

Thinking about Thought

Theories of Brain, Mind, Consciousness

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Part 1.

Philosophy of Mind

Cognitive Psychology

By the time you finish this class you will be a different person.

I am simply referring to the fact that the cells in your body, including the neurons of your brain, are continuously changing. By the time you finish this class you will literally be a different body and a different brain. By the time you finish this class only a tiny part of your body and of your brain will still be the same that it is now.

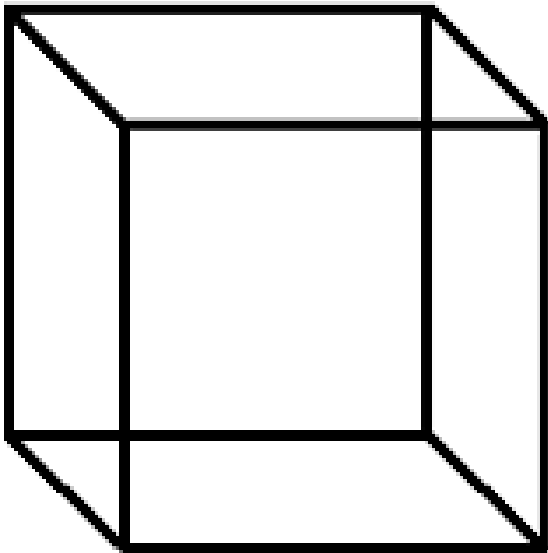
Every word that you read is having an effect on the connections between your neurons. And every breath you take is pacing the metabolism of your cells.

This class is about what just happened to you...

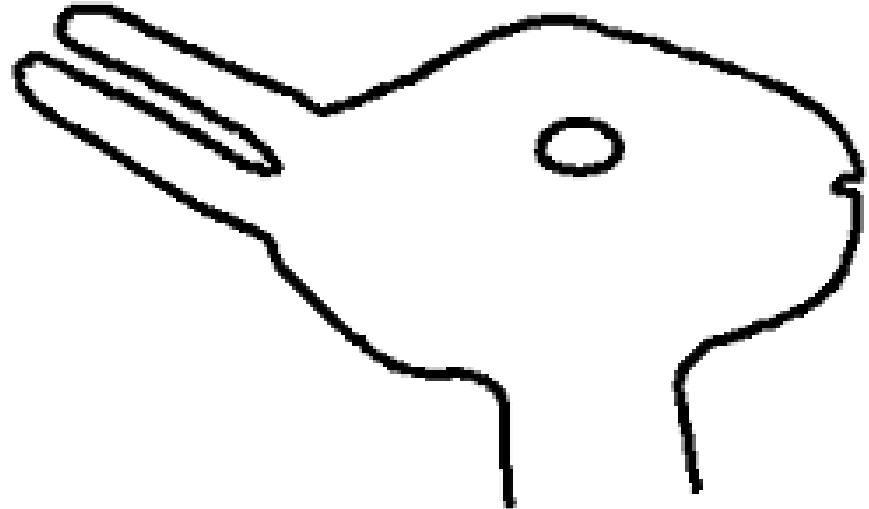
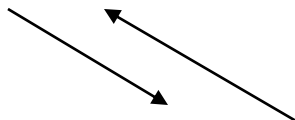
The Factory of Illusions

<Insert picture of you here>

The Factory of Illusions

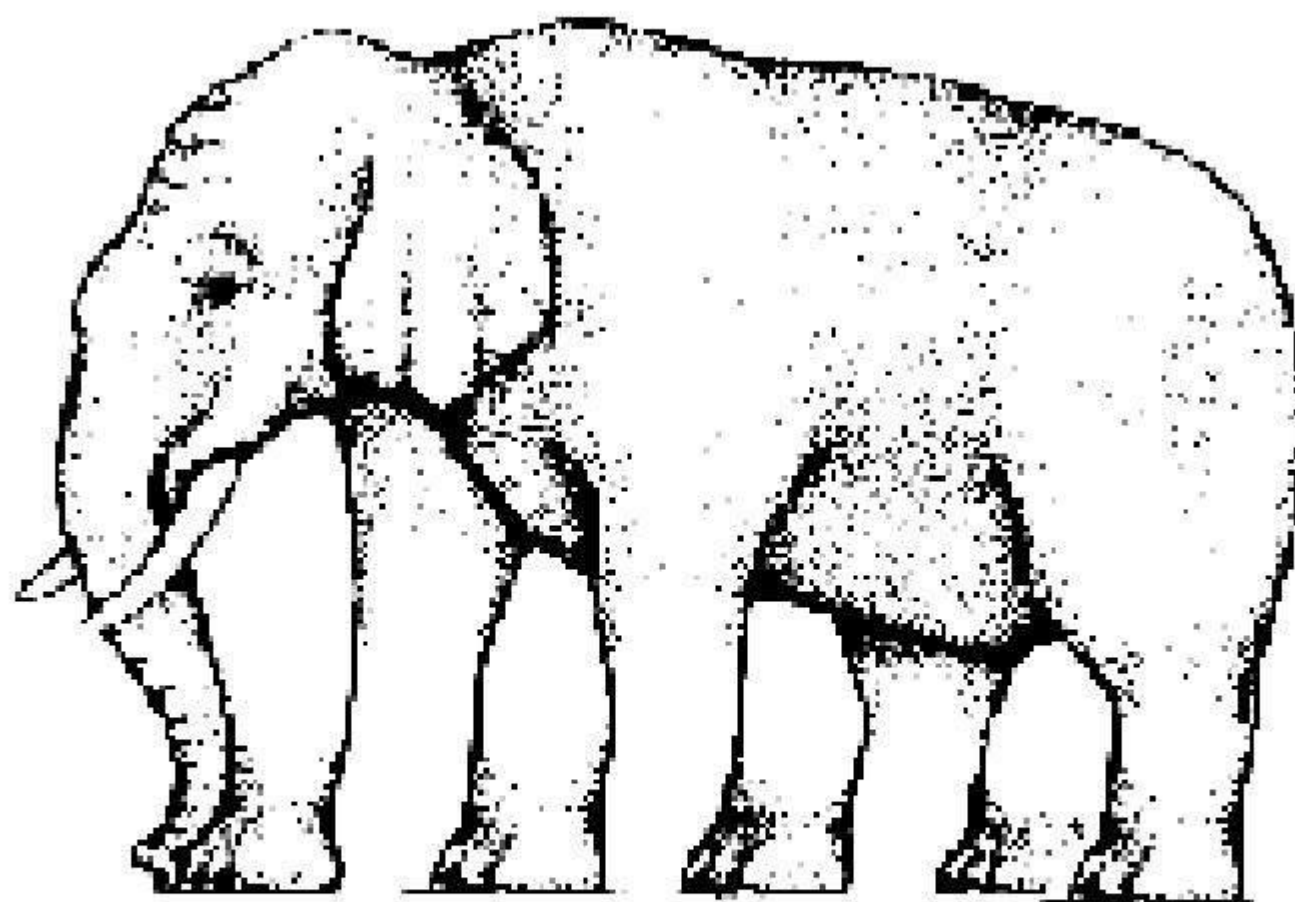


Which direction?



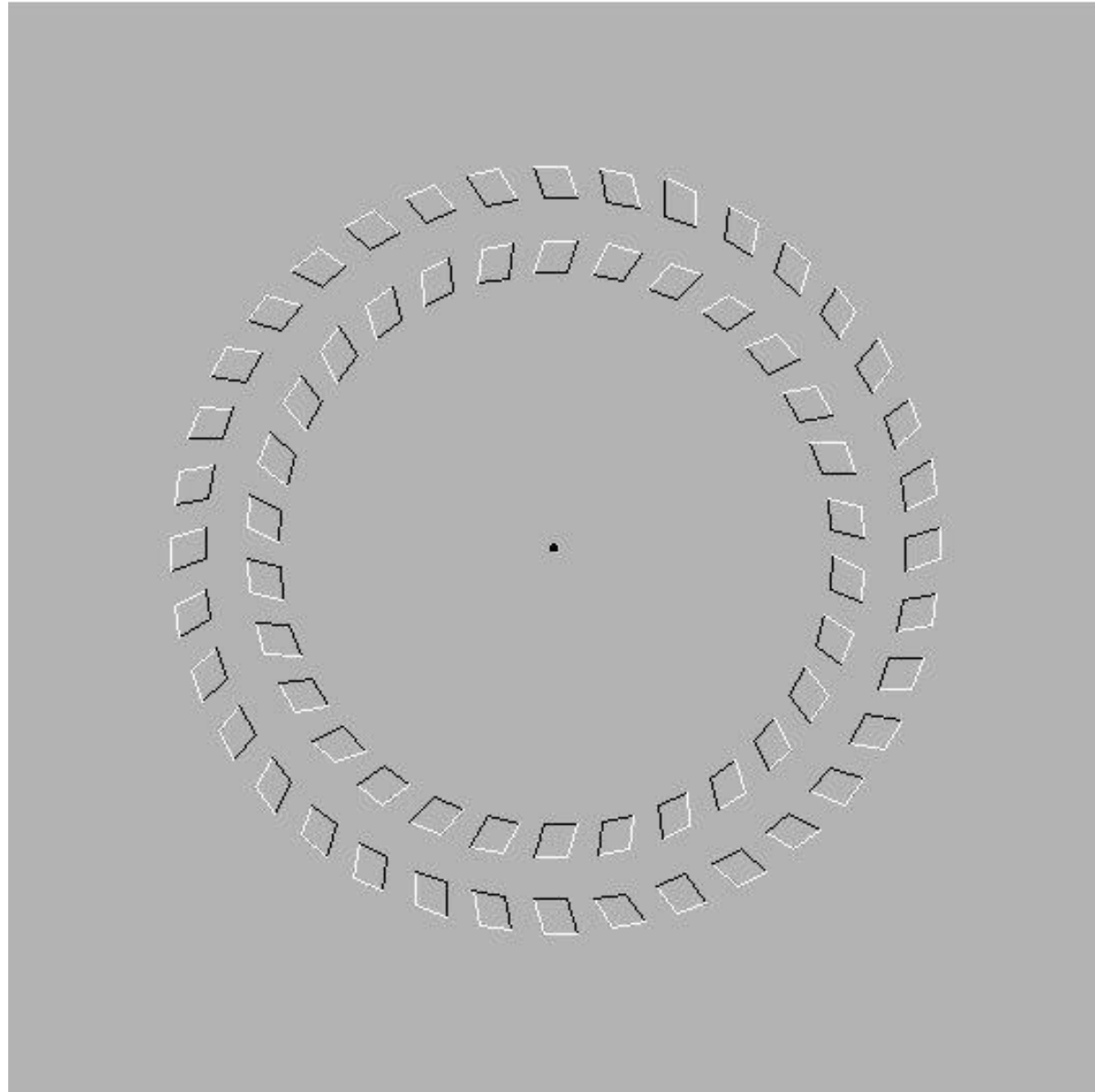
Duck or rabbit?

*How long does it take you to switch
from one illusion to the other one?*



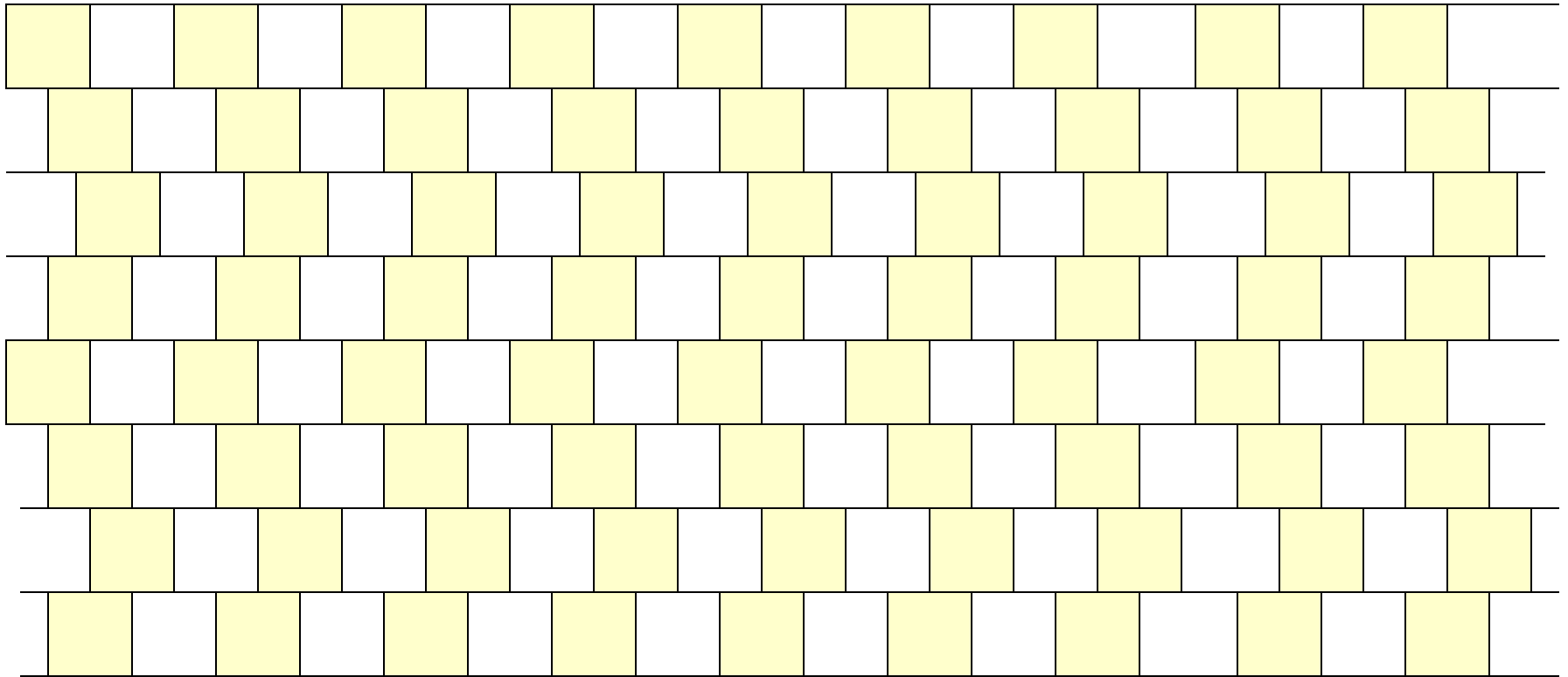
How many legs does this elephant have?

The Factory of Illusions



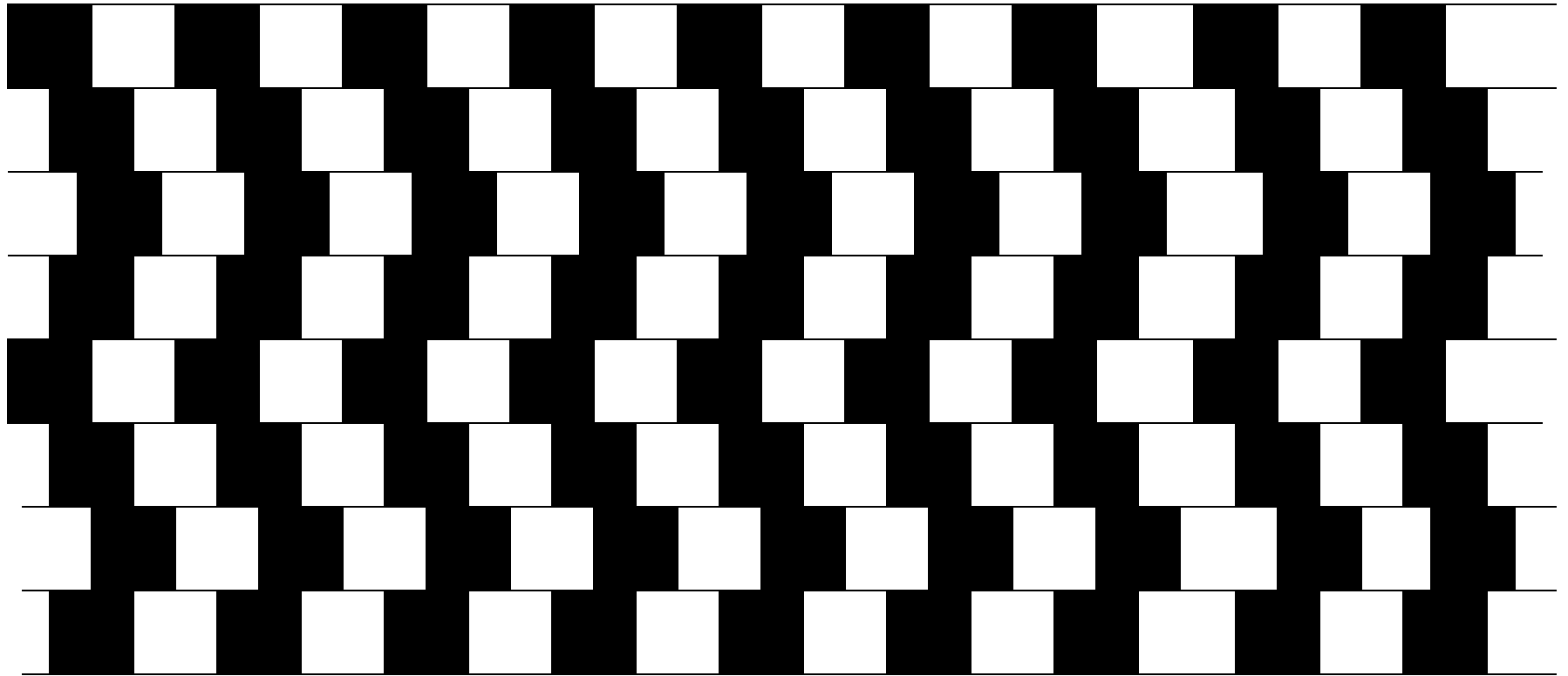
Look closer...

The Factory of Illusions



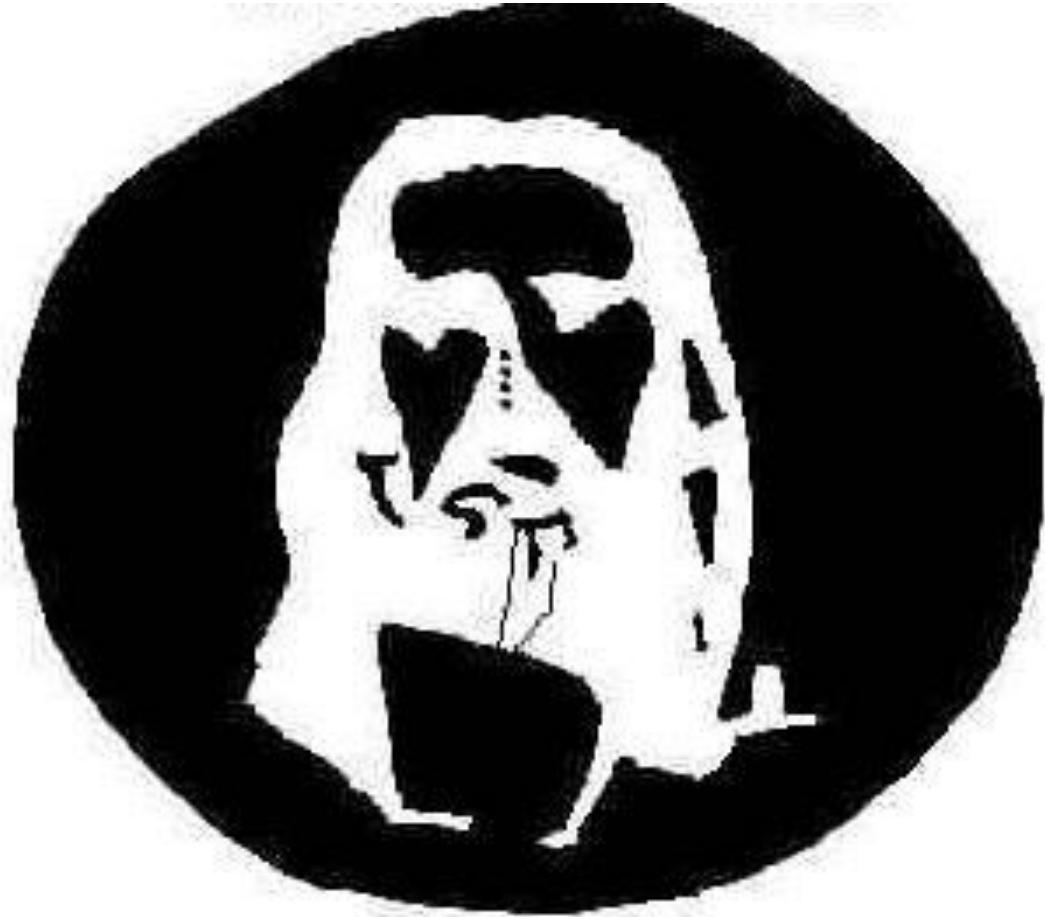
These lines are parallel, right?

The Factory of Illusions



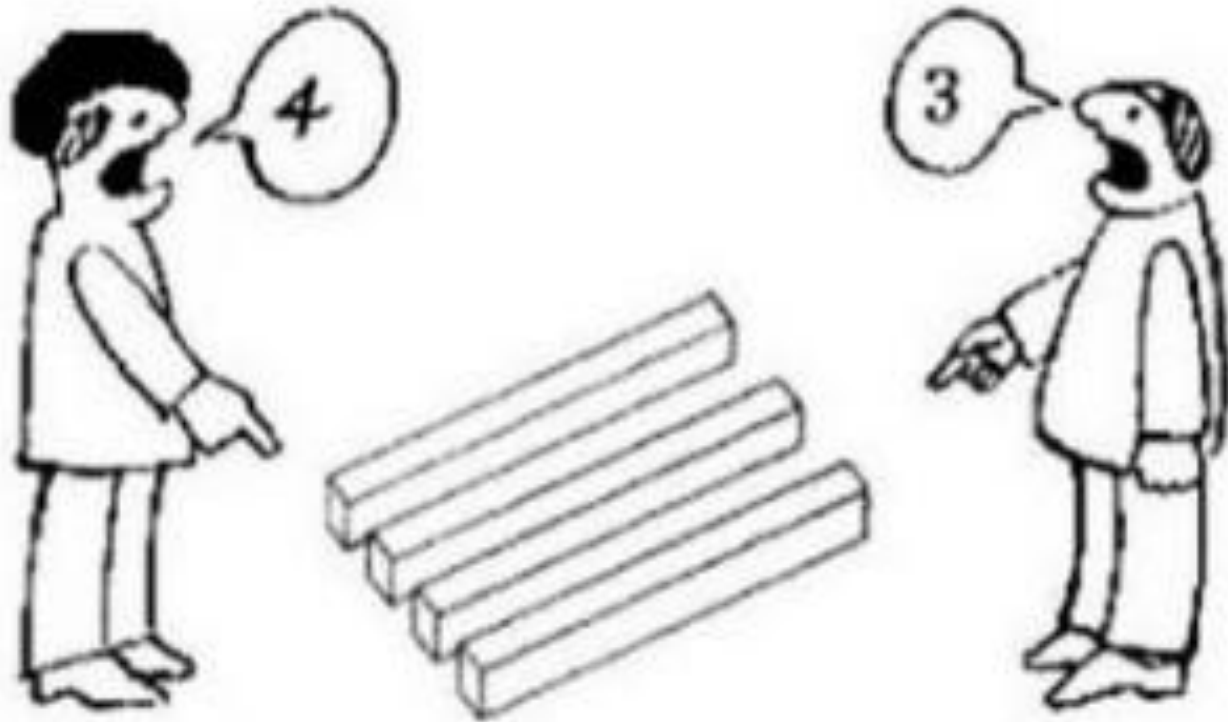
And now?

The Factory of Illusions

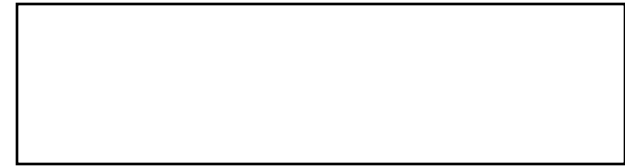


*Focus on the four dots for 30 seconds
Look at a wall and blink your eyes
Keep staring at the wall*

The Factory of Illusions

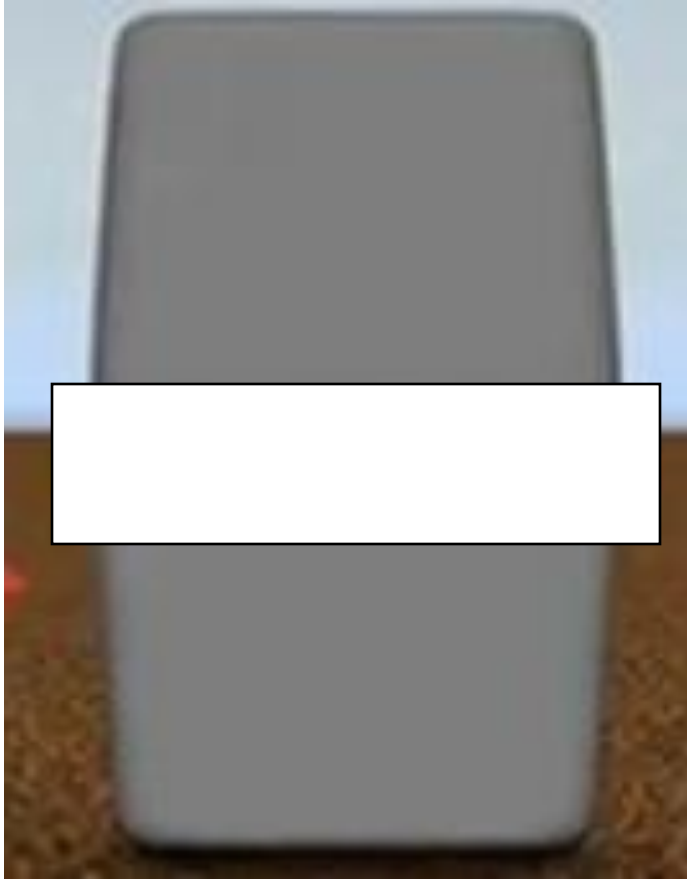


The Factory of Illusions



Which one is lighter?

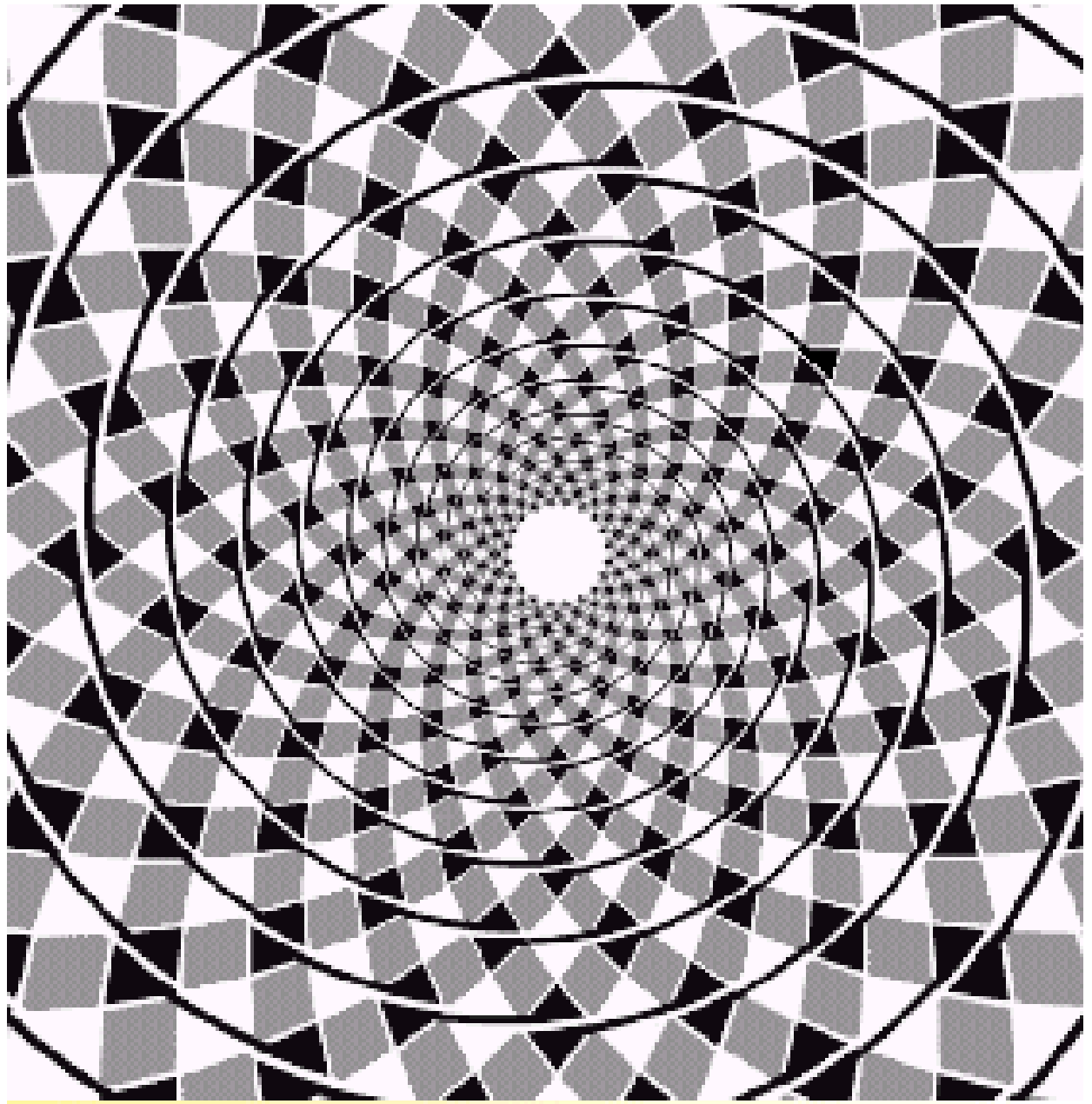
The Factory of Illusions



Neither!

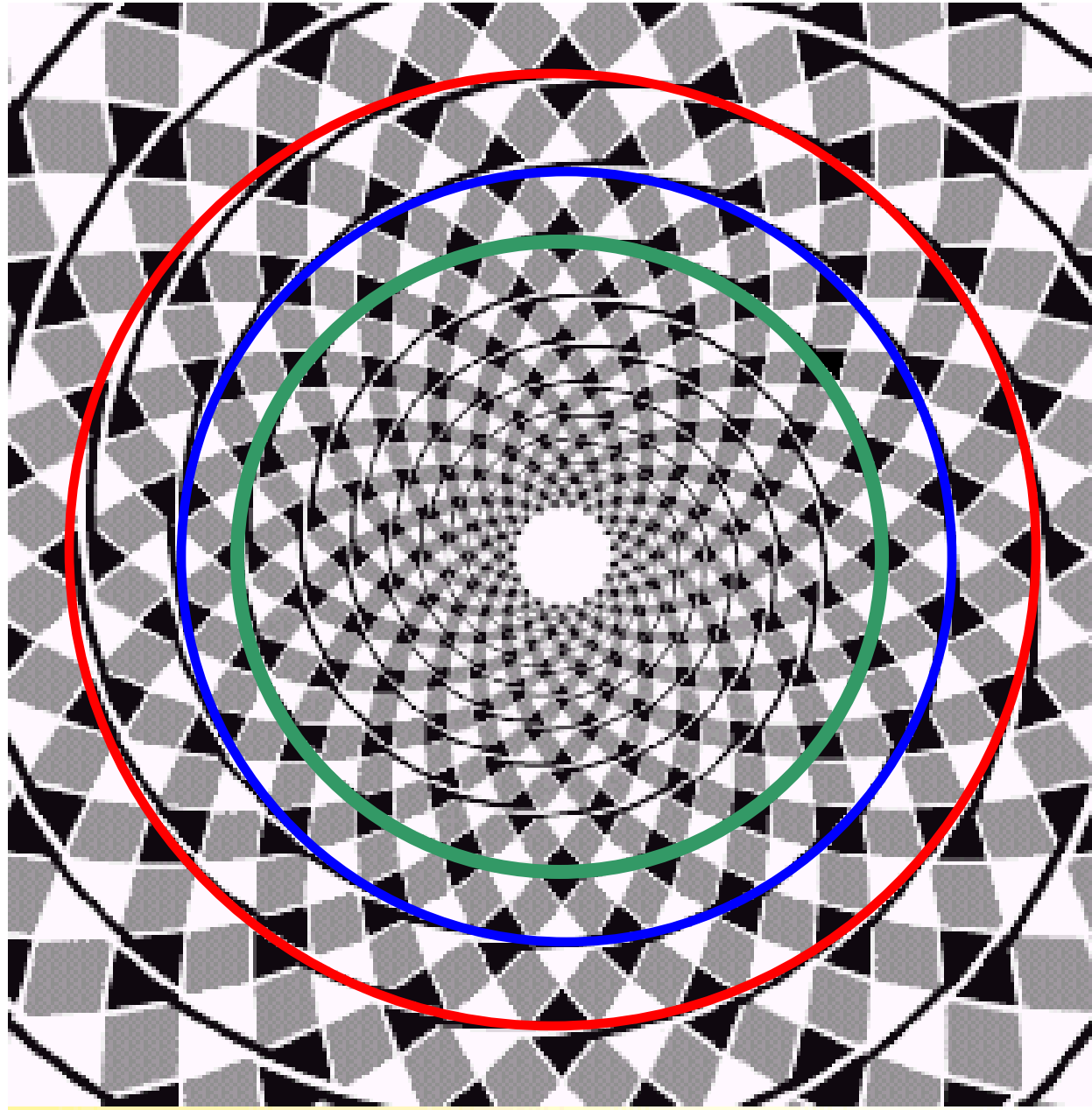
The Factory of Illusions

Do you see the spiral?



The Factory of Illusions

There is no spiral,
just concentric circles



Mt Tamalpais





QUESTION YOUR INTELLIGENCE

If you overtake the second runner in a race, in what position are you now?

QUESTION YOUR INTELLIGENCE

What if you overtake the last runner?

QUESTION YOUR INTELLIGENCE

Mary's father has five daughters:

- 1. Nana,*
- 2. Nene,*
- 3. Nini,*
- 4. Nono.*

What is the name of the fifth daughter?

QUESTION YOUR INTELLIGENCE

A mute person goes into a shop and wants to buy a toothbrush. By imitating the action of brushing his teeth he successfully expresses himself to the shopkeeper and the purchase is done.

Next, a blind man comes into the shop who wants to buy a pair of sunglasses: how does he indicate what he wants?

DAVID COPPERFIELD

You can see 6 different cards.

Think on one.

Just think on it.

Do not touch it

Do not click on it.

I will find the card on your mind



DAVID COPPERFIELD
MAGIC OF INTELLIGENCE

*¡Look!
¡¡Your card is
gone!!*



Humor



Humor



Those are my principles.
If you don't like them I have others.

Why should I care about posterity?
What's posterity ever done for me?

I never forget a face,
but in your case
I'll be glad to make an exception.

Military justice is to justice
what military music is to music.

A child of five could understand this.
Fetch me a child of five.

Remember men:
we're fighting for this woman's honor;
which is probably more than she ever did.

From the moment I picked your book up
until I laid it down
I was convulsed with laughter.
Someday I intend reading it.

Behind every successful man is a woman,
behind her is his wife.

Quote me as saying I was mis-quoted.

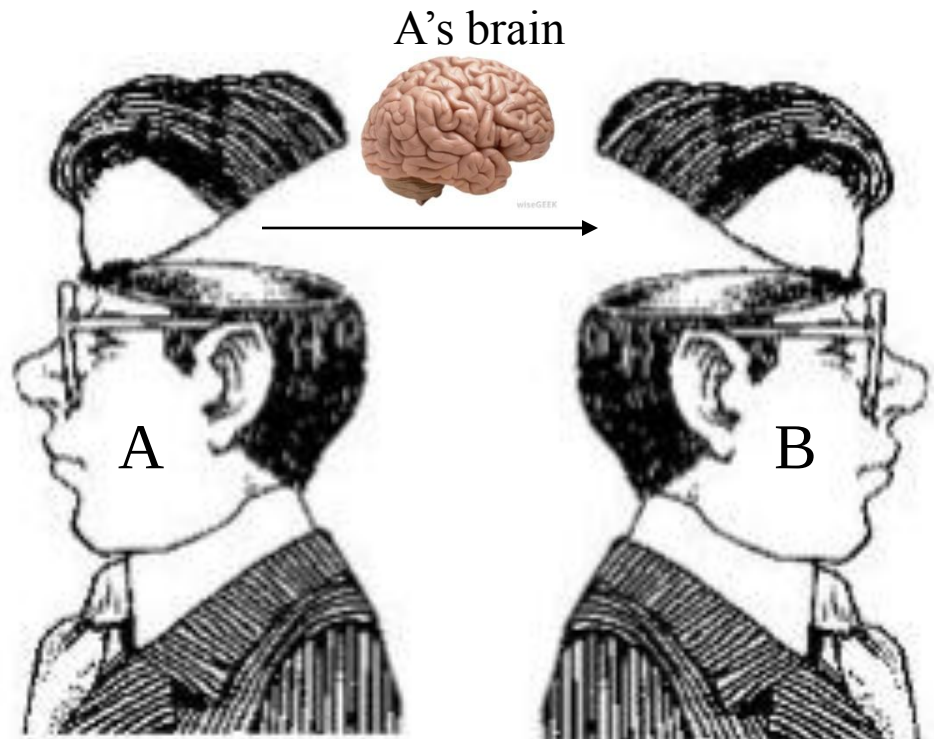
(Groucho Marx)

Break



The Takeover of the Mind

Anyone ready for a brain transplant?



Is B still B?

Intelligence

- A measure of performance in solving problems?
- Are animals intelligent?
- Are plants intelligent?
- Are all humans intelligent the same way?
- Are intelligence values only zero and one?
- Are all living beings “intelligent”?

Cognition

- The set of cognitive faculties: memory, learning, reasoning, language, vision...
- What is a cognitive faculty?
- Are they independent?
- Are they all the same thing?
- Are all living beings “cognitive systems”?
- What else has cognitive faculties?

Mind

- Does it correspond to all brain processes?
- Does it correspond to a subset of brain processes?
- Does it correspond to more than brain processes?
- Is it the same thing as cognition?
- Is it the same thing as consciousness?
- Is memory part of mind? Is seeing part of mind? Is moving an arm part of mind? Is eating part of mind?

Consciousness

- Awareness of self
- Awareness of others
- Awareness of space and time
- Identity
- Free will

The Mind-Body Debate

- Is our mind made of matter?
- Is it made of a different substance?
- What differentiates the mental from the non-mental?
- How do our mind and our body relate?
- Is our mind inside our body?
- Is our mind born with the body?
- Will it die with the body?
- Does it grow with the body?

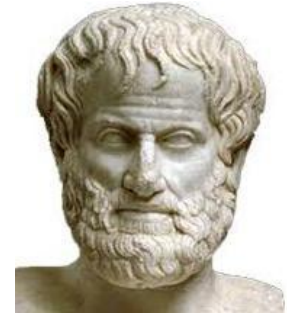
Dualism

- Dualism: mind and body are made of two different substances
 - Substance dualism: the mind is a different (nonphysical) substance altogether from the brain
 - René Descartes (1649)
 - "Res extensa" (things that have an extension) and "res cogitans" (things that think) belong to two separate realms, and cannot be studied with the same tools



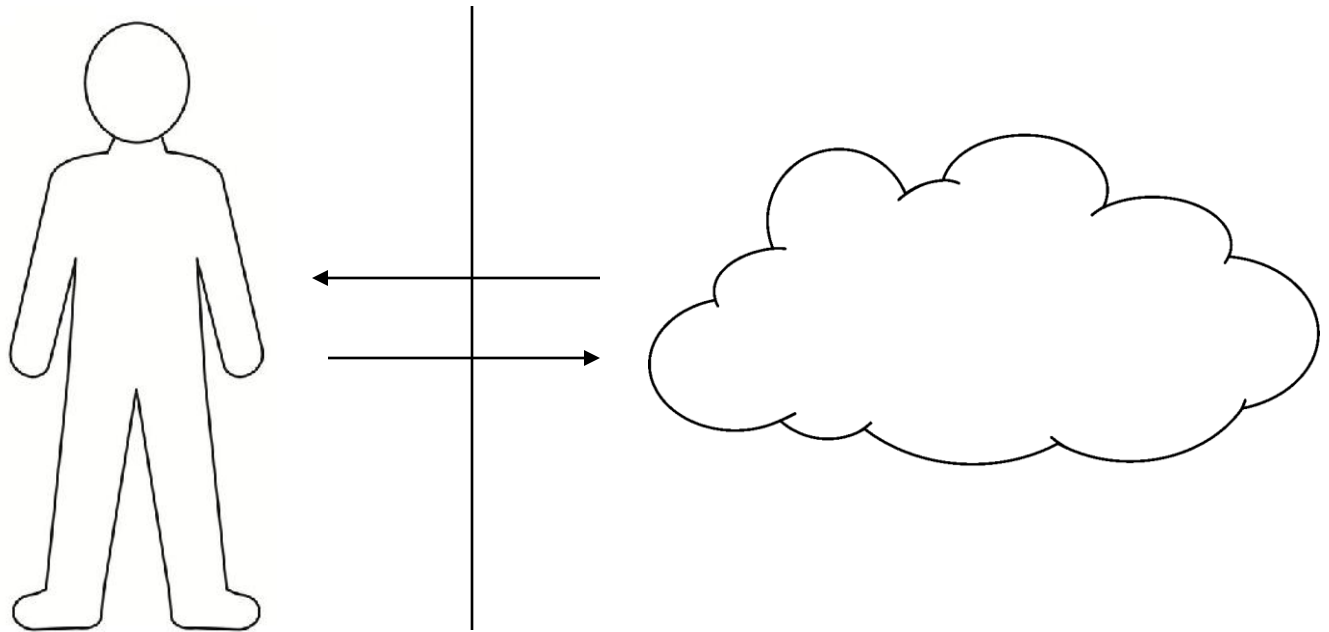
Dualism

- Substance Dualism
 - Aristoteles: living and nonliving things
 - Descartes:
 - Emphasis on mind, not on life
 - The brain is the seat of the body-mind interaction
 - Newton's Physics is a direct consequence of that approach: Physics studies the realm of matter, and only deals with matter



Dualism

- Dualism
 - The Dualist's dilemma: how do mind and body interact?



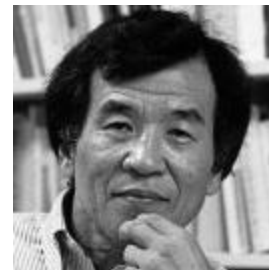
Dualism



- Epiphenomenalism (Charles Bonnet - 1754)
 - The mind is an accidental product of the brain
 - The mind merely observes the behavior of the body, although it believes that it actually causes it.
 - Donald Davidson's anomalous monism (1970)

Dualism

- Property Dualism: the mind is the same substance as the brain, but comes from a different class of properties (that are exclusive of the brain).
 - Charles Dunbar Broad (1925):
 - The universe is inherently layered
 - Each layer has its own properties
 - Each layer yields the following layer but cannot explain the new properties that emerge with it
 - At each level some properties apply, but at the immediately higher level some other properties apply
 - Supervenience/ Jaegwon Kim (1984)

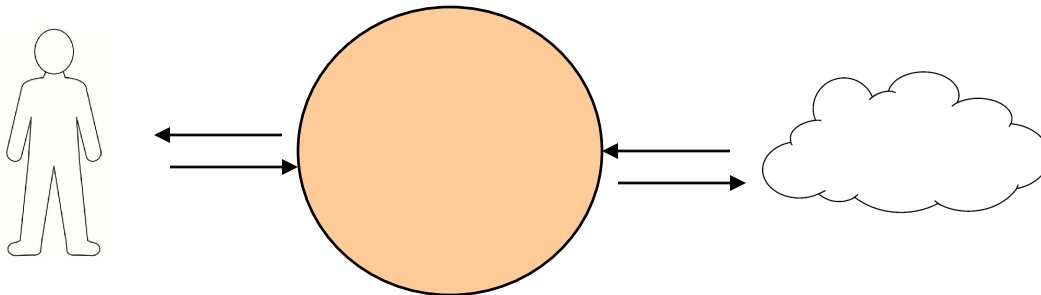
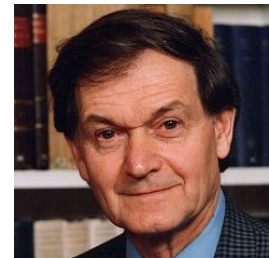


Dualism

- Supervenience/ examples
 - Biological properties "supervene" (or "are supervenient") on physical properties, because the biological properties of a system are determined by its physical properties.
 - Biological and physical properties of an organism are different sets of properties, but the physical ones determine the biological ones.
 - Chemical compounds have density and conductivity, whereas biological organisms have growth and reproduction.
 - Another example: electrons have mass and spin, but electricity has potential and intensity

Dualism

- Trialism: another way to explain how mind and body interact
 - Karl Popper's and John Eccles' world of ideas (1977)
 - Rudy Rucker's mindscape (1982)
 - Roger Penrose's protoconsciousness (1989)



Monism

- Monism: only one substance exists
 - Materialism: only matter exists
 - Idealism: only mind exists

Monism

- Monism
 - Baruch Spinoza (17th century)
 - God is all that exists (he is what is), there is nothing that is not God (“pantheism”)



Idealism

- Idealism: only mind exists
 - Gottfried Leibniz (17th c)
 - Everything has a mind ("panpsychism")
 - Minds come in degrees, starting with matter (whose minds are very simple) and ending with God (whose mind is infinite)
 - George Berkeley (18th c)
 - All we know is our perceptions ("esse est percipi")
 - The only thing that exists is the experiences of our mind



Idealism

- Quantum idealism
 - We cannot perceive reality
 - Reality is what the observer observes

Monism

- Neutral Monism
 - Bertrand Russell (1921)
 - Only spacetime events exist
 - Matter and mind are both built out of the same stuff, which is neither material nor mental ("neutral")



Dualism	Substance Dualism	Descartes	
	Property Dualism	Broad	
		Supervenience	Kim
	Trialism	Popper, Penrose, Rucker	
Monism	Epiphenomenalism	Bonnet	
	Idealism	Berkeley	
		Panpsychism	Leibniz
	Pantheism	Spinoza	
	Neutral Monism	Russell	
	Materialism		

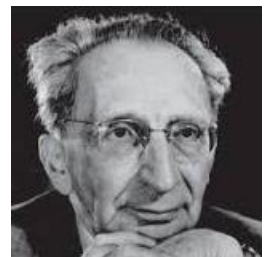
...coming up...

Behaviorism
Functionalism

...coming up...

Materialism

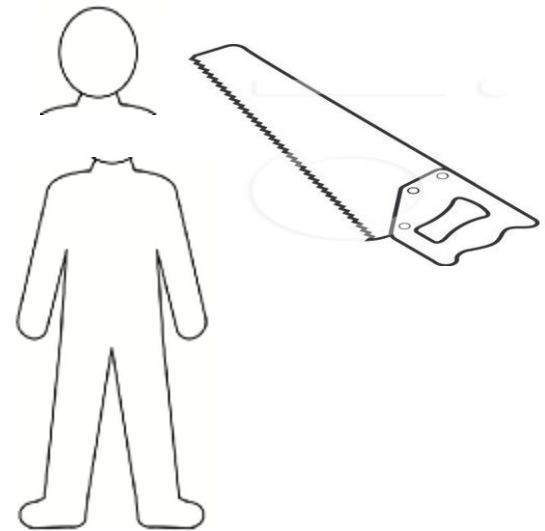
- Monism: only one substance exists
 - Materialism
 - Julien La Mettrie (1748): the mind as a machine made of matter, and thought as a material process (the "homme machine")
 - Only matter exists
 - Mental states are identical to physical states of the brain ("physicalism")
 - Consciousness is a physical processes in the brain
 - Herbert Feigl ("The Mental and the Physical", 1958) resurrects the mind-body problem for 20th century philosophy



Materialism

– Materialism

- 20th century: the mind-body problem became the "mind-brain problem"
- (Note: too much emphasis on the brain now? I feel pain in my foot, not in my brain!)



Materialism

– Materialism/ Issues

- Leibniz's law“... 
- Reducibility: how can feelings arise from material processes? how can electrochemical activities in my brain suddenly turn into the feeling of pain or fear?
- John Searle's paradox... 

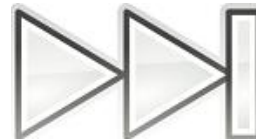
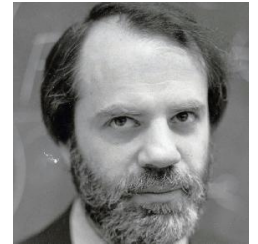
Materialism

- Against physicalism
 - The knowledge argument (Frank Jackson - 1982)
 - A scientist who has a complete understanding of the science of color, but has never experienced color: will she learn something new the first time that she experiences color?
 - If yes, then there cannot be a complete physical explanation of mental states.



Materialism

- Against physicalism
 - The philosophical zombie argument (Saul Kripke, 1972)
 - If a world in which all physical facts are the same as those of the real world must contain everything that exists in the real world, then
 - A world of non-conscious (zombie) human beings identical to the real world of conscious human beings must contain consciousness.



Materialism

- Beyond physicalism
 - Bertrand Russell (1927)
 - What a neurologist really sees while examining someone else's brain is a part of her own (the neurologist's) brain.



Behaviorism

- Behaviorism
 - Behaviorism deals with mental terms only to the extent that they are related to behavior
 - John Watson (1913)
 - Mental states are unscientific
 - All behavior can be explained as stimulus and response relations.
 - Gilbert Ryle (1949)
 - Descartes invented a myth: the myth of the mind inside the body (“the ghost in the machine”)



Functionalism

- Functionalism (David Malet Armstrong, David Lewis - 1960s): the function not the substance
 - Mental states have a function
 - What is it that makes a physical state of the brain also a mental state? the function it performs
 - But then a mind doesn't necessarily require a brain...

Functionalism

– Computational Functionalism

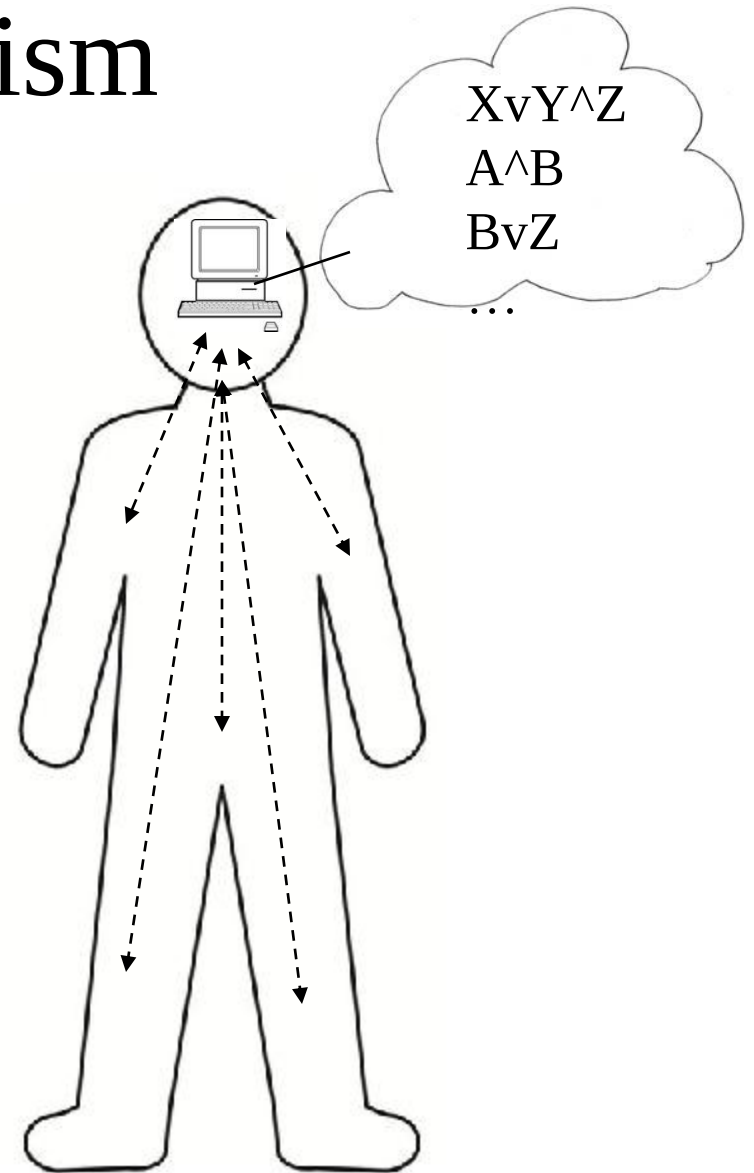
- Computational Functionalism (Hilary Putnam -1960)
 - The mind works like a Turing Machine
- Representational Theory of the Mind (Jerry Fodor - 1975, Stephen Stich)
 - Knowledge of the world is embedded in mental representations
 - Mental representations are symbols (the “language of thought” or “mentalese”)
 - Cognitive life is the output of symbolic processing



Functionalism

– Computational Functionalism

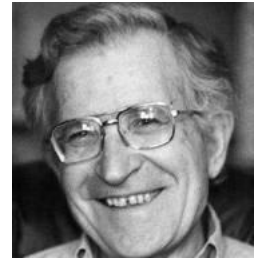
- How mind and body communicate: beliefs and desires are information, represented by symbols, and symbols are physical states of a processor, and the processor is connected to the muscles of the body.



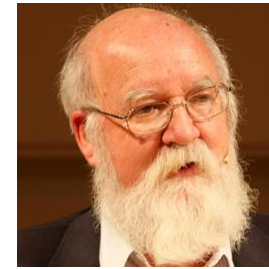
Functionalism

– Computational Functionalism

- Noam Chomsky in linguistics (1957) and David Marr in vision (1982): the mind as a set of modules that “compute” something based on an innate symbolic capability.



Functionalism



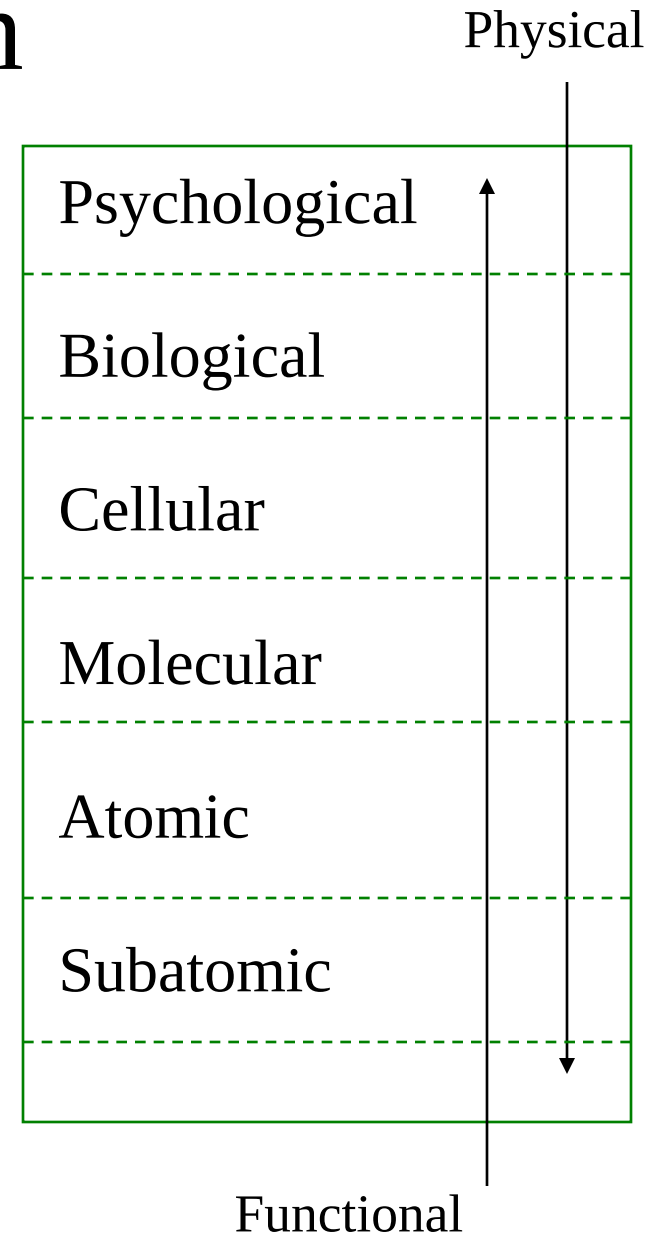
– Homuncular Functionalism (Daniel Dennett - 1978, William Lycan - 1987)

- A mental process is the product of many independent lower mental processes, and each of these lower processes is the product of more and more primitive (less and less mental) independent processes all the way down to the physical processes of the brain



Functionalism

- Homuncular Functionalism (Daniel Dennett - 1978, William Lycan - 1987)
 - Between the low level of electrochemical processes and the high level of psycho-functional processes, nature is organized in a number of hierarchical levels (subatomic, atomic, molecular, cellular, biological, psychological)
 - Each level is both physical and functional: physical with respect to its immediately higher level and functional with respect to its immediately lower level



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	Pantheism	Spinoza	
	Neutral Monism	Russell	
	Materialism		
		Identity Theory	Place, Feigl, Smart
		Anomalous Monism	Davidson
Behaviorism	Ryle		
	Eliminative Materialism	(Feyerabend, Rorty, Churchland)	
Functionalism		Computational Functionalism	Putnam, Fodor, Stich, Block
		Homuncular Functionalism	Dennett, Lycan, Minsky

Phenomenology

- Edmund Husserl (1900)
 - The essence of something is not its physical constituents or physical laws, but the way we experience it
 - By separating phenomenon and being, science denied humans the truth of the reality that they experience



Phenomenology



- Martin Heidegger (1927)
 - You can't divide reality into subjective and objective
 - The objective is impossible because we are part of it
 - We can't be objective observers
 - We don't exist as independent observers, we exist as part of the world
 - We react by instinct, we are thrown into the world
 - We are rarely aware of what we are doing

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Phenomenology			
	Husserl, Heidegger		

Bibliography

Bechtel William: Philosophy Of Mind (Lawrence Erlbaum, 1988)

Dennett Daniel: Kinds Of Minds (Basic, 1998)

Dretske, Fred: Naturalizing The Mind (MIT Press, 1995)

Gardner Howard: Mind's New Science (Basic, 1985)

Cognition

- Cognition: the set of faculties that allow the mind to **process inputs** from the external world and to determine **action** in the external world
 - Perception,
 - Learning,
 - Memory,
 - Reasoning
 - Vision,
 - Language, ...

Cognition

- The level of awareness for the same cognitive faculty may vary wildly
- Cognitive faculties and consciousness seem to be independent processes

Mediation

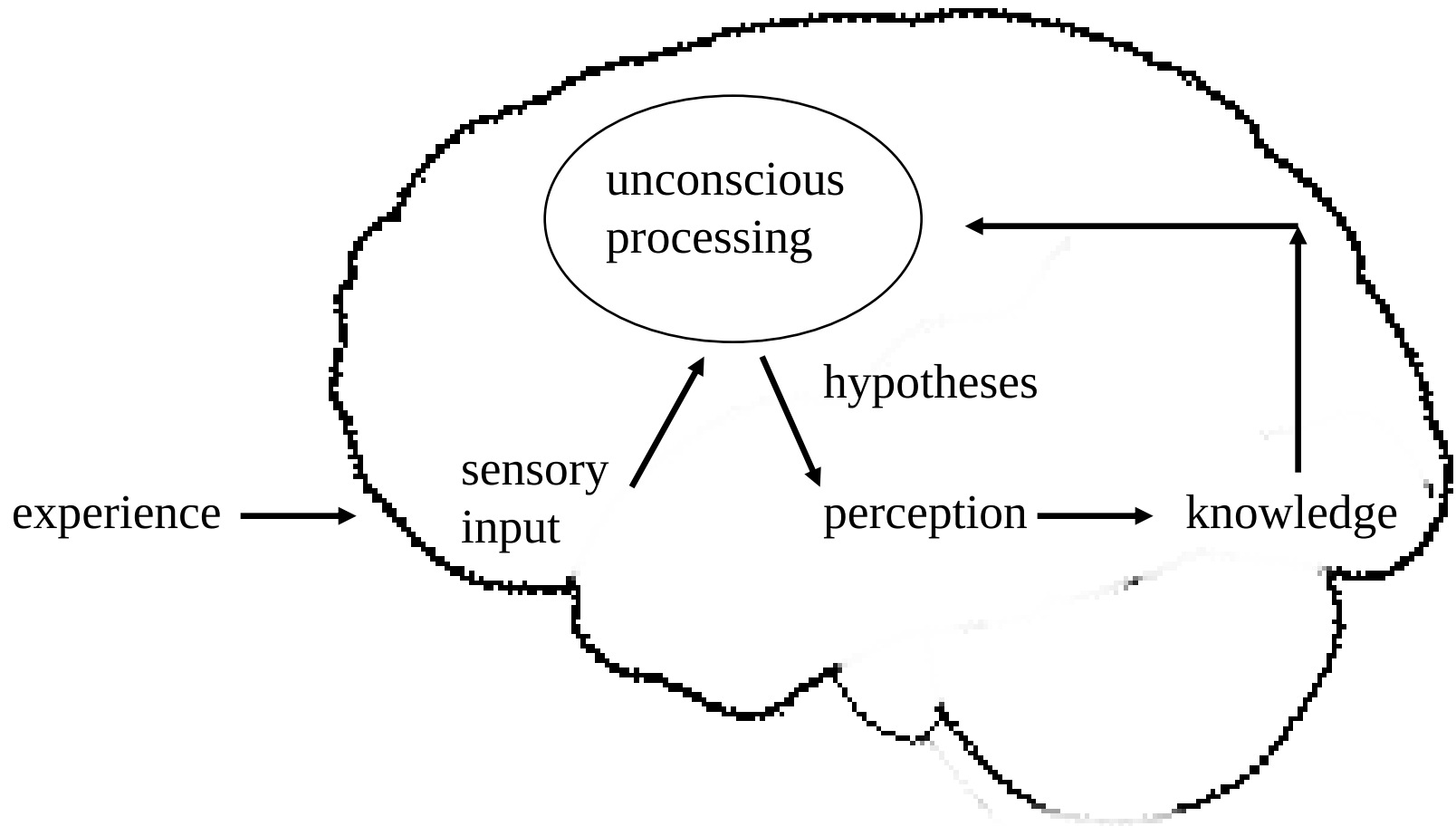


- Hermann Helmholtz (19th c)
 - Perception and action are mediated by a process in the brain
 - The "reaction time" of a human being is high because this brain process is slow
 - Perceptions are derived from unconscious inference on sense data
 - The brain turns perceptions into knowledge
 - All knowledge comes from experience, there is no innate knowledge
 - Perceptions are mere hypotheses about the world and can be wrong (optical illusions)
 - Perceptions are hypotheses based on our knowledge

Mediation



- Hermann Helmholtz (19th c)



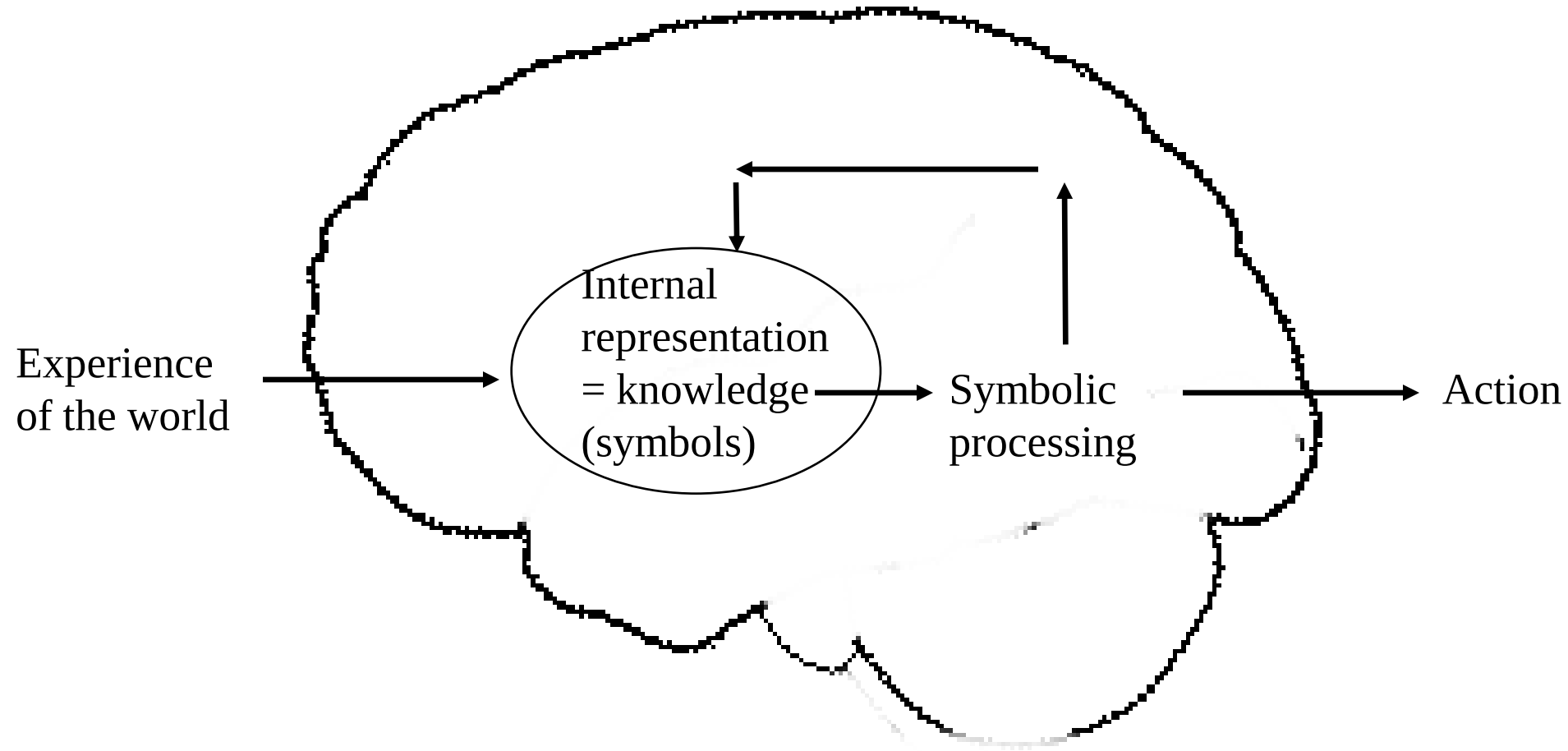
Representation



- Kenneth Craik (1943)
 - Mind is a particular type of machine which is capable of building internal models of the world and processing them to produce action
 - Internal representation
 - Symbolic processing of such representation
 - Intelligence = inferential processing of knowledge
 - Action based on knowledge and inference

Representation

- Kenneth Craik (1943)



Symbolic Processing

- The computer architecture is able to achieve cognitive faculties
- Computers consist of interacting modules, each processing symbols
- Maybe the human mind too can be reduced to an architecture of interacting modules and sequential computation of symbols



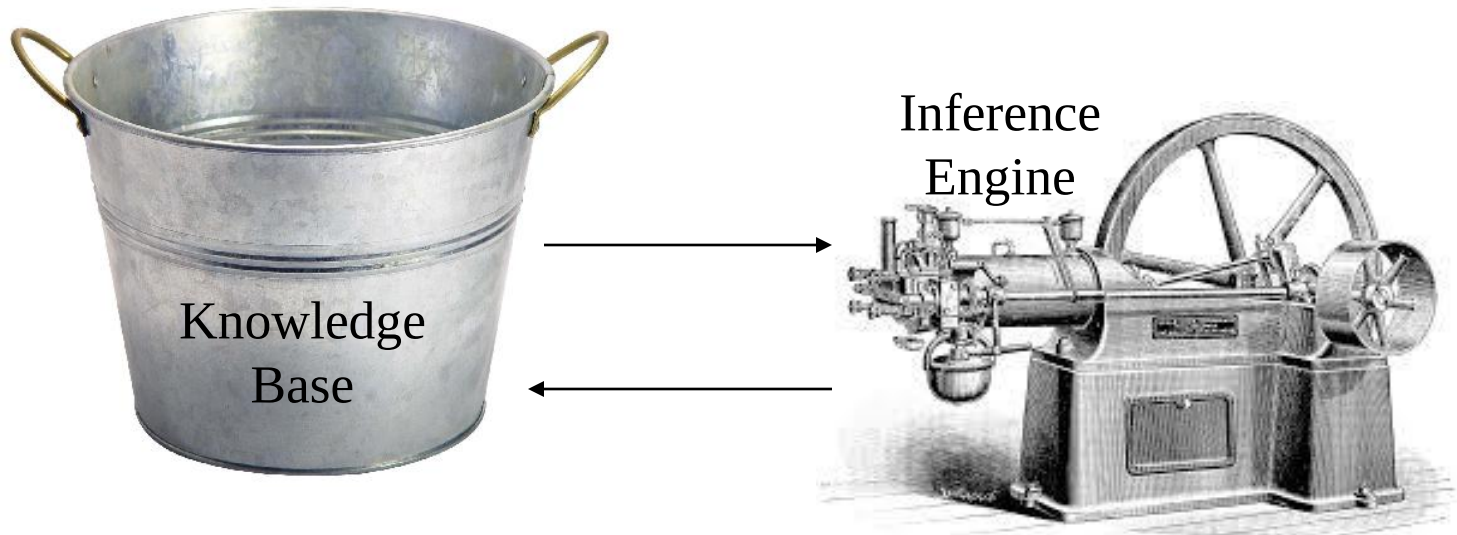
Symbolic Processing

- Herbert Simon & Allen Newell: Physical Symbol Systems (1976)
 - "A physical symbol system has the necessary and sufficient means for intelligent action"
 - Physical symbol processors are Turing machines



Symbolic Processing

- Physical Symbol Systems
 - A memory containing knowledge is operated upon by an inference engine; the results are added to the knowledge base; inference engine operates on the knowledge base;...



Symbolic Processing



- Production Systems
 - John Anderson's Act (1976)
 - Knowledge is expressed in “production rules” (“If it is raining, take the umbrella”)
 - Declarative knowledge ("knowing that") that can be consulted vs procedural knowledge ("knowing how") that must be enacted in order to be used

I know that a bicycle has two wheels

I know how to ride a bicycle



Knowledge Representation



- Otto Selz's Schema (1913)
 - To solve a problem entails to recognize the situation and to fill the gaps
 - Information in excess contains the solution
 - To solve a problem is equivalent to comprehending it, and comprehending ultimately means reducing the current situation to a past situation
 - **The representation of the world “is” what determines action in the world**

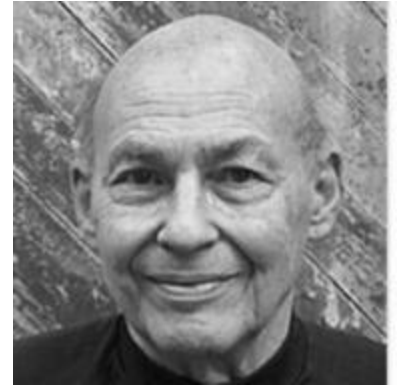
Knowledge Representation



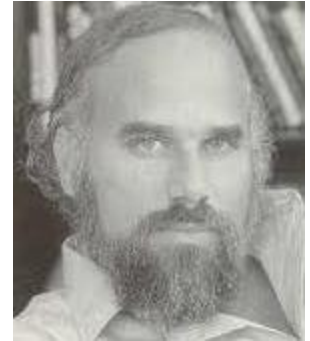
- Edward Tolmans' cognitive map (1932)
 - Learning involves acquisition of knowledge about the world (a "cognitive map")
 - A cognitive map encodes "expectations" about the world
 - We don't act in the world, we respond to the world

Knowledge Representation

- Marvin Minsky's “Frame” (1974)
 - A packet of information that helps recognize and understand a scene
 - A representation of stereotypical situations
 - Memory is a network of frames
 - **Unity of perception, recognition, reasoning, understanding and memory**
 - Perception, recognition, reasoning, understanding and memory cannot be separated

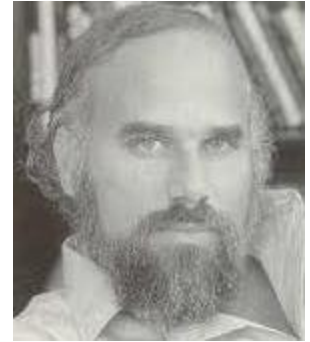


Knowledge Representation



- Roger Schank's Script (1975)
 - Script = stereotypical knowledge of situations as a sequence of actions and a set of roles
 - Script = helps understand the situation and predicts what will happen
 - A dynamic memory that grows from experience
 - Expectation-driven
 - New memories = expectation failures

Knowledge Representation



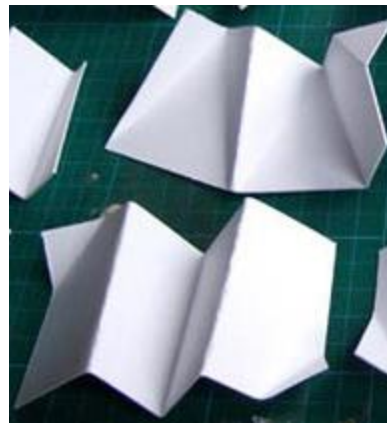
- Roger Schank's Script
 - Anticipatory reasoning
 - Remembering is closely related to understanding and learning.
 - Memory has the passive function of remembering and the active function of predicting.
 - The comprehension of the world and its categorization proceed together.
 - Knowledge is stories
 - Conversation is reminding and storytelling is understanding

The Unity of Cognition

- Perception, memory, learning, reasoning, understanding and action are simply different aspects of the same process.
- All mental faculties are different descriptions of the same process
- Cognition does not seem to require consciousness

The Unity of Cognition

- Cognition = algorithm, refined by natural selection, that operates on structures that reflect our experience
- Various levels of cognition can be identified in other systems
- Everything in nature can be said to remember and to learn something
- Cognition: a general property of matter?



Paper that has “learned” a position after being repeatedly bent

Break



"The foolish ask questions the wise cannot answer" (Oscar Wilde)

Memory

Alice: I can't remember things before they happen.

Queen: It's a poor sort of memory that only works backwards.



Memory vs Storage

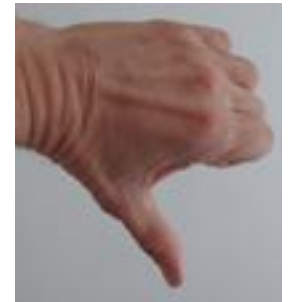
- Animal memory is not just like a computer memory: real-life tasks rarely require perfection but do require speed and capacity
- Memory is more than storage. Memory is also recognition
- Without memory we would not see trees, but only patches of brown and green.

Memory is not just Storage

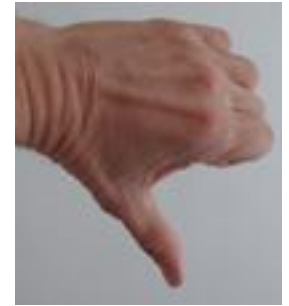
- Memory is capable of organizing experience into concepts
- Mental life “is” those concepts
- The process of thinking depends on the process of categorizing
- All cognitive faculties use memory and would not be possible without memory. They are, in fact, but side effects of the process of remembering

Memory sucks...

- The most peculiar feature of our memory is, perhaps, the fact that it is so bad at remembering.
- Our memory forgets most of the things that happen
- Even when it remembers, it does a lousy job of remembering
- Memory of something is almost always approximate
- Many details are forgotten right away
- Sometimes memory is also very slow



Memory sucks...



- We cannot count very easily.
- If you see a flock of birds in the sky, you can tell the shape, the direction, the approximate speed... but not how many birds are in the flock, even if there are only six or seven.
- We are not very good at remembering the temporal order of events: we have trouble remembering if something occurred before or after something else.

Memory's limitation...

- Human memory is a bizarre device that differs in a fundamental way from the memory of machines: a camera or a computer can replicate a scene in every minute detail, whereas our memory was just not designed to do that



...and Memory's power

- On the other hand, we can recognize a plot, told by somebody else, as the plot of the same novel that we read, even if that person's version of the plot and our version of the plot probably do not share a single sentence



Memory and Concepts

- It is hard to think of something without thinking also of something else. It is hard to focus on a concept and not think of related concepts

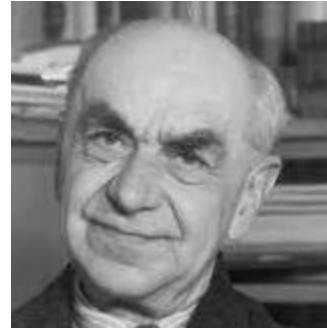


evokes...



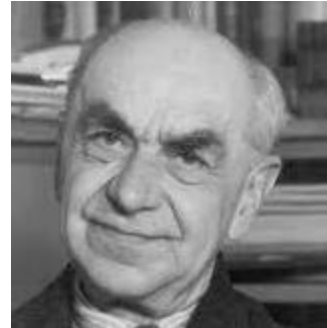
Memory

- Frederic Bartlett's reconstructive memory (1930s)
 - We can easily relate the plot of a movie, but we cannot cite verbatim a single line of the movie
 - If we relate the plot three times, we will use different words each single time



Memory

- Frederic Bartlett's reconstructive memory (1930s)
 - Events are not stored faithfully in memory: they are somehow summarized into a different form, a "schema"
 - Memories do not passively record stories verbatim, but rather actively code them in terms of schemas, and then can recount the stories by retranslating the schemas into words.
 - Optimized storage: only what is strictly necessary is “memorized”



Cognitivism

- Behaviorism: focus on the output that corresponds to an input
 - 1959: Noam Chomsky's review of a book by Skinner ends the domination of behaviorism and resurrects cognitivism
- Cognitivism: focus on the processing between input and output
 - George Miller (1956)
 - Donald Broadbent (1957)
 - Allen Newell (1958)
 - Noam Chomsky (1957)

Cognitivism

- Donald Broadbent

- Short-term memory (fast, small) vs long-term memory (slow, large)
- The brain can only be conscious of so many events at the same time



- George Miller

- Seven “chunks”



Memories



- Endel Tulving (1970s)
 - The remembering of episodes depends on the interaction between encoding and retrieval conditions (between the "engram" and the "cue")
 - The likelihood of recalling a memory (of decoding it) depends on recreating those circumstances, on reinstating the same psychological state.
 - The rememberer does more than retrieve information about a past event: the rememberer experiences that event again.

Memories



- Neal Cohen (1980)
 - “Declarative” memory (the memory that one can consciously remember, which is forgotten in an amnesia)
 - “Procedural” memory (the skills and procedures which are usually not forgotten, as people with amnesia can still perform most actions they have learned throughout their lives)
 - “Emotional” memory (amygdala)

Memories



- Daniel Schacter (1996)
 - “Memory” is actually a set of different kinds of memory, each specialized in a different kind of task and implemented by a different brain circuit
 - Different aspects of a memory are stored in different regions of the brain
 - “Field memory” (you are in it) vs “observer memory” (you are not in it).
 - We tend to recall older events as field memories, and more recent ones as observer memories.

Memories



- Daniel Schacter
 - We distort our memories of ourselves
 - We construct our own autobiography, which is only loosely based on what truly happened.

Memory and Knowledge: Categories

- Categorization is the main way that humans have of making sense of their world.
- Categorization: using the literal past to build abstractions that are useful to predict the future

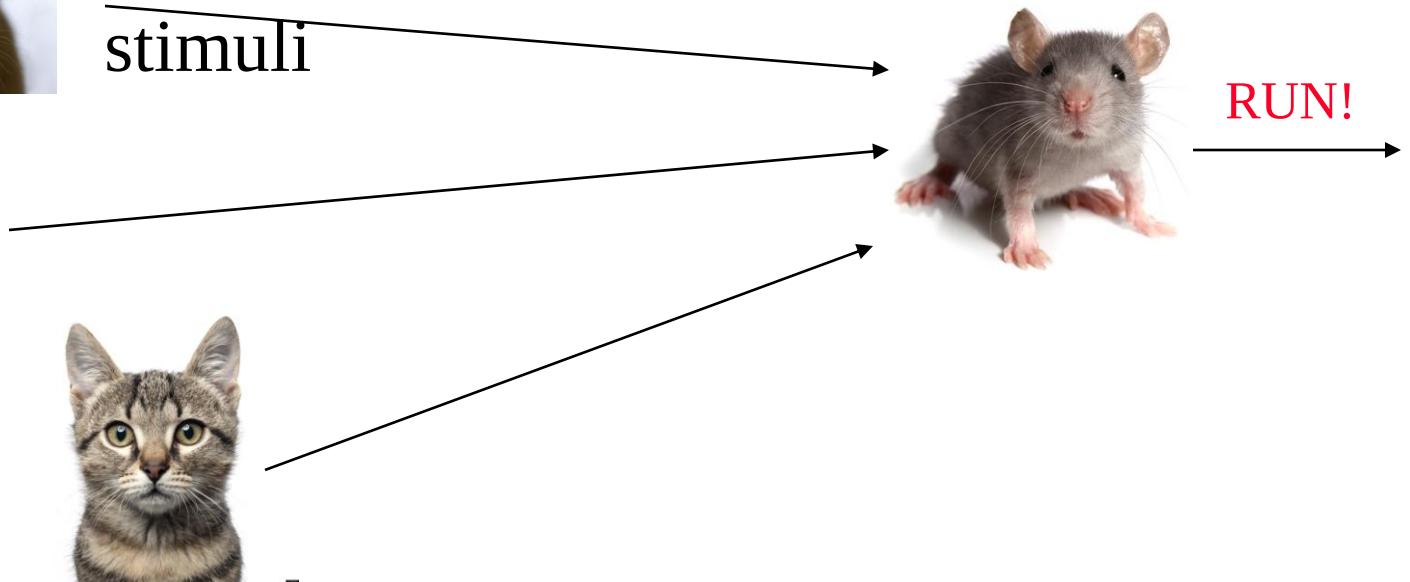


Categories

- Eric Lenneberg (1967):
 - All animals organize the sensory world through a process of categorization
 - All animals respond to categories of stimuli
 - Enables “similar” response to “different” stimuli

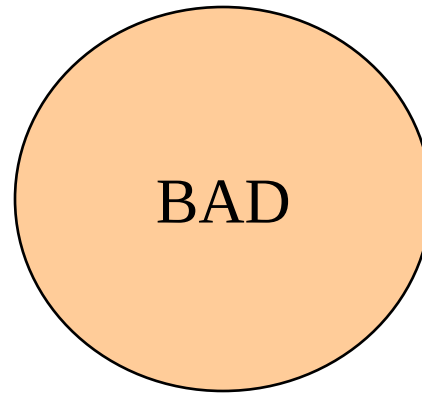
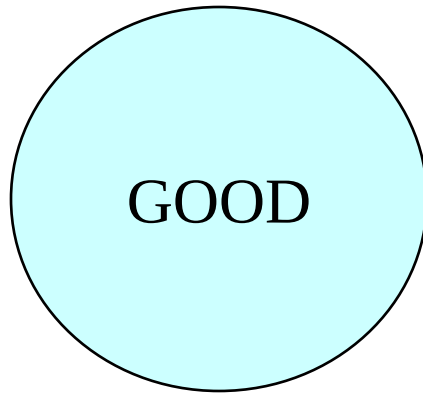


RUN!



Categories

- Classical categories
 - Closed by clear boundaries and defined by common properties of their members



Categories



- Jerome Bruner's categories (1956)
 - A category is basically a set of events that can be treated the same way by the cognitive organism
 - Most cognitive processes are nothing but classification processes in disguise
 - Cognitive activity ("thinking") depends on placing an event or situation in the appropriate category

Categories

- Eleanor Rosch's prototype theory (1978)
 - The best way to teach a concept is to show an example of it
 - Prototype = “best” example of the category
 - Membership of an individual in a category is determined by the perceived distance of resemblance of the individual to the prototype of the category



Categories



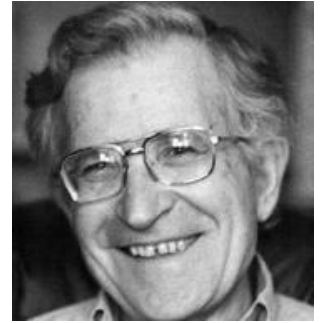
- Eleanor Rosch's prototype theory (1978)
 - Concepts promote a cognitive economy by partitioning the world into classes, and therefore allowing the mind to substantially reduce the amount of information to be remembered and processed
 - The task of category systems is to provide maximum information with the least cognitive effort

Origin of categories

- Immanuel Kant
 - Experience is possible only if we have knowledge
 - Knowledge evolves from concepts
 - Some concepts must therefore be native
 - We must be born with an infrastructure that allows us to learn concepts and to build concepts on top of concepts



Origin of categories



- Noam Chomsky
 - Human brains are designed to acquire a language
 - They contain a "universal grammar"
 - We speak because our brain is meant to speak
- We think in concepts because we are meant to think in concepts
- Our mind creates categories because it is equipped with some native categories and a mechanism to build categories on top of existing categories

Holism

- Pierre Duhem (1906)
 - Scientific hypotheses cannot be tested in isolation from the whole theoretical network in which they appear



Holism



- Willard Quine (1951):
 - A hypothesis is verified true or false only relative to background assumptions
 - Each statement in a theory partially determines the meaning of every other statement in the same theory
 - The structure of concepts is determined by the positions that their constituents occupy in the "web of belief" of the individual

Holism

- Frank Keil (1989):
 - No concept can be understood in isolation from all other concepts
 - Concepts are embedded in theories about the world



The Mind's Growth



Farside

The Mind's Growth

- Mind is not always the same: it grows
- Not just learning about the environment, but also capability of new types of actions in the environment
- How "Nature" and "Nurture" (instincts and experience) interact ("Nativism" vs "Constructivism")

The Mind's Growth

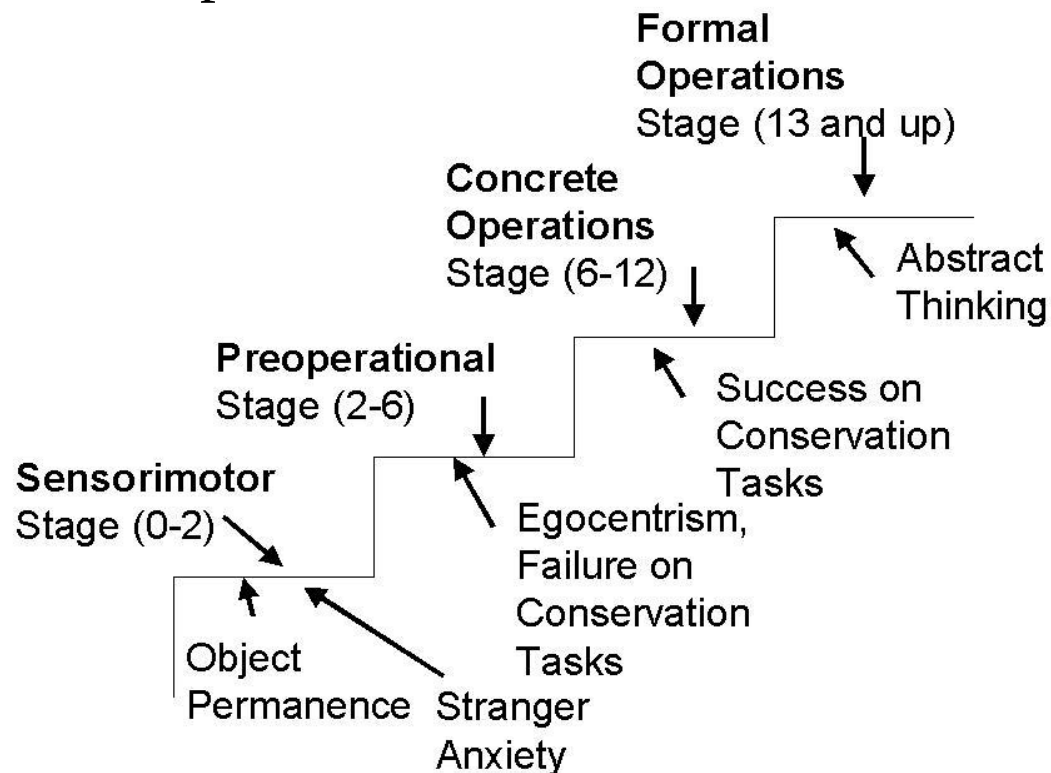


- Jean Piaget's Constructivism
 - Cognitive faculties are not fixed at birth but evolve during the lifetime of the individual.
 - Not by gradual evolution but by sudden rearrangements of mental operations
 - Growth produces qualitatively new forms of thought
 - Cognitive growth = transition from a stage in which the dominant factor is perception, which is irreversible, to a stage in which the dominant is abstract thought, which is reversible

The Mind's Growth



- Jean Piaget's constructivism
 - Progress from simple mental arrangements to complex ones



The Mind's Growth



- Jean Piaget's Genetic Epistemology
 - Living beings are in constant interaction with their environment
 - Survival depends on maintaining a state of equilibrium between the organism and the environment
 - Cognition is a dynamic exchange between organism and environment

The Mind's Growth



- Jean Piaget's Genetic Epistemology
 - Rationality is the overall way in which an organism adapts to its environment.
 - Rational action occurs every time the organism needs to solve a problem, i.e. when the organism needs to reach a new form of balance with its environment.
 - Once that balance has been achieved, the organism proceeds by instinct.
 - Rationality will be needed only when the equilibrium is broken again.

The Mind's Growth



- Lev Vygotsky
 - Thought is determined by language.
 - Language guides the child's cognitive growth.
 - Cognition thus develops in different ways depending on the cultural conditions.

The Mind's Growth



- Annette Karmiloff-Smith (1992)
 - Mind is made of a number of independent, specialized modules (a` la Fodor)
 - Modules are not static but "grow" during child's development
 - New modules are created during child's development

Bibliography

Franklin Stan: Artificial Minds (MIT Press, 1995)

Johnson-laird Philip: Mental Models (Harvard Univ Press, 1983)

Lakoff, George: Women, Fire And Dangerous Things (Univ of Chicago Press, 1987)

Mcginn Colin: Mindsight (2004)

Minsky Marvin: The Society Of Mind (Simon & Schuster, 1985)

Newell Allen: Unified Theories Of Cognition (Harvard Univ Press, 1990)

Posner Michael: Foundations Of Cognitive Science (MIT Press, 1989)

Schacter, Daniel: Searching For Memory (Basic, 1996)

Summary

- The factory of illusions
- Dualism, Idealism, Materialism, Epiphenomenalism, Supervenience, Panpsychism, etc
- Representation (Helmholtz, Craik, Simon & Newell)
- Reconstructive memory (Bartlett)
- The schema (Selz)
- Categories (Rosch)
- Mind's growth (Piaget)

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