wp-content/uploads/2015/02/Dopamine_Norepinephrine_Serotonin.jpg)

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

# Whole brain model

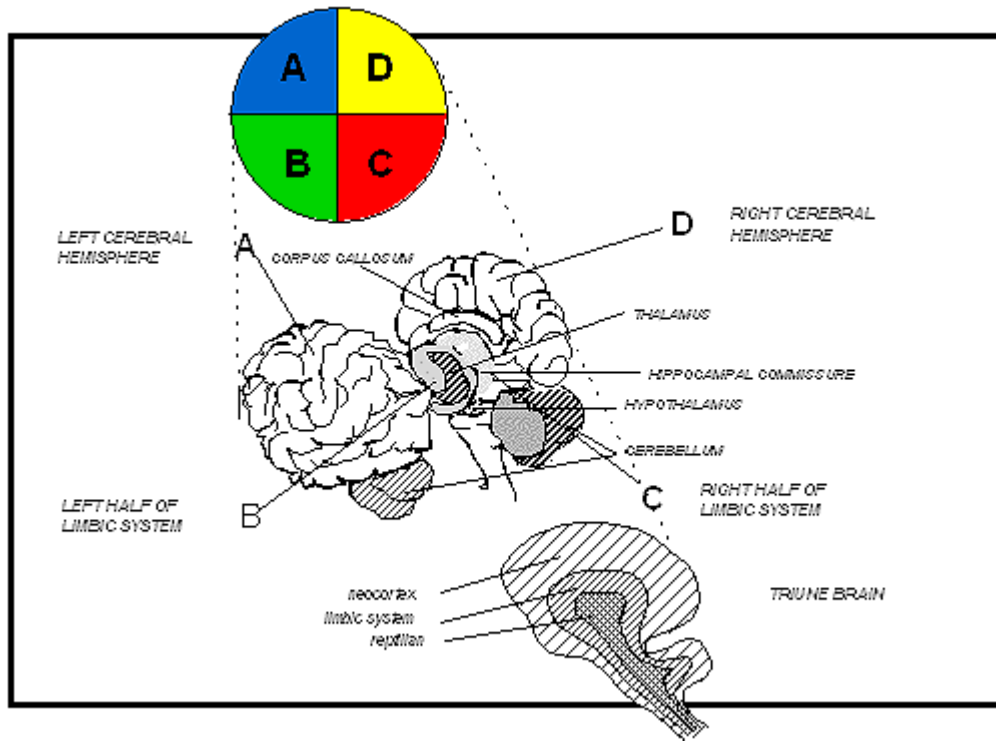


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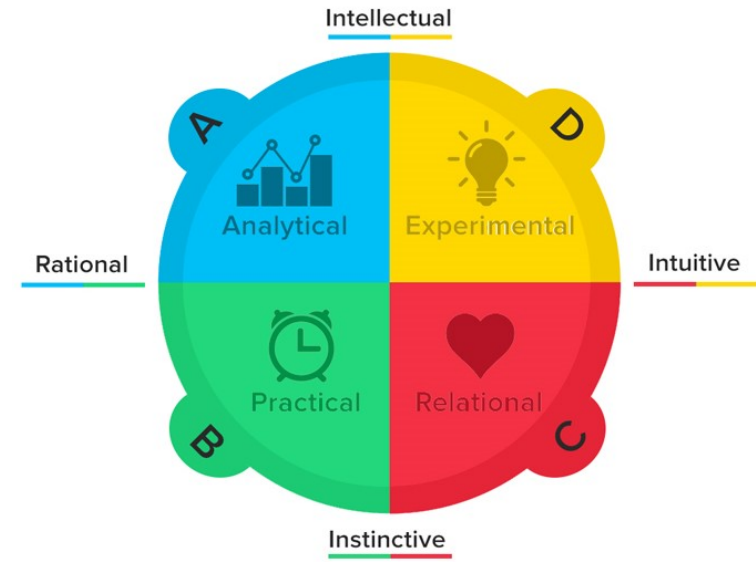
1978



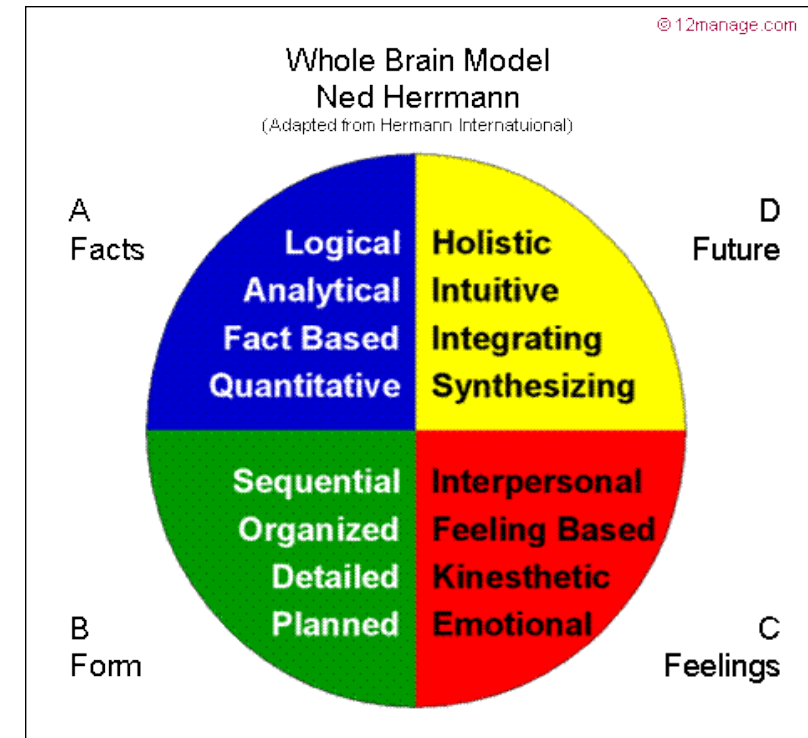
# Whole brain model



<http://www.sacsa.sa.edu.au/ATT/%7BBA2B8C52-92B6-4C17-AEEB-3A9D4F9AE8DE%7D/images/BackgroundInfo/images/image8.gif>



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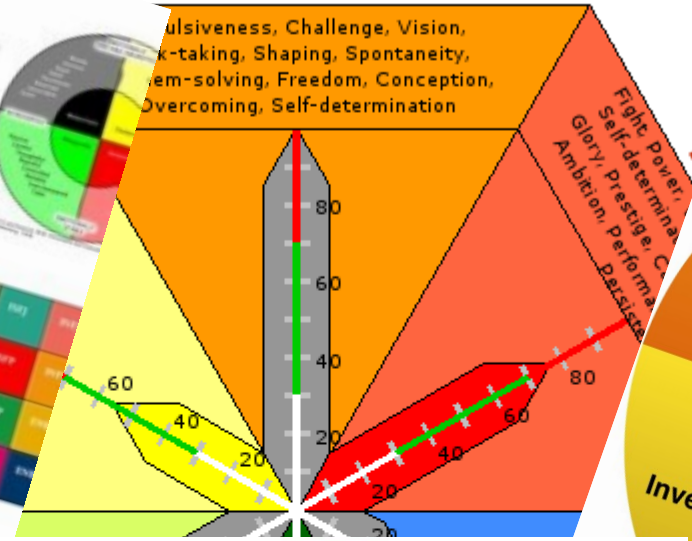
1978





# Innovation "Pioneer"

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

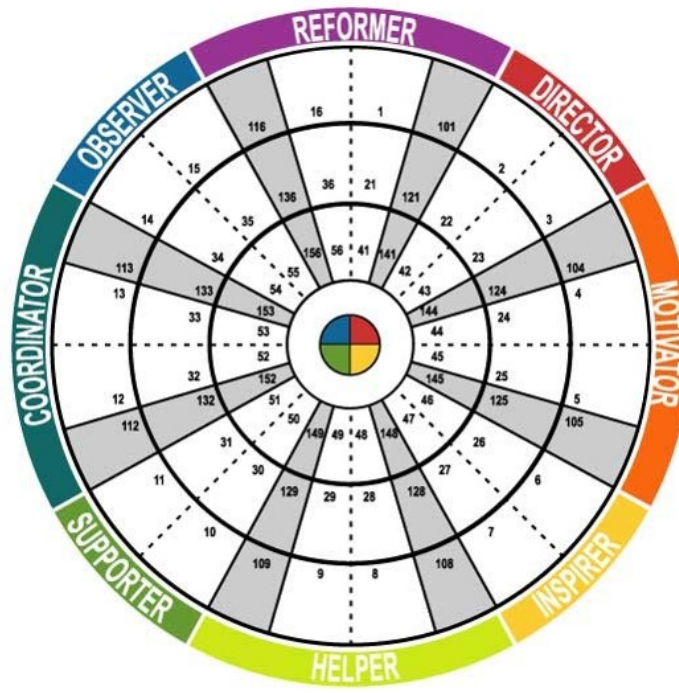


# The Four Quadrants of Technology Service & Support



Disciplined "Control"

<https://lowcitytechnologyservices.files.wordpress.com/2015/10/20151015th0132-four-quadrants-of-technology-service-and-support-chart.jpg>



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

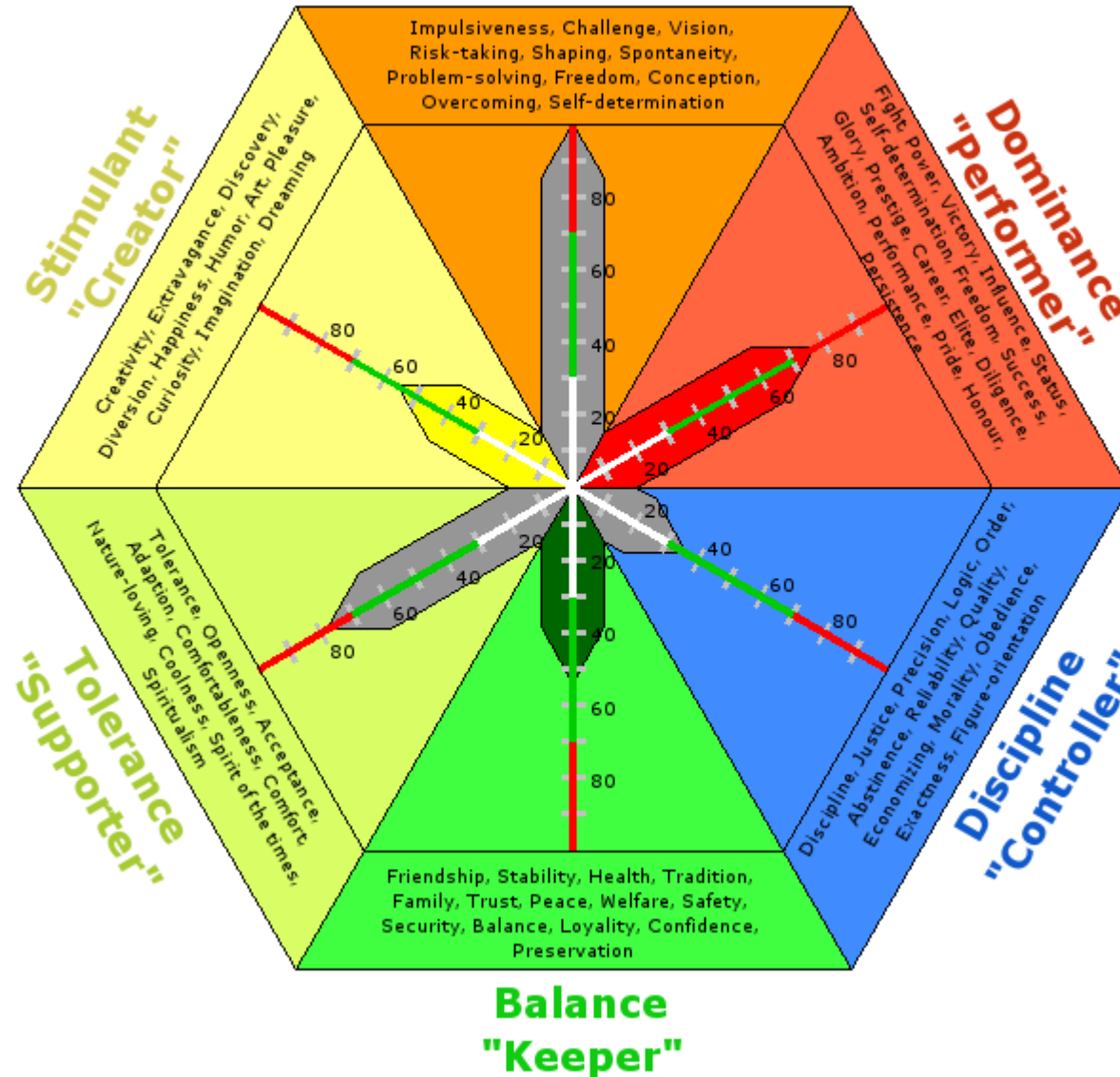


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# Innovation "Pioneer"



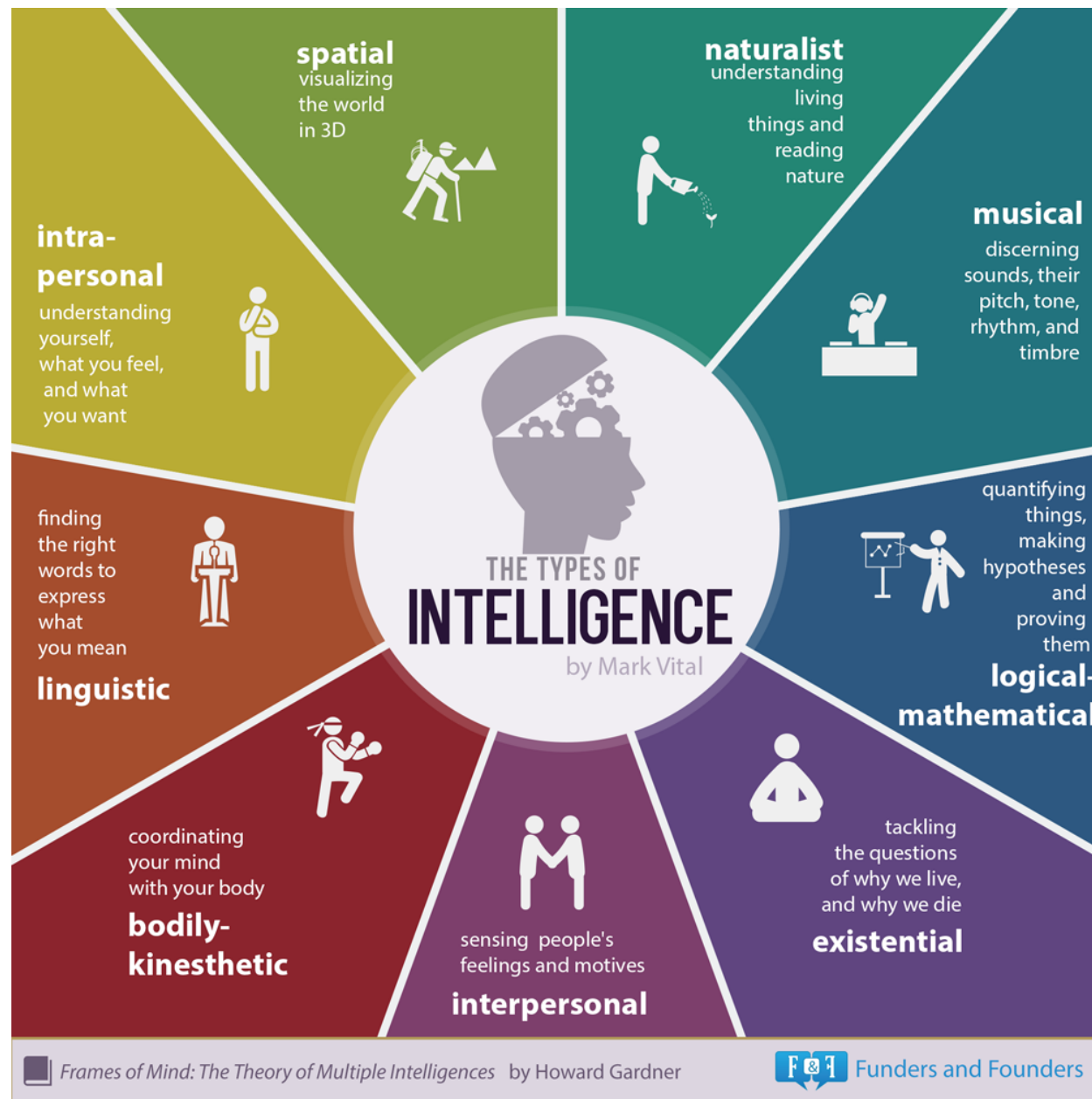
<https://web.limbic-personality.com/files/CjvXQ2.bmp>

# Every brain is unique

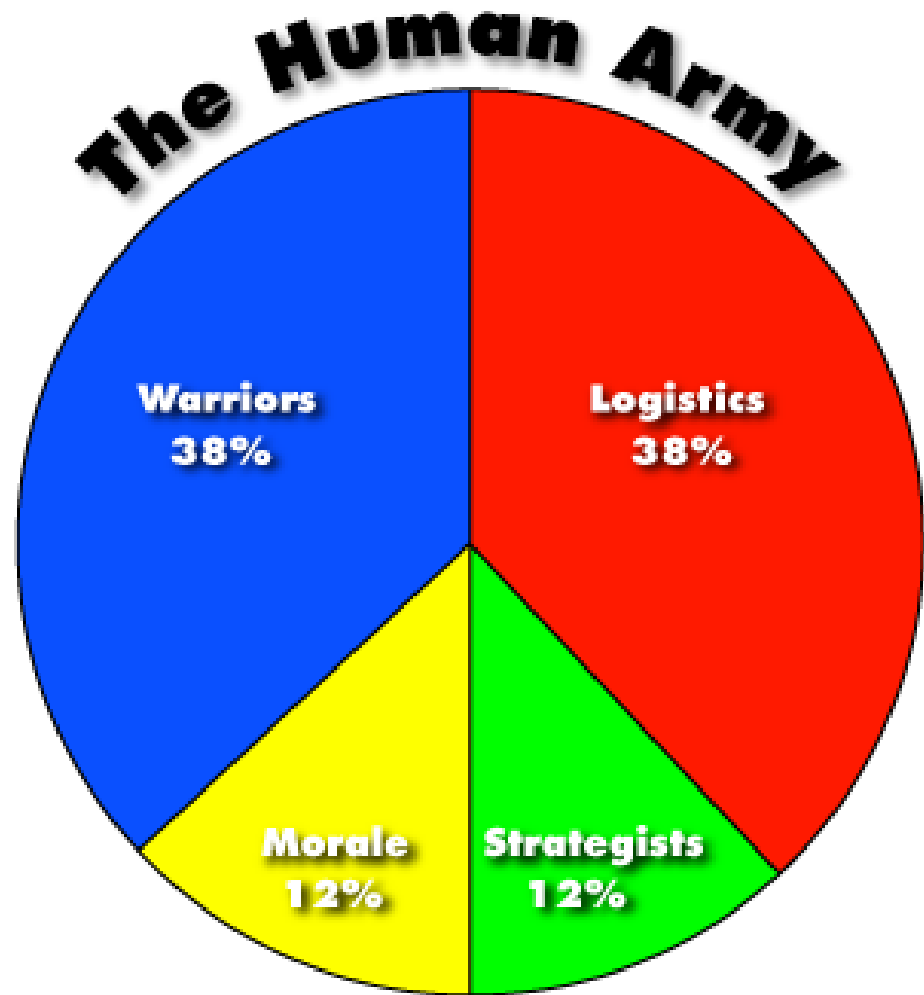
- Emotionally
  - Limbic system
- Rationally
  - Neocortex

✓ Genetics  
✓ Environment





- Society**
- ✓ Collaboration
  - ✓ Categorization of duties and responsibilities
  - ✓ Hierarchical

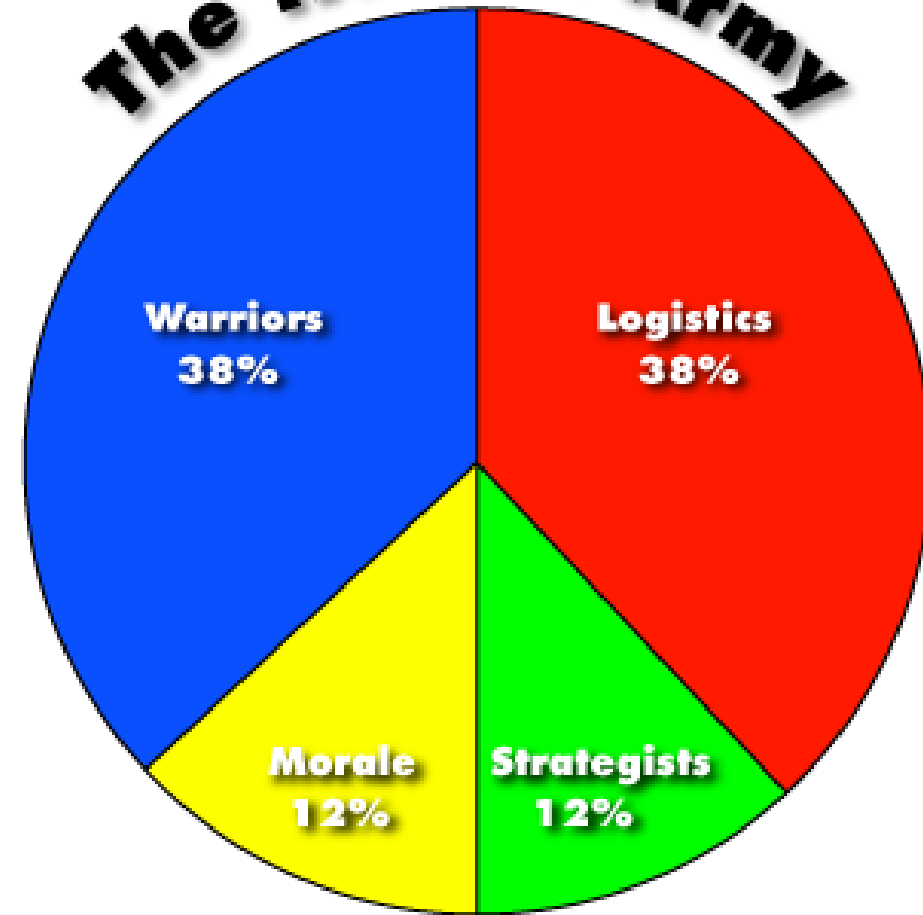


**The 4 Personality Types In The Human Race**

©2011 Personality Marketing LLC

<http://customersecrets.com/wp-content/uploads/2011/09/Army-Personality-Types.png>

# The Human Army



**Society**

- ✓ Collaboration
- ✓ Categorization of duties and responsibilities
- ✓ Hierarchical

**Potential conflict**

- I do not respect the status quo
- We do not respect the status quo

- Me versus society
- We versus other society (societies)

## The 4 Personality Types In The Human Race

©2011 Personality Marketing LLC

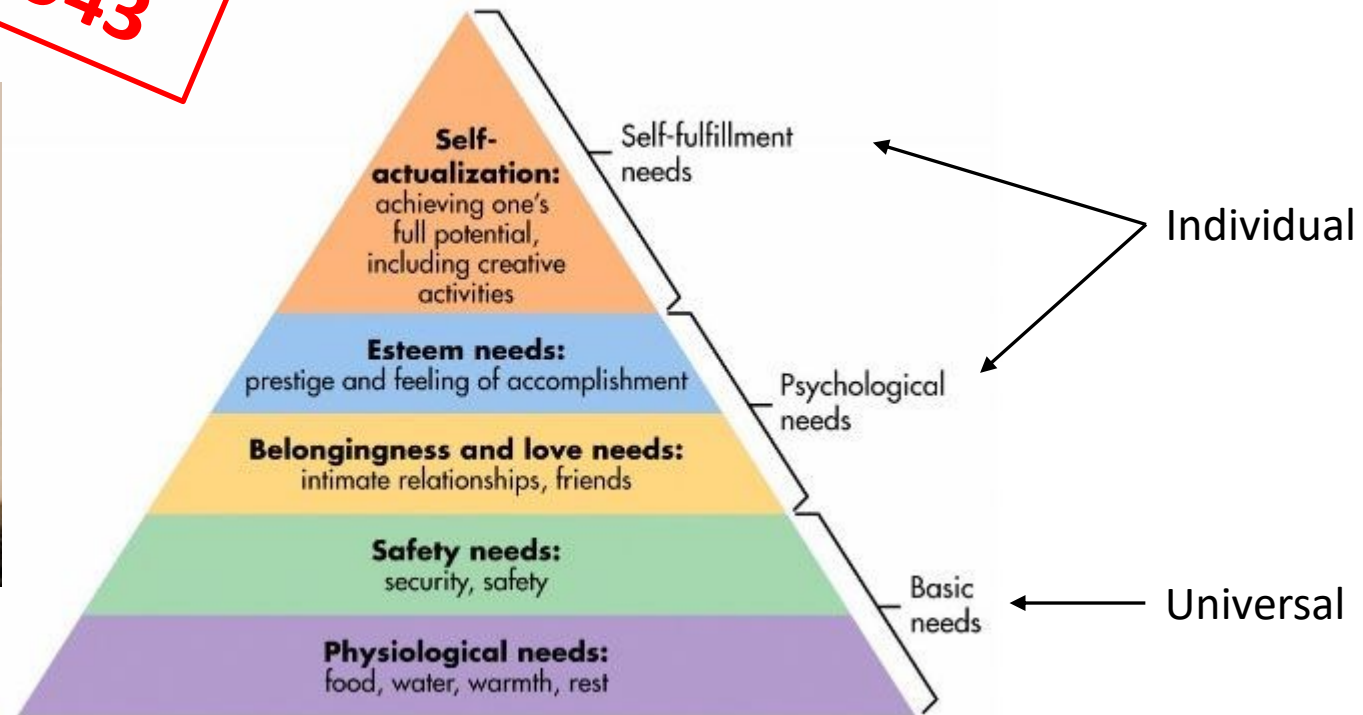
<http://customersecrets.com/wp-content/uploads/2011/09/Army-Personality-Types.png>

# Hierarchy of Needs by Abraham Maslow

1943



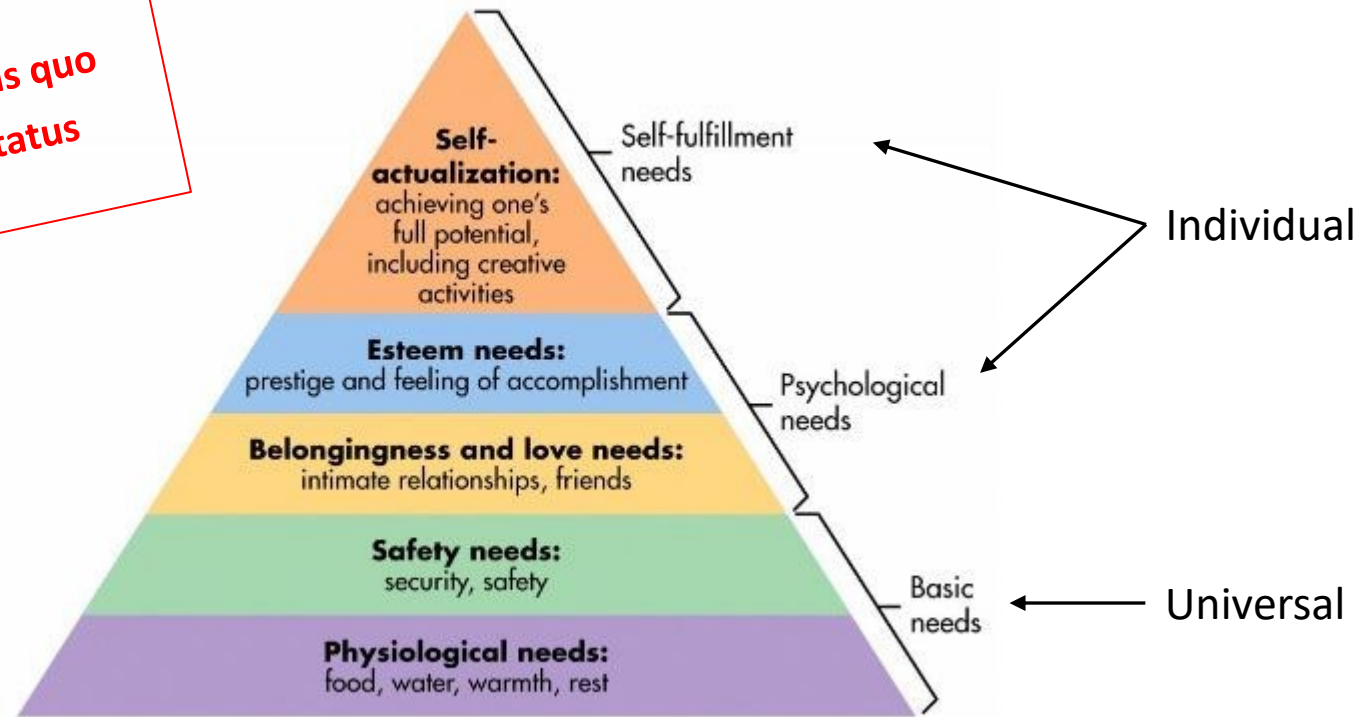
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<http://www.simplypsychology.org/maslow-pyramid.jpg>

# Hierarchy of Needs by Abraham Maslow

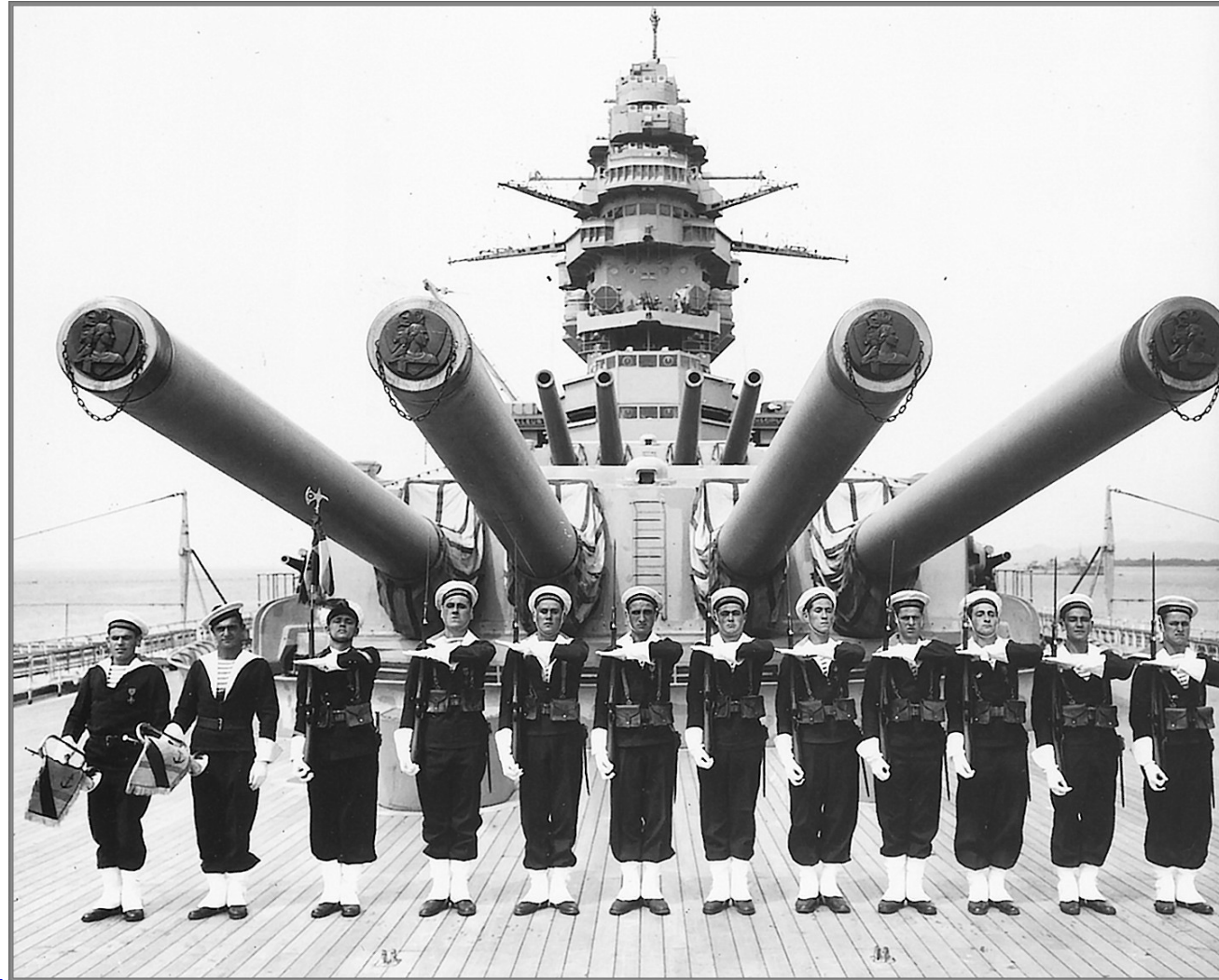
- Potential conflict**
  - I do not respect the status quo
  - We do not respect the status quo
- The hunter brain Versus The Social brain**
- EGOISM Versus ALTRUISM**



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



# Social brain or asocial brain?



# Social brain or asocial brain?



FORMER FRENCH BATTLESHIP STRASBOURG AND CRUISER.

US AAF PHOTO 225-8

# Social brain or asocial brain?

Nick Ut, Trang Bang 1972



# Social brain

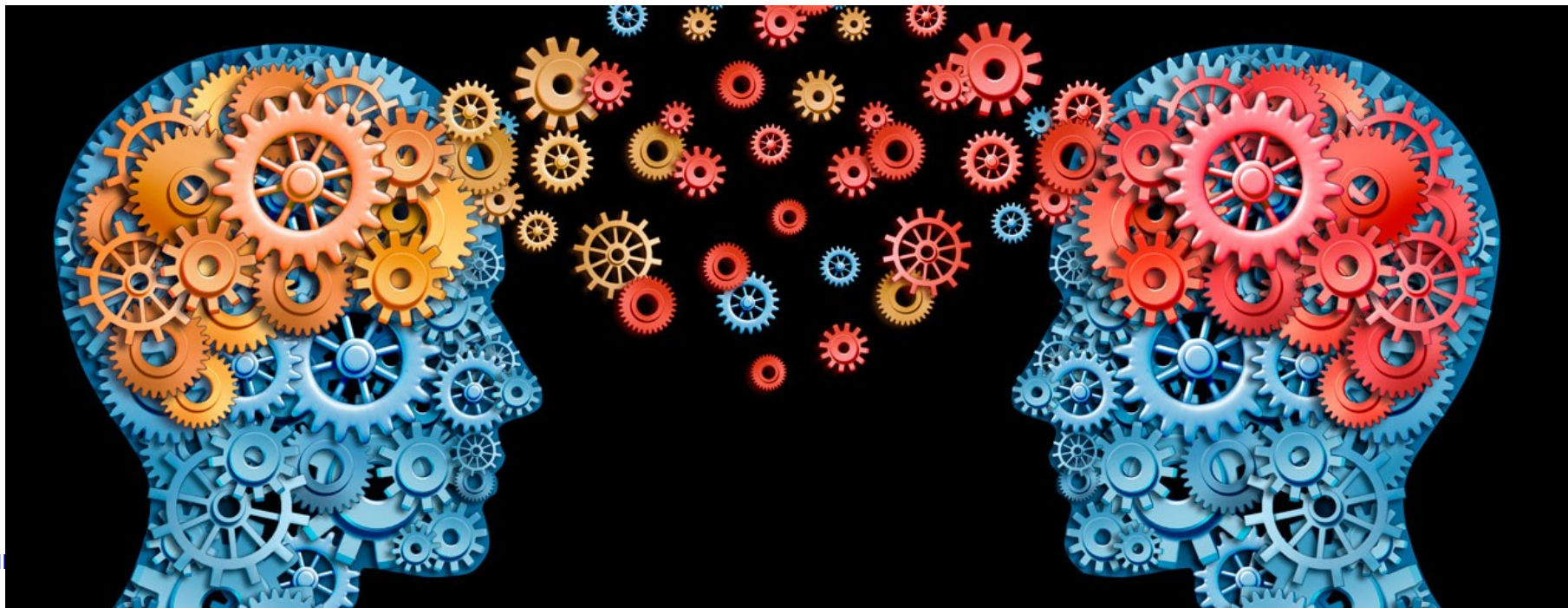
„The first sign of civilization was a femur that had been broken and then healed... Helping someone else through difficulty is where civilization starts“

Margaret Mead



# Mentalization

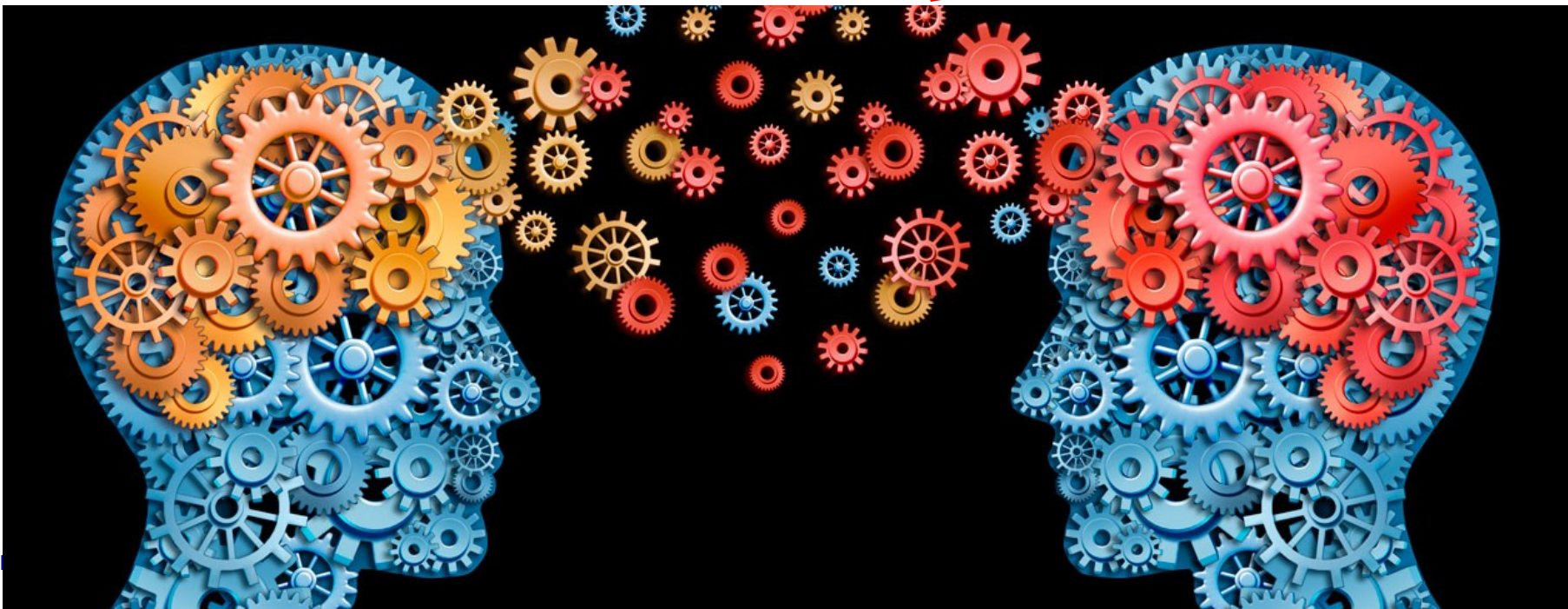
- the ability to understand the mental state, of oneself or others, that underlies the behavior
  - Rationally
  - Emotionally



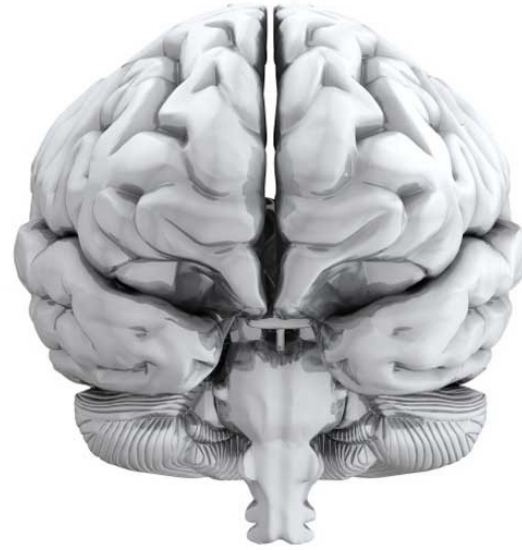
# Mentalization

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

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



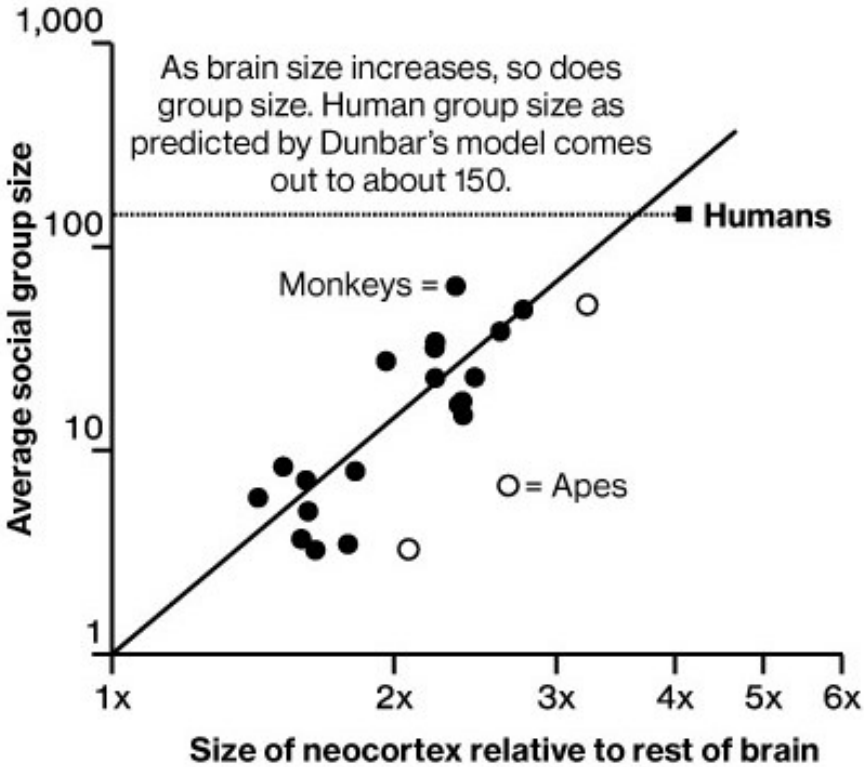
# Social brain



# Social brain

1998

## 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](https://en.wikipedia.org/wiki/Robin_Dunbar)

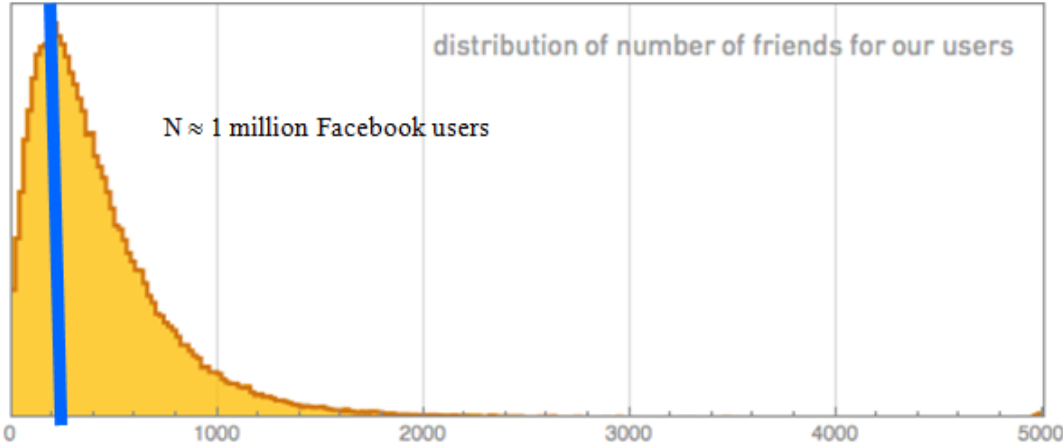


2014

# Social brain

## 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](https://en.wikipedia.org/wiki/Robin_Dunbar)

[http://www.slideshare.net/EXCCLEssex/robin-dunbar-has-the-internet-changed-our-social-world?qid=8bec5233-8b90-40fa-9c8c-a7033224c639&v=&b=&from\\_search=1](http://www.slideshare.net/EXCCLEssex/robin-dunbar-has-the-internet-changed-our-social-world?qid=8bec5233-8b90-40fa-9c8c-a7033224c639&v=&b=&from_search=1)

# Every brain is a powerful machine...

... which is hard to control



✓ The conflict between the limbic system and the neocortex

✓ The problem with effective control of the neocortex



# The conflict between the limbic system and the neocortex



# Limbic system and neocortex

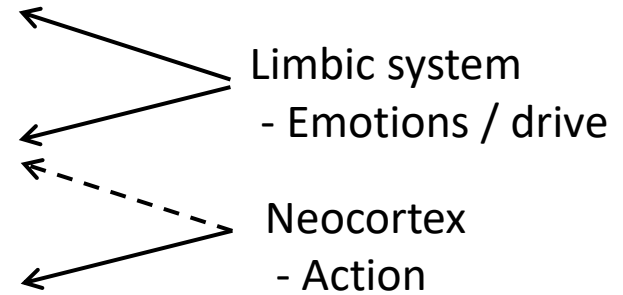
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**Why = The Purpose**  
*What is your cause? What do you believe?*

**How = The Process**  
*Specific actions taken to realize the Why.*

**What = The Result**  
*What do you do? The result of Why. Proof.*



# Limbic system and neocortex

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



**Why = The Purpose**

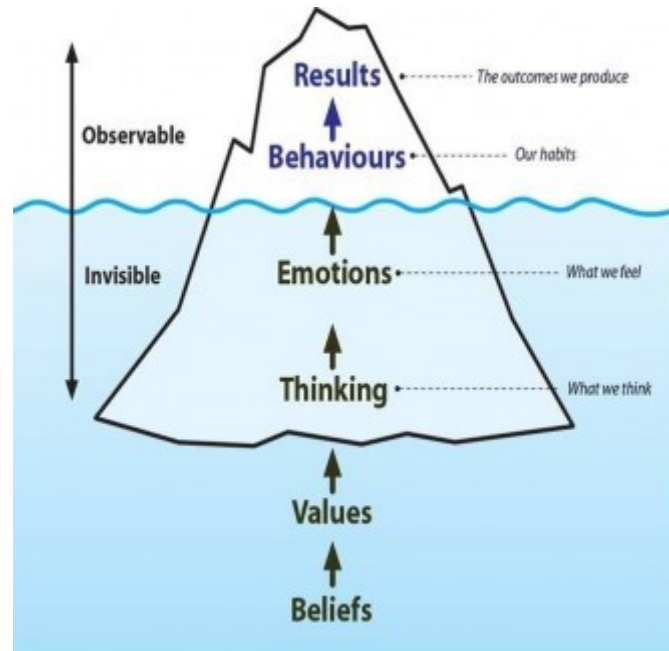
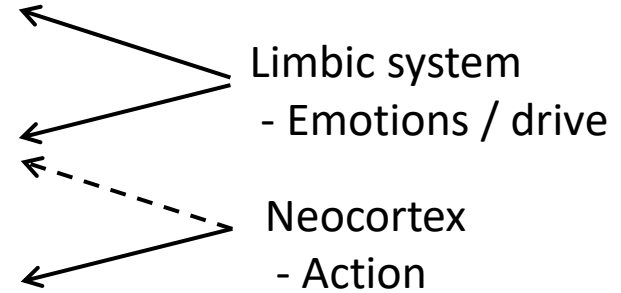
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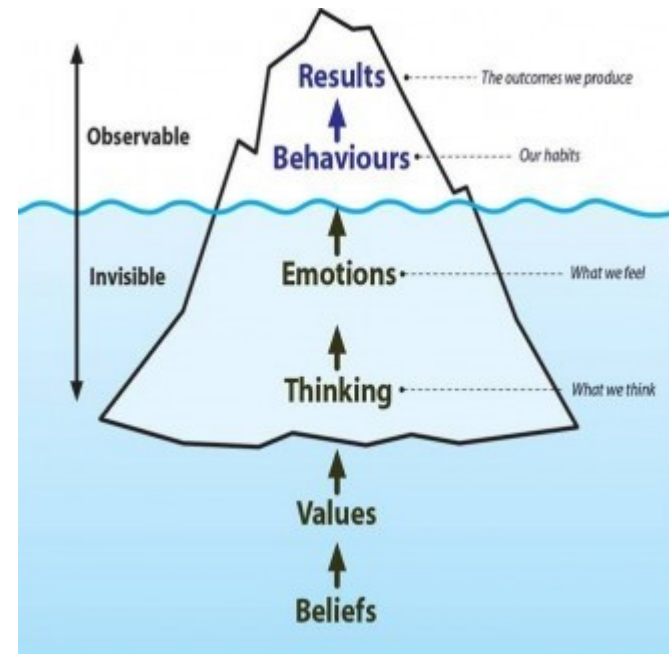


<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-J-e1371521135440.jpg>

# Limbic system and neocortex

## Instinctive behavior

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



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

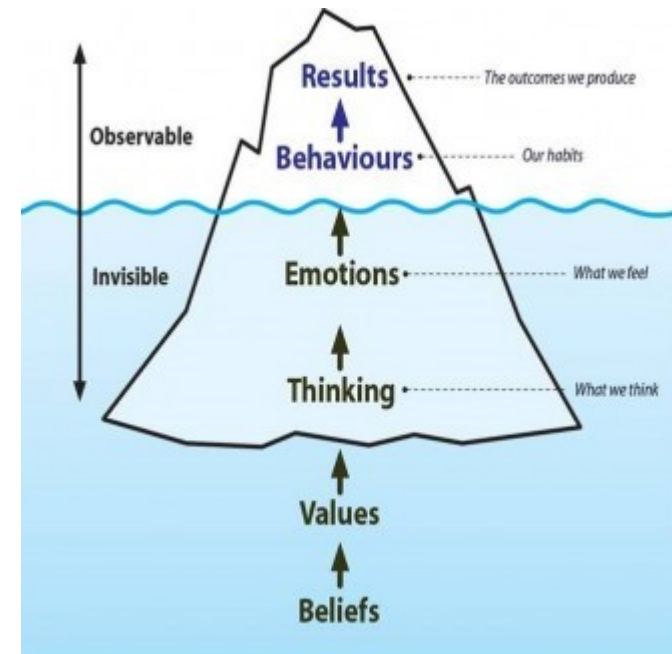
# Limbic system and neocortex

## 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



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

# Limbic system and neocortex

## Instinctive behavior

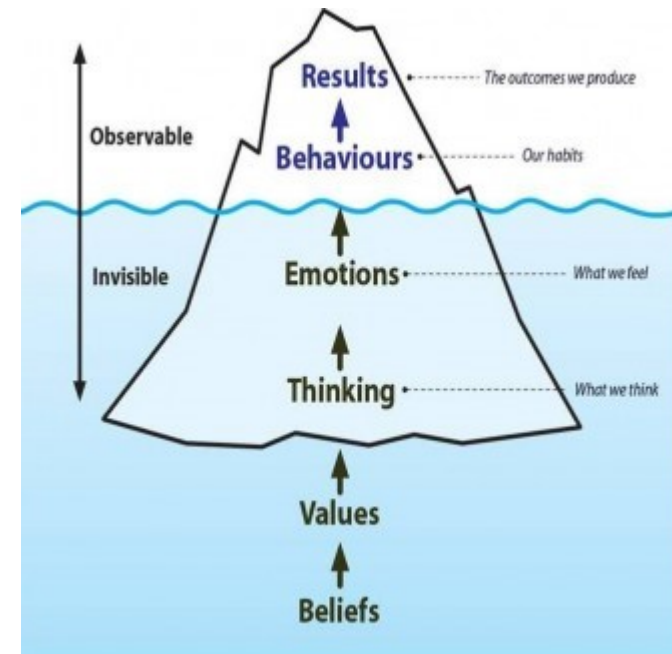
- Limbic system
- ✓ I see a nice thing, so why not to steal it?

## 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

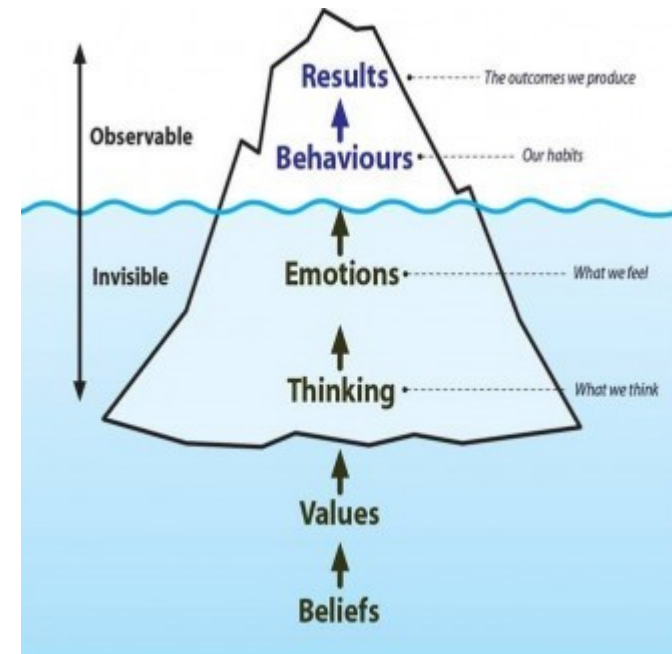
- Limbic system
- ✓ I see a nice thing, so why not to steal it?

## Socially enforced behavior

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

## Moral behavior

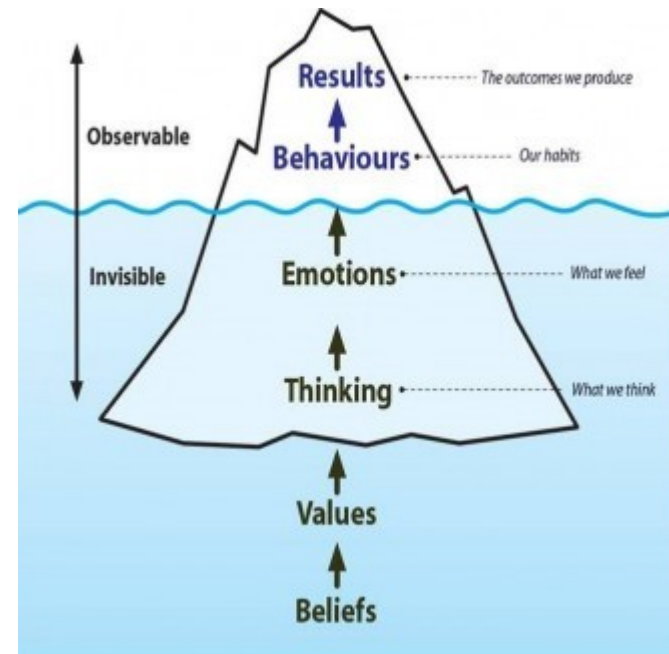
- Legal behavior
- **Moral stance** (Neocortex)
- ✓ Stealing is a bad thing



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

# Limbic system and neocortex

**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-j-e1371521135440.jpg>

# Limbic system and neocortex

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

Aristoteles

**Information**

NEOCORTEX

VS

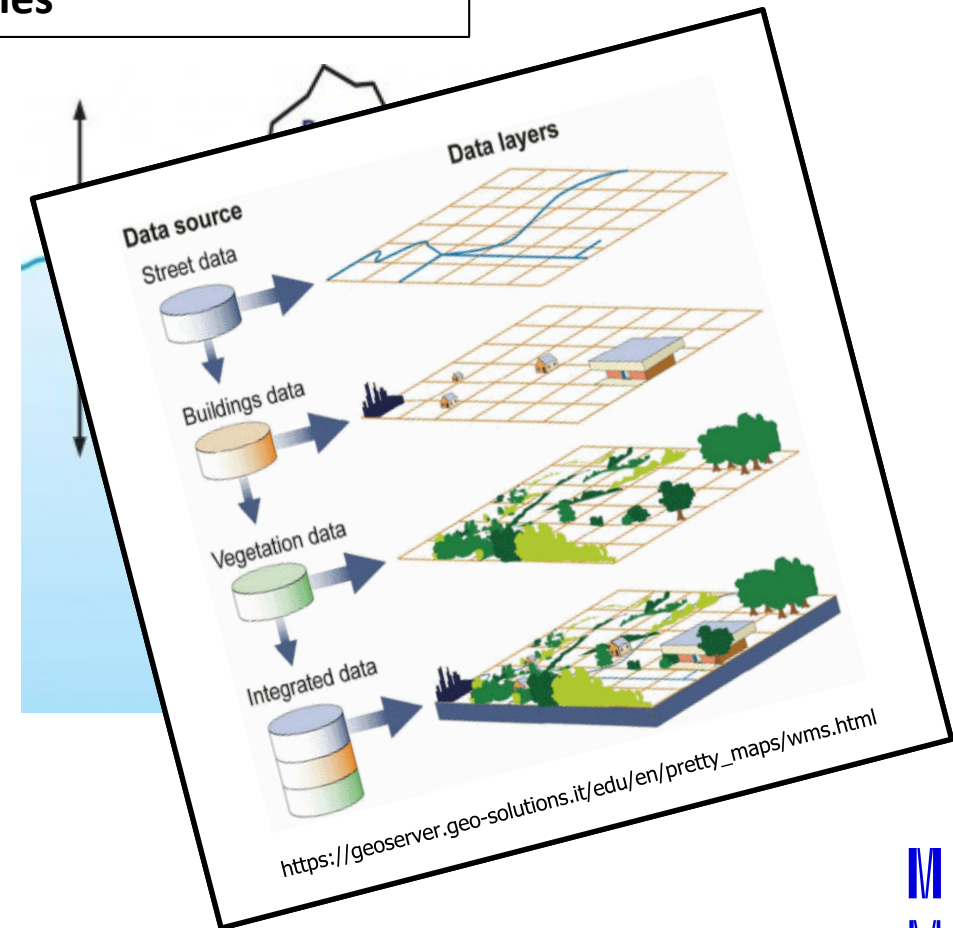
**Complex information**

NEOCORTEX/limbic system

VS

**Values/Philosophy/Faith**

Neocortex/LIMBIC SYSTEM

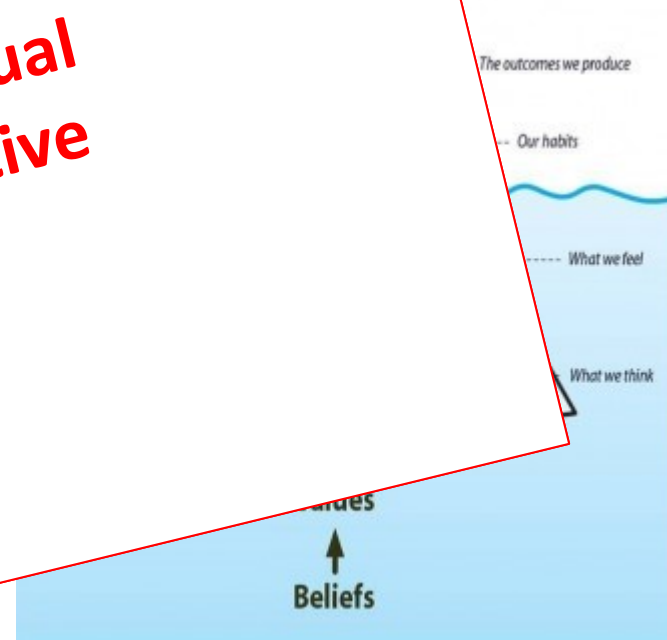


# Limbic system and neocortex

„ The whole is greater than the sum of parts

**Brain activity**  
✓ Highly individual  
✓ Very subjective

Value  
N



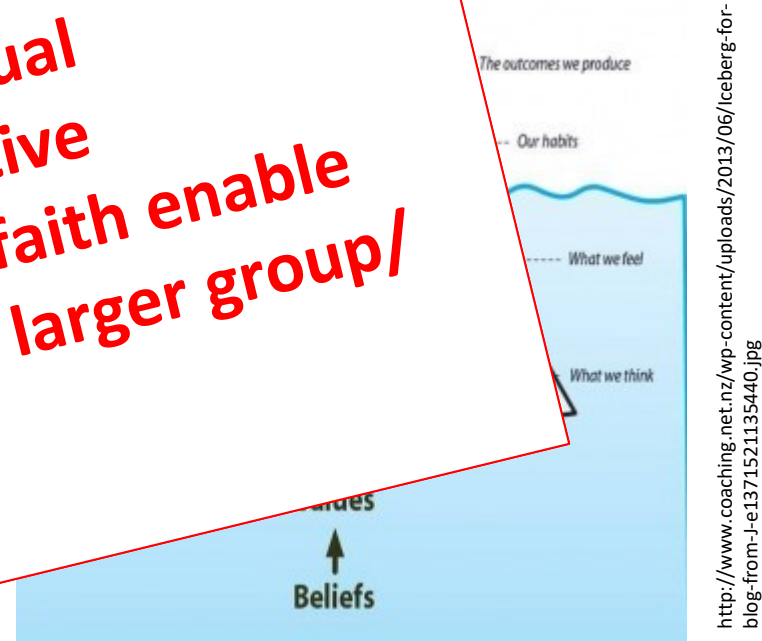
<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-j-e1371521135440.jpg>

# Limbic system and neocortex

„ The whole is greater than the sum of parts

**Brain activity**  
✓ Highly individual  
✓ Very subjective  
✓ Values/philosophy/faith enable  
coexistence within the larger group/  
society

Value  
N

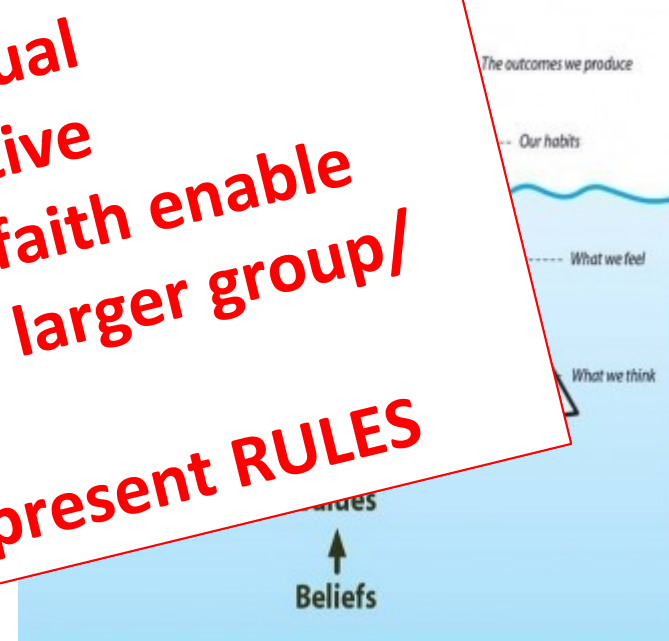


<http://www.coaching.net.nz/wp-content/uploads/2013/06/iceberg-for-blog-from-j-e1371521135440.jpg>

# Limbic system and neocortex

„ The whole is greater than the sum of parts

- ✓ **Brain activity**
- ✓ Highly individual
- ✓ Very subjective
- ✓ Values/philosophy/faith enable coexistence within the larger group/society
- ✓ These systems represent **RULES**



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

# Individual / subjective character of brain activity

## LIMBIC SYSTEM – IRRATIONAL

- Irrational preferences
- Irrational fear
- Phobia
  - Panic (extreme) irrational fear
    - Specific
    - Social
- <http://www.fearof.net/>



[https://images.sciencedaily.com/2008/03/080320132646\\_1\\_900x600.jpg](https://images.sciencedaily.com/2008/03/080320132646_1_900x600.jpg)

# Individual / subjective character in activity

## LIMBIC SYSTEM

### Top 100 Phobia List

These are the top 100 phobias in the world, with the most common ones listed from the top. You can click on each phobia to learn about causes, symptoms and treatments.

1. Arachnophobia – The fear of spiders affects women four times more (48% women and 12% men).
2. Ophidiophobia – The fear of snakes. Phobics avoid certain cities because they have more snakes.
3. Acrophobia – The fear of heights. Five percent of the general population suffer from this phobia.
4. Agoraphobia – The fear of open or crowded spaces. People with this fear often won't leave home.
5. Cynophobia – The fear of dogs. This includes everything from small Poodles to large Great Danes.
6. Astraphobia – The fear of thunder/lightning AKA Brontophobia, Tonitrophobia, Ceraunophobia.
7. Claustrophobia – The fear of small spaces like elevators, small rooms and other enclosed spaces.
8. Mysophobia – The fear of germs. It is also rightly termed as Germophobia or Bacteriophobia.
9. Aerophobia – The fear of flying. 25 million Americans share a fear of flying.
10. Trypophobia – The fear of holes is an unusual but pretty common phobia.

<http://www.fearfor.net/>

[https://images.sciencedaily.com/2008/03/080320132646\\_1\\_900x600.jpg](https://images.sciencedaily.com/2008/03/080320132646_1_900x600.jpg)



# Individual / subjective character of brain activity

## NEOCORTEX – RATIONAL

- (Pseudo)rational preferences
- Imagination



<http://www.hospitality-school.com/wp-content/uploads/2011/06/guest-preference-2.jpg>

# Individual / subjective character of brain activity

## NEOCORTEX – RATIONAL

- Imagine red car...

# Individual / subjective character of brain activity

## NEOCORTEX – RATIONAL

- Imagine red car...



[https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC\\_5PSAhVDbBoKHe53B98QsAQIGA#tbn=isch&q=red+car+white+background](https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC_5PSAhVDbBoKHe53B98QsAQIGA#tbn=isch&q=red+car+white+background)

# Individual / subjective character of brain activity

## NEOCORTEX – RATIONAL

- Imagine red Ferrari...



[https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC\\_5PSAhVDbBoKHe53B98QsAQIGA#tbm=isch&q=red+ferrari+white+background](https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC_5PSAhVDbBoKHe53B98QsAQIGA#tbm=isch&q=red+ferrari+white+background)

# Individual / subjective character of brain activity

## NEOCORTEX – RATIONAL

- Imagine red Ferrari 458 from the side...



[https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC\\_5PSAhVDBoKHe53B98QsAQIGA#tbn=isch&q=red+ferrari+458+from+side+white+background](https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC_5PSAhVDBoKHe53B98QsAQIGA#tbn=isch&q=red+ferrari+458+from+side+white+background)

# Individual / subjective character of brain activity

## NEOCORTEX – RATIONAL

- Imagine red Ferrari 458 from the side...



[https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC\\_5PSAhVDbBoKHe53B98QsAQIGA#tbn=isch&q=red+ferrari+458+from+side+white+background](https://www.google.cz/search?q=red+car&biw=1150&bih=492&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjBupCC_5PSAhVDbBoKHe53B98QsAQIGA#tbn=isch&q=red+ferrari+458+from+side+white+background)

- Closer specification (more conditions) leads us to a more consistent output, but increases the likelihood of errors
  - ✓ Random – some specifications are randomly overlooked
  - ✓ System – some specification is unknown (How does Ferrari 458 look like?)

# Every brain is unique

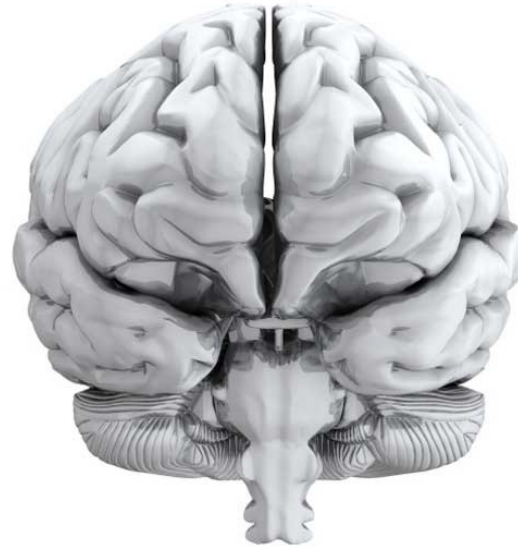
- Emotionally
  - Limbic system
- Rationally
  - Neocortex

✓ Genetics  
✓ Environment



# Every brain is a powerful machine...

... which is hard to control



✓ The conflict between the limbic system and the neocortex

✓ The problem with effective control of the neocortex





## 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, dehumanization
- Functional diagnostic methods (EEG, SPECT, PET , fMRI)

M U N I

M E D