

Theory of knowledge

IB DP course

Common sense

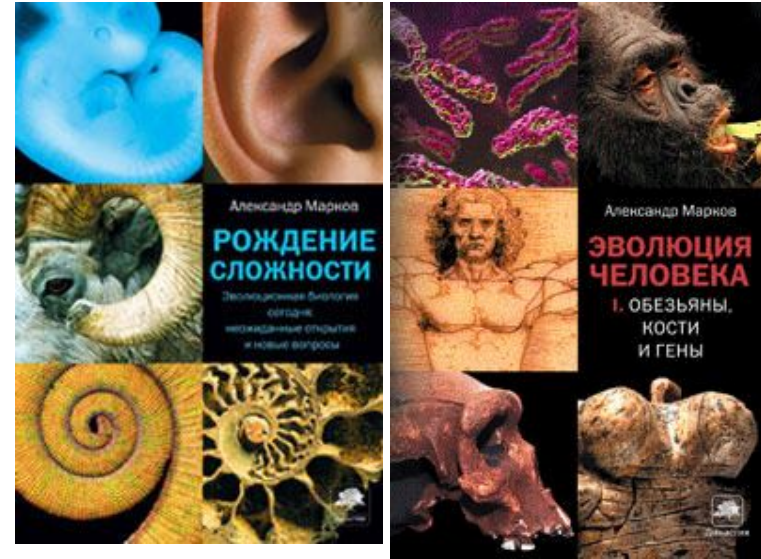
- What do you mean when you write or say “knowledge”?
- Organised common sense



GMO



Alexander Markov



GMO



Alexander Markov

“I try to eat only Genetically Modified Food as there is no principal difference between controlled selection of favorable mutations and natural selection. It is a big myth that GM plants can be dangerous for you health. There is no biological mechanisms that allow plants to incorporate new mutations in your genotype. Moreover, it is the only way to feed the increasing human population”

Common sense

- Untested beliefs
- Prejudice
- Blind authority



Paradox of cartography

- The map is not the territory. If a map is to be useful, it should be imperfect



Certainty

- Could we be 100% sure that these facts are true?
- Alkaida bombed twin towers in 2001
- Murder is wrong
- All strawberries are red

Colorblind person view?



Radical doubt(Radical scepticism)

- A systematic process of being skeptical about (or doubting) the truth of one's beliefs.
- Rene Descartes The statement that is absolutely certain – “I exist”



Relativism

- **Protagoras:** Truth is relative. It is only a matter of opinion.
- **Socrates:** You mean that truth is mere subjective opinion?
- **Protagoras:** Exactly. What is true for you is true for you, and what is true for me, is true for me. Truth is subjective.
- **Socrates:** Do you really mean that? That my opinion is true by virtue of its being my opinion?
- **Protagoras:** Indeed I do.
- **Socrates:** My opinion is: Truth is absolute, not opinion, and that you, Mr. Protagoras, are absolutely in error. Since this is my opinion, then you must grant that it is true according to your philosophy.
- **Protagoras:** You are quite correct, Socrates.

Concepts to remember

- Common sense
- Relativism
- Radical doubt

Information vs knowledge

- Just when you think you know about something, you learn about it in more depth and realise your previous knowledge was superficial.
- Information → disconnected facts (e.g. cramming facts for an exam but lacking real understanding).
- Knowledge → facts connected by logic to help the facts make sense (e.g. problem solving -arriving at understood knowledge by considering all the facts).

Argument

- Argument – a reason or reasons supporting a conclusion. Typical argument consists of: premise(s) and a conclusion. Both a premise and a conclusion are called claims or statements

Reasoned argument:

- 1. Premise (assumptions, laws, rules, facts, observations, research data, statistics, anecdotal evidence)
- 2. Conclusion (a claim that is supported by a premise(s))

Argument

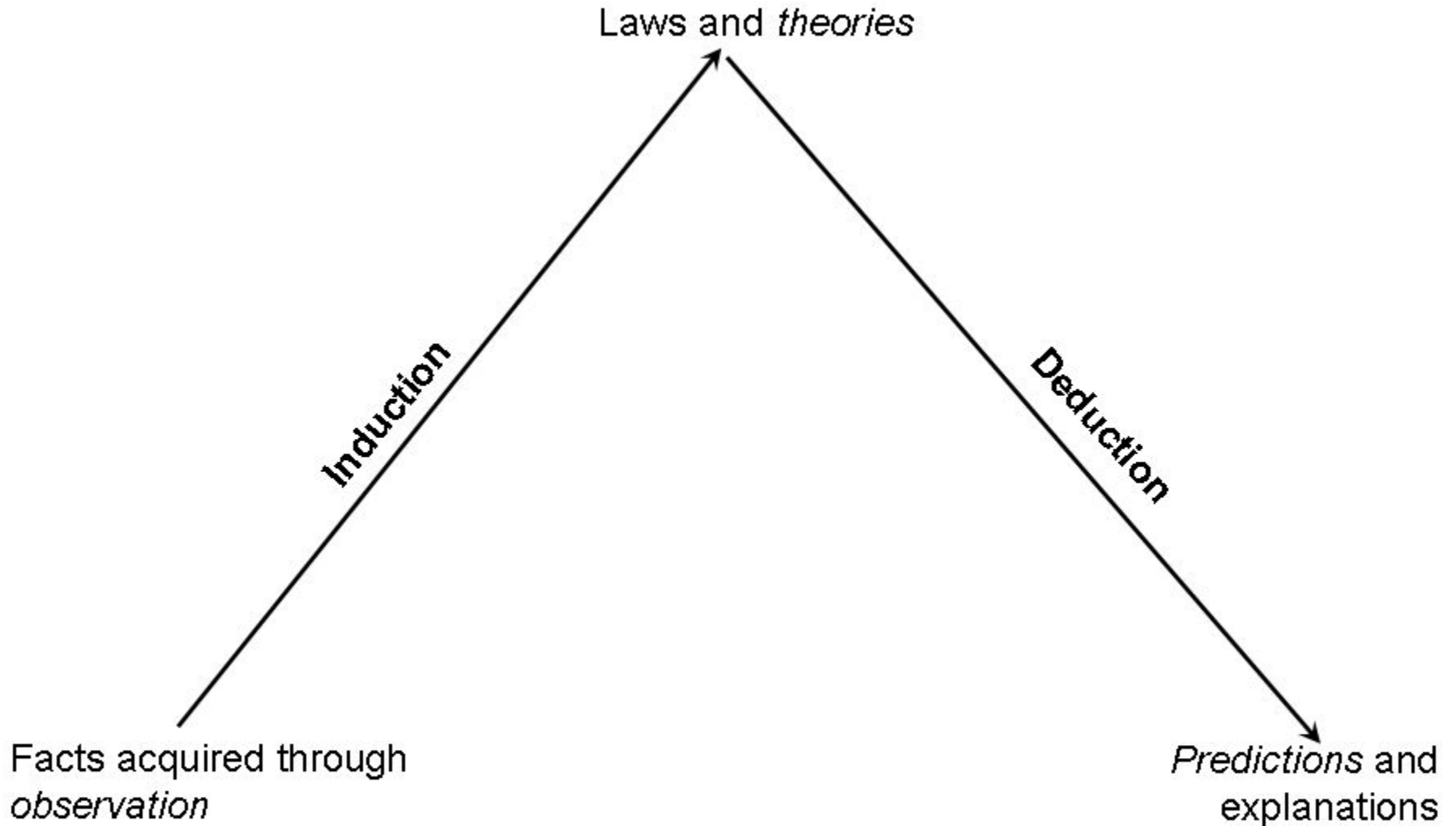


Argument



We will not consider a dispute or a quarrel as an argument

Types of arguments



Types of arguments

- A **deductive** argument is one in which it is **impossible** for the premises to be true but the conclusion false. Thus, the conclusion follows **necessarily** from the premises and inferences. In this way, it is supposed to be a definitive proof of the truth of the claim (conclusion). (from general rules to specific facts)
- An **inductive** argument is one in which the premises are supposed to support the conclusion in such a way that if the premises are true, it is **improbable** that the conclusion would be false. Thus, the conclusion follows **probably** from the premises and inferences. (from specific facts to general rules)

Validity and soundness of an argument

- A deductive argument is said to be valid if and only if it takes a form that makes it impossible for the premises to be true and the conclusion nevertheless to be false. Otherwise, a deductive argument is said to be invalid.
- A deductive argument is *sound* if and only if it is both valid, and all of its premises are *actually true*. Otherwise, a deductive argument is *unsound*.

Validity and soundness of an argument

The Distinction between truth and validity	
TRUTH	VALIDITY
Concerned with what is the case	Concerned with whether conclusions follows from premises
	The validity of an argument is independent of the truth or falsity of the premises it contains.

Validity and soundness of an argument

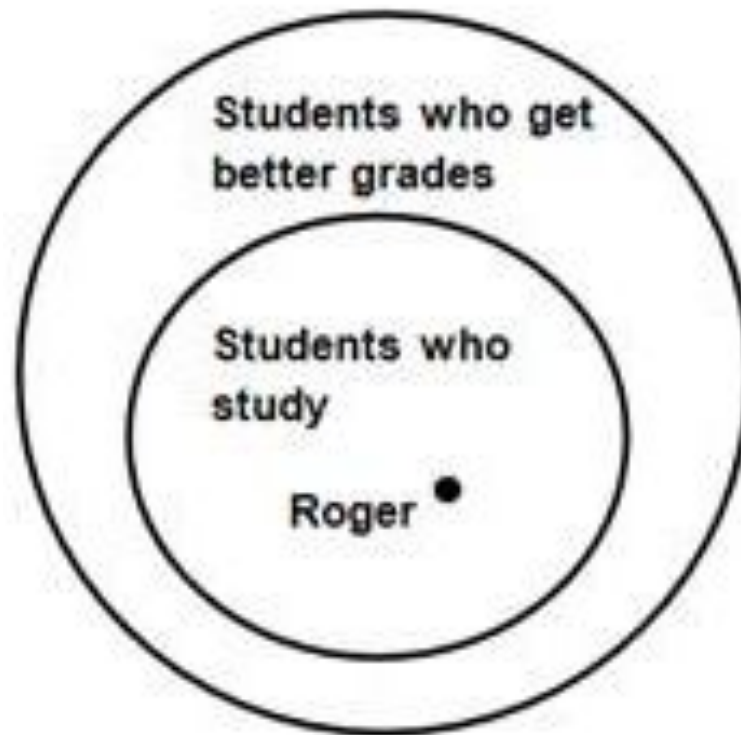
	Deductive Reasoning	Inductive Reasoning
Premises	Stated as <u>facts</u> or general principles ("It is warm in the summer in Spain.").	Based on <u>observations</u> of specific cases ("All crows Knut and his wife have seen are black.").
Conclusion	Conclusion is more <u>special</u> than the information the premises provide. It is reached directly by <u>applying logical rules</u> to the premises.	Conclusion is more <u>general</u> than the information the premises provide. It is reached by <u>generalizing</u> the premises' information.
Validity	If the premises are true, the conclusion <u>must be true</u> .	If the premises are true, the conclusion <u>is probably true</u> .
Usage	More difficult to use (mainly in logical problems). One needs <u>facts</u> which are definitely true.	Used often in everyday life (fast and easy). <u>Evidence</u> is used instead of proved facts.

Visualization of an argument using the Euler's circles

- Euler's circles are used to define the validity of an argument
- Circles represents different sets
- Intersection of circles – common elements of several sets
- Lack of intersection - the lack of common elements of different sets
- The circle inside the circle is a subset
- X is a single element

Visualization of an argument using the Euler's circles

All students who study get better grades.
Roger is a student who studies.
∴ Roger will get better grades.



Example 1.

- Is the following argument valid? All dogs are animals. Fred is a dog. Fred is an animal.
- Draw regions to represent the premise. (Let x represent Fred) Animals Dogs x Since:
 - ❖ the set of all animals contains the set of all dogs, and
 - ❖ that set contains Fred
 - ❖ Fred is also inside the regions for animals.

Therefore, if both premises are true, the conclusion that Fred is an animal must be true also. The argument is valid as checked by the Euler diagram.

Example 2

- All rainy days are cloudy.
- Today is not cloudy.
- Today is not rainy.

Example 3.

- All banana trees have green leaves
- That plant has green leaves.
- That plant is a banana tree.

Example 4.

- All expensive things are desirable.
- All desirable things make you feel good.
- All things that make you feel good make you live longer.
- All expensive things make you live longer

Example 5.

- 1. All boxers wear trunks. Steve Tomlin is a boxer.
----- Steve Tomlin wears trunks.
- 2. All residents of NYC love Coney Island hot dogs.
Ann Stypuloski loves Coney Island hot dogs.
----- Ann
Stypuloski is a resident of NYC.
- 3. All politicians lie, cheat, and steal. That man
lies, cheats, and steals.
----- That man is a
politician.

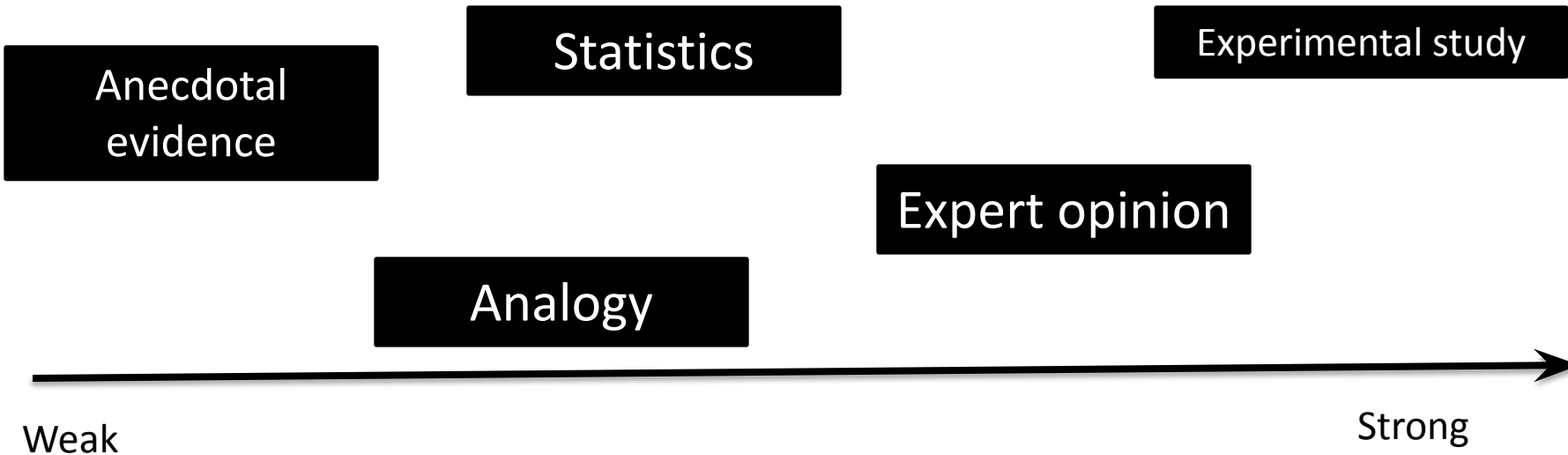
Example 6.

- Given the premises: 1. All people who drive contribute to air pollution. 2. All people who contribute to air pollution make life a little worse. 3. Some people who live in a suburb make life a little worse.
- Which of the following conclusions are valid? a) Some people who live in a suburb drive. b) Some people who contribute to air pollution live in a suburb. c) Suburban residents never drive. d) All people who drive make life a little worse.

JUSTIFIED true belief

- “Shown to be fair, right or reasonable”
- Proof – enough evidence to claim something is true
- Anecdotal evidence – personal stories
- Coincidence – when two or more events happens in the same time independently
- Correlation – when there is a relationship between two or more events (not necessary causal)
- Causation – one event leads to another event

Evidence



Anecdotal evidence

- Anecdotal evidence is essentially a story told by individuals. It often comes in the form of “I know a person who . . .,” but it can take many guises.



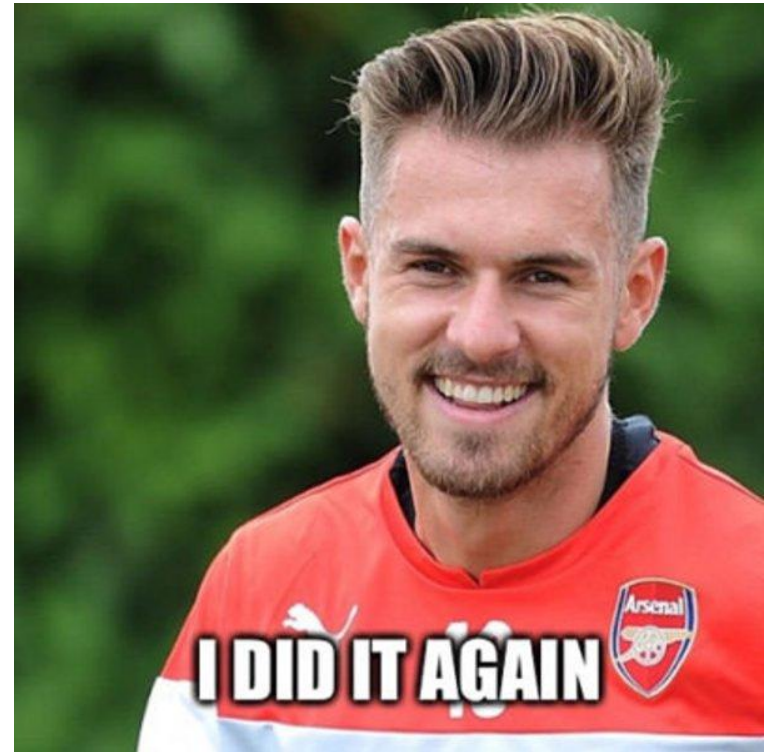
Anecdotal evidence (Limitations)

- **Incomplete** (anecdotal evidence often misses important information that would result in different conclusions)
- **Inaccurate** (they rely on people's memories which are often incomplete and sometimes outright wrong)
- **An exceptional event (not typical)**
- **Not representative**

Aron Ramsey

(Correlation doesn't mean Causation)

- 1 May 2011 v Manchester United: Osama bin Laden dies 2 May 2011
- 2 October 2011 v Tottenham Hotspur: Steve Jobs dies 5 October 2011
- 19 October 2011 v Marseille: Muammar Gaddafi dies 20 October 2011
- 11 February 2012 v Sunderland: Whitney Houston dies 11 February 2012
- 30 November 2013 v Cardiff: Paul Walker dies 30 November 2013
- 9 January 2016 v Sunderland: David Bowie dies 10 January 2016



Statistics vs. Anecdotal evidence

Statistical methodology

Anecdotal evidence

Large, representative samples

Very small, biased samples

Precise measurements in controlled situations

Casual observations in uncontrolled circumstances

Measure/control all other relevant factors that affect the outcome

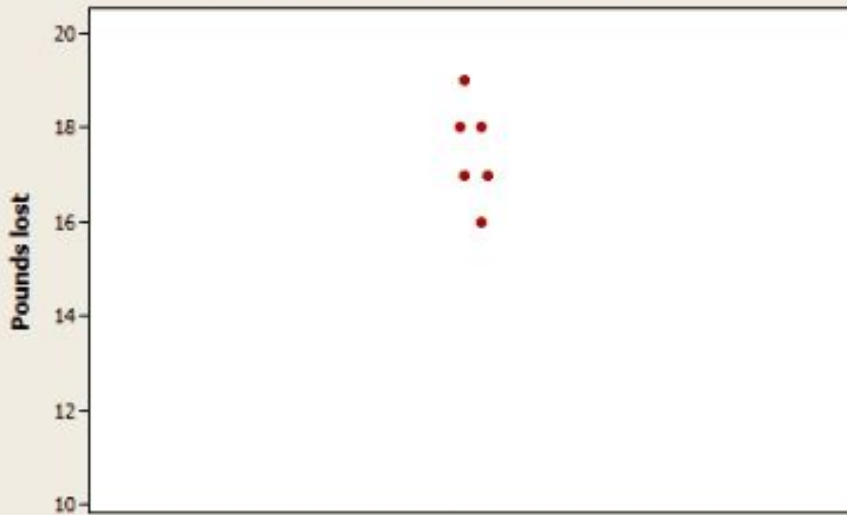
Other important factors are unaccounted

Careful about making causal connections

Causal connections are made too easily

Statistics vs. Anecdotal evidence

Anecdotal Evidence of Pounds lost



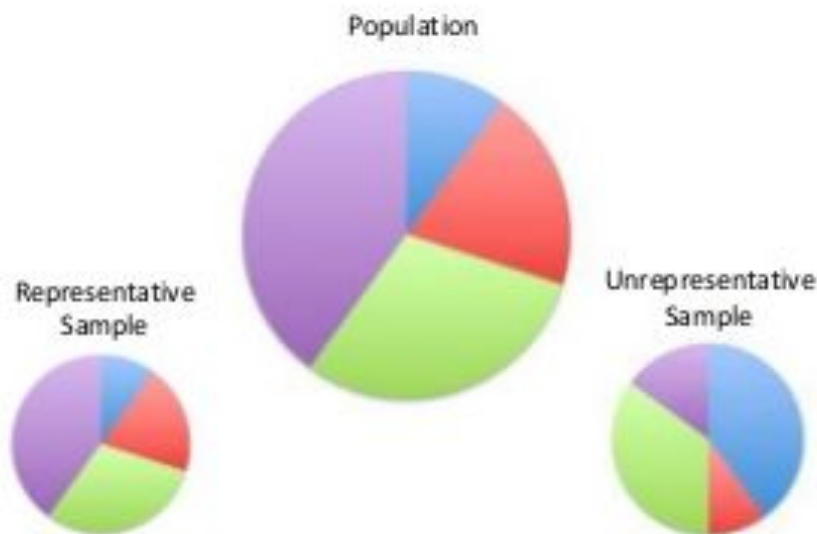
Representative Sample of Pounds lost



A representative sample is a small quantity of something that accurately reflects the larger entity. An example is when a small number of people accurately reflect the members of an entire population. In a classroom of 30 students, in which half the students are male and half are female, a representative sample might include six students: three males and three females.

Representative Sample

“A sample in which the relevant characteristics of the sample members are generally the same as the characteristics of the population.”



A sample of 500 Jacksonville citizens can provide an accurate representation of the views of the general population as long as the variation and diversity within the city are reflected in the group polled (i.e., gender,

Limitations of correlations

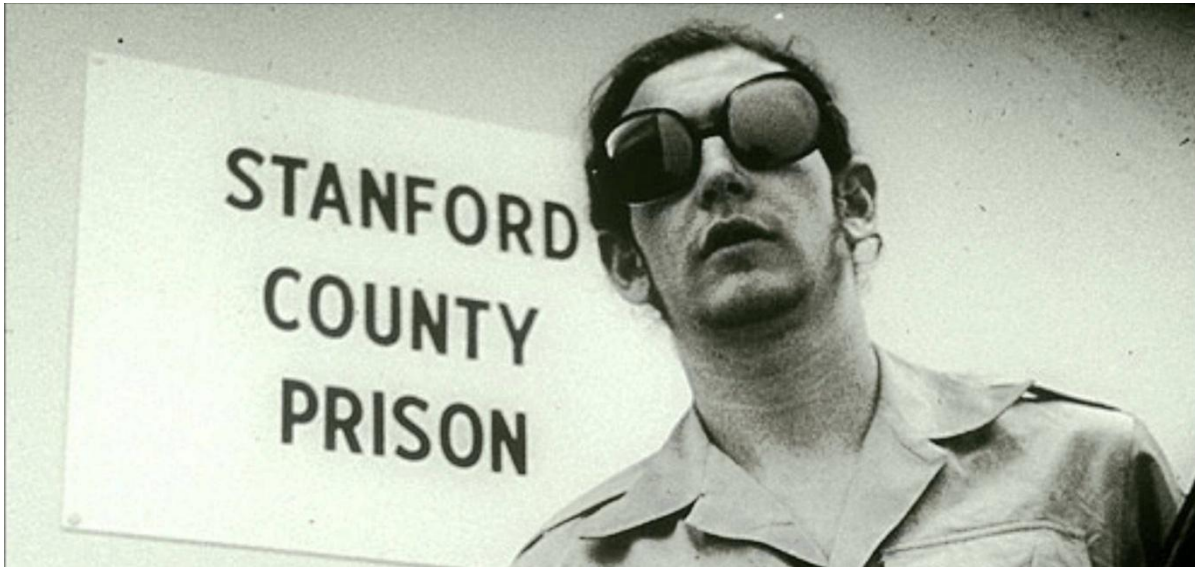
- It is hard to directly measure non-physical concepts (love, kindness)
- Impossible to say what is CAUSE and what is EFFECT
- Results are true on average
- Two events might occur independently from each other but at the same time

Weak evidence for the right claim

- In 1964 the United States' Surgeon General issued a [report](#) claiming that cigarette smoking causes lung cancer. Unfortunately, according to Pearl the evidence in the report was based primarily on correlations between cigarette smoking and lung cancer. As a result the report came under attack not just by tobacco companies, but also by some of the world's most prominent statisticians, including the great [Ronald Fisher](#). They claimed that there could be a hidden factor – maybe some kind of genetic factor – which caused both lung cancer *and* people to want to smoke (i.e., nicotine craving). If that was true, then while smoking and lung cancer would be correlated, the decision to smoke or not smoke would have no impact on whether you got lung cancer.

Causal connection

- Experiment(randomized, controlled) is the only method that can demonstrate the causal connection between two different events, concepts, etc.



Design of an experiment (Variables)

- **Variable** - things that are changing in an experiment
- **Dependent variable(DV)**- is what will be measured; it's what the investigator thinks will be affected during the experiment
- **Independent variable(IV)**- is what is varied during the experiment; it is what the investigator thinks will affect the dependent variable.
- **Controlled variable (CV)** -- the variables held constant. Since the investigator wants to study the effect of one particular independent variable, the possibility that other factors are affecting the outcome must be eliminated.
- *Since you need to know which factor is affecting the dependent variable(s), there may be only one independent variable. The investigator must choose the one that he/she thinks is most important. But the scientist can measure as many dependent variables as he/she thinks are important!!!*

REMEMBER!!!

INDEPENDENT VARIABLE



What I CHANGE



DEPENDENT VARIABLE

What I OBSERVE



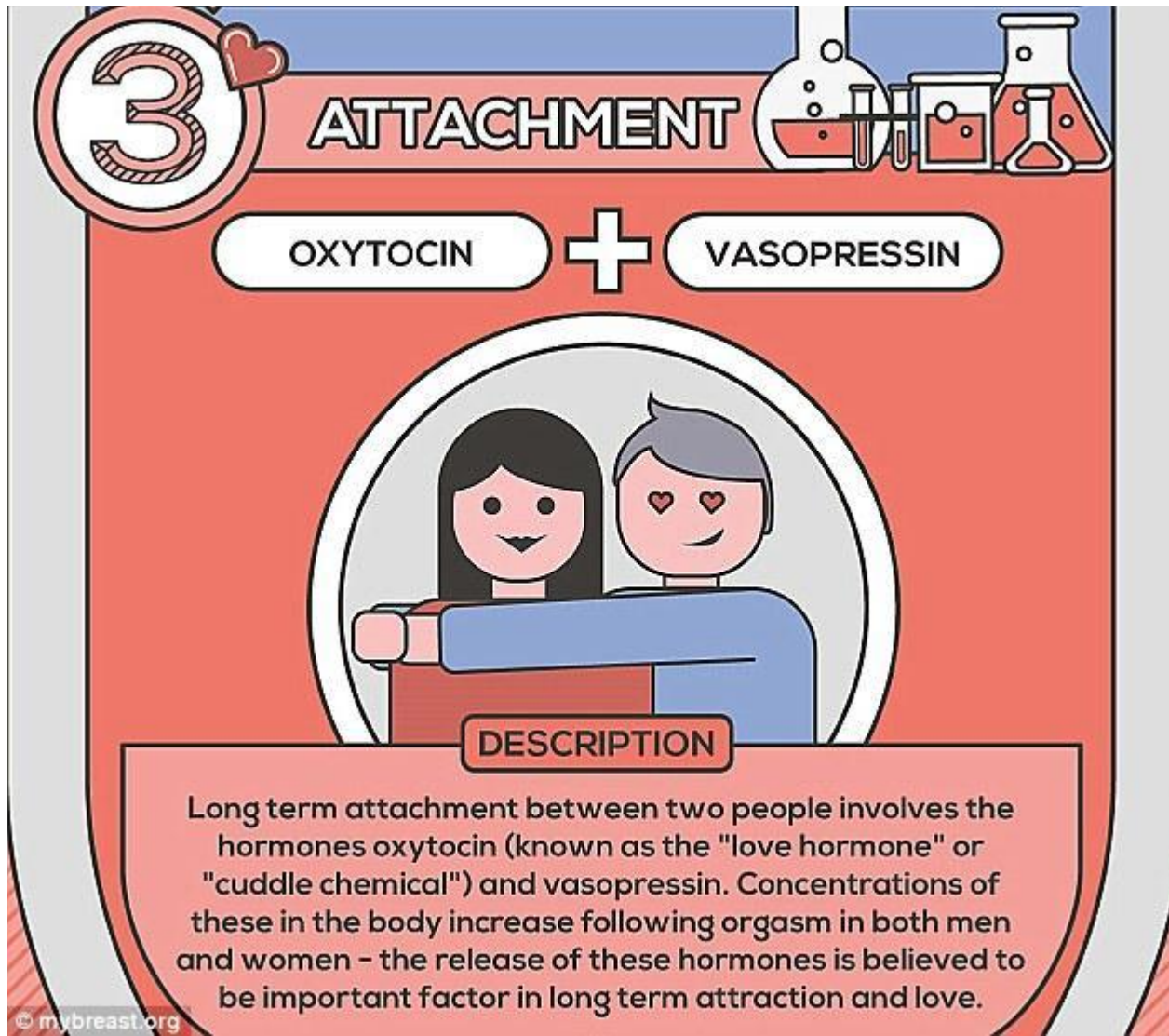
CONTROLLED VARIABLE

What I KEEP THE SAME

Design of an experiment (Operationalization)

- **Operationalization** - the process of strictly defining variables into measurable factors. The process defines fuzzy concepts and allows them to be measured, empirically and quantitatively (making variables measurable)
- *“Children grow more quickly if they eat vegetables.”*
- What does the statement mean by '**children**'? Are they from America or Africa. What age are they? Are the children boys or girls? There are billions of children in the world, so how do you define the sample groups?
- How is '**growth**' defined? Is it weight, height, mental growth or strength? The statement does not strictly define the measurable, dependent variable.
- What does the term '**more quickly**' mean? What units, and what timescale, will be used to measure this? A short-term experiment, lasting one month, may give wildly different results than a longer-term study.

LOVE is



The infographic is titled "LOVE is" and features a large number "3" in a circle with a heart, indicating it is the third point. The word "ATTACHMENT" is written in large, bold letters. To the right of the title are illustrations of laboratory glassware: a round-bottom flask, a test tube, a beaker, and an Erlenmeyer flask, all containing red liquid. Below the title, the words "OXYTOCIN" and "VASOPRESSIN" are placed in rounded rectangular boxes, separated by a plus sign. In the center is a circular illustration of a man and a woman embracing; the man has heart-shaped eyes. Below this illustration is a box labeled "DESCRIPTION" containing text about the hormones. At the bottom left corner, there is a small copyright notice.

3 **ATTACHMENT**

OXYTOCIN + VASOPRESSIN

DESCRIPTION

Long term attachment between two people involves the hormones oxytocin (known as the "love hormone" or "cuddle chemical") and vasopressin. Concentrations of these in the body increase following orgasm in both men and women - the release of these hormones is believed to be important factor in long term attraction and love.

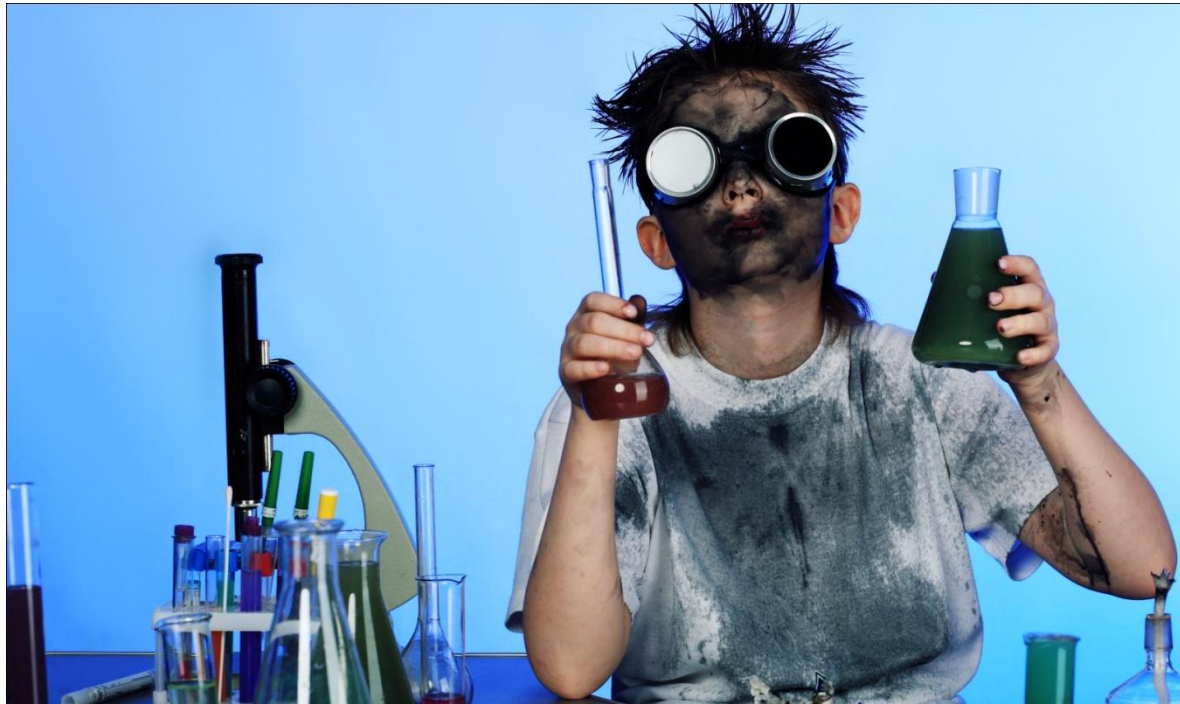
© mybreast.org

Design of an experiment (Groups)

- **Experimental group** - the group in a scientific experiment where the experimental procedure is performed. This group is exposed to the independent variable(IV).The changes of dependent variable(s)(DV) are observed and recorded. Controlled variables(CV) are stable and are the same in comparison with the controlled group
- **Control group** - a group separated from the rest of the experiment where the independent variable being tested cannot influence the results. This isolates the independent variable's effects on the experiment and can help rule out alternate explanations of the experimental results.

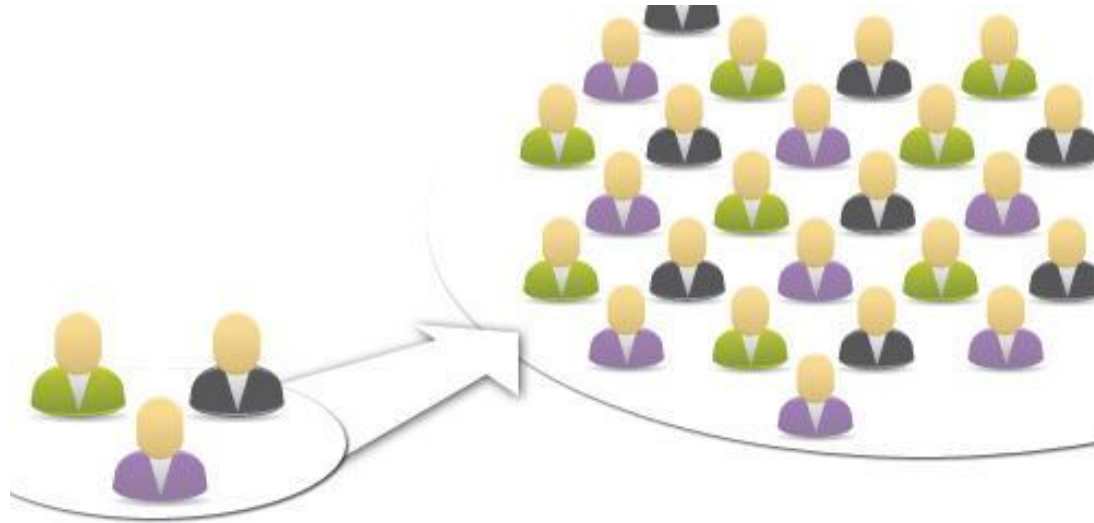
REMEMBER!!!

- While all experiments have an experimental group, not all experiments require a control group. Controls are extremely useful where the experimental conditions are complex and difficult to isolate. Experiments that use control groups are called **controlled** experiments.



Design of an experiment (sample)

- **The idea of trying to take a representative section of the population, perform the experiment and extrapolate it back to the population as a whole.**
- **Sample must be representative**
- **The bigger the better, if a sample is randomly assigned**



Invent a design of your own social experiment

- Hypothesis
- IV,DV,CV (operationalization)
- Size of sample (How can you make it representative?)
- Controlled group, experimental group

Gaining knowledge

- Knowledge is often context dependent
- Cultural background
- Social surrounding
- Time
- Religion (or its absense)

Bathing in the Middle ages



The colour of death? (China vs Japan)



The Nazi symbol for 75 years vs
Hindu symbol for thousands of
years



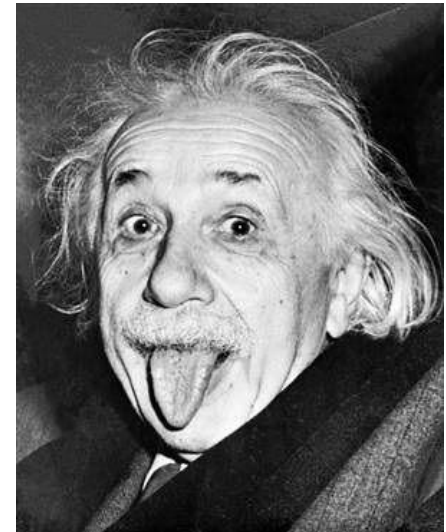
Personal knowledge

- Knowledge in this sense is about being familiar with something: in order to know Amy, one must have met her; in order to know fear, one must have experienced it.
- If you begin to think of examples to complete the sentence 'I know....' there's a mass of things you could think of. Your list is unique to you.
- Give an example of your personal knowledge

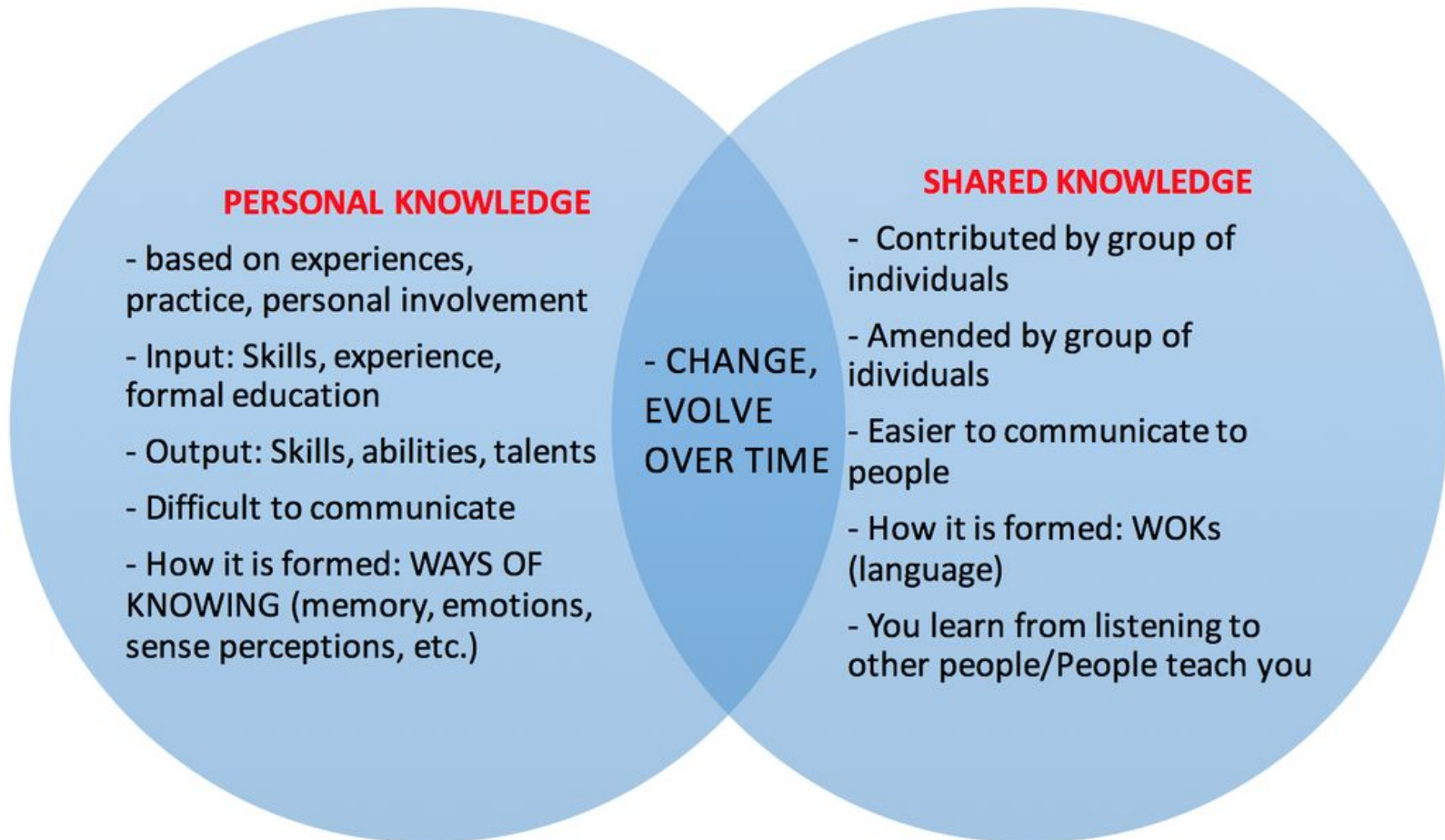


Shared knowledge

- Shared knowledge is assembled by a group of people.
- If you make a list of things that ‘we know...’ there’s more common knowledge that people agree on. In each of your six IB subjects, there’s a body of shared knowledge.
- ...was built up over centuries by thousands of talented scientists



Euler's diagram again!



The zone of exchange

- Think and question!
- Why should we believe what others tell us?
- How do we know it is true?
- Is there another way of thinking about what we are taught?
- We=Parents but what if not?



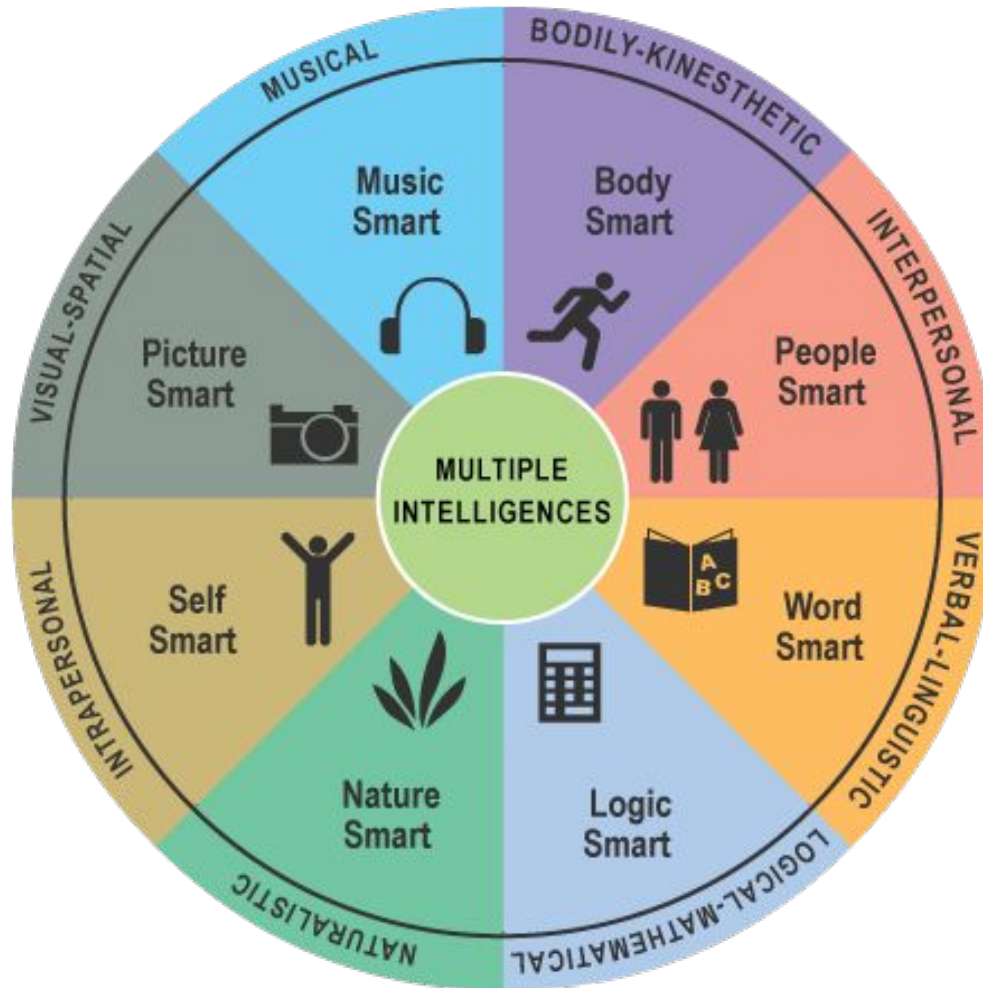
Experiential knowledge

- Experiential knowledge depends on living in the world, having sensations and emotions, learning language and thinking.
- Direct experience(immediate contact with the things around, active involvement, personal familiarity) It is unique!
- Critical Reflection – experience will pass, but thoughts remain. The habit of reflection can strengthen your personality! Watch out for mistakes in your thinking, it might improve your reflection.

Knowing how

- Skill based knowledge – experience that helps us to learn a skill
- Something between step by step information and experience
- All thinking skills are useless unless they are applied!

Howard Gardner's Multiple Intelligence



Propositional knowledge

- This is knowledge of facts, knowledge that such and such is the case.
- What is important is that propositional knowledge is not enough to give you either personal knowledge or procedural knowledge. Personal knowledge involves acquiring propositional knowledge in a certain way, and procedural knowledge may entail propositional knowledge.

Knowledge claim

- Knowledge claim is asserting that you know something
- Expressed in language, gestures, photos, music – all that communicate between people
- Phrased as a statement (not question)
- Presented as being true (even being highly questionable)
-

Knowledge claim

- Statement of personal observation
- Assertion of what we know through our sense



Knowledge claim

- Value judgment
- Opinions that can not prove to be true or false



Knowledge claim

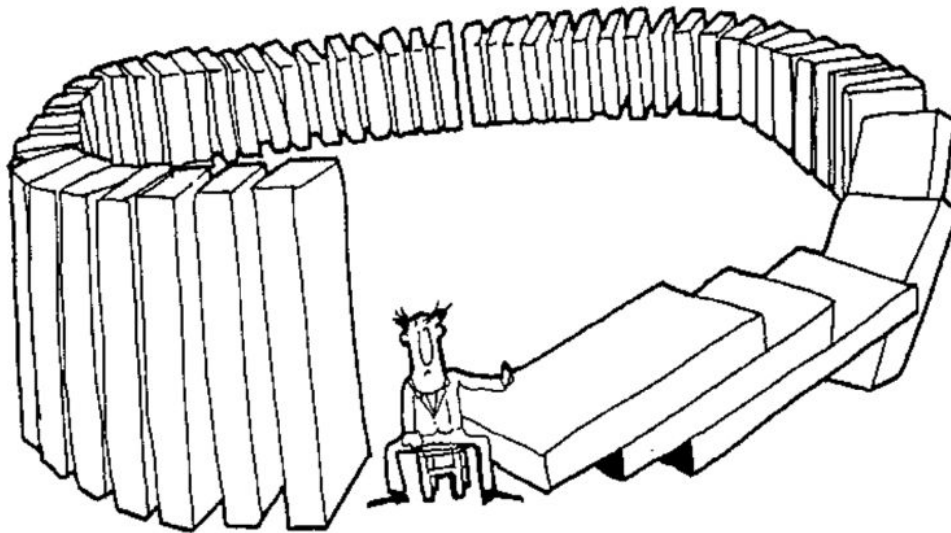
- Predictions
- You can apply observations of the past to the future



Knowledge claim

- Hypothetical statement
- Based on past observation and places two actions with causal connection

In complex systems, cause and effect are often distant in time and space



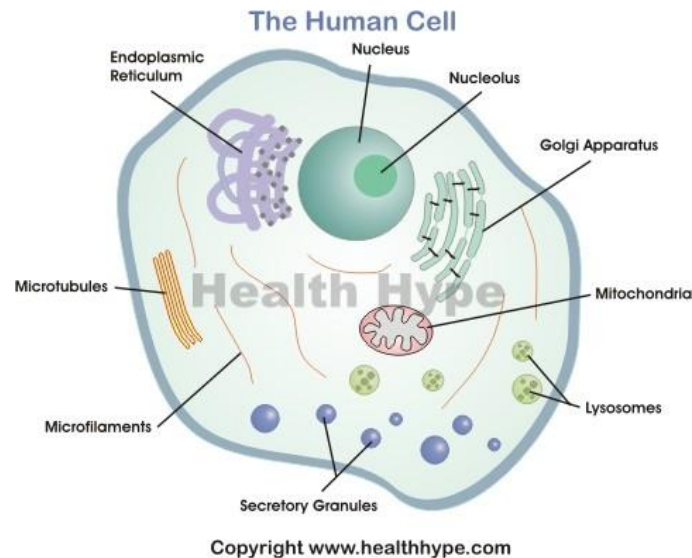
Knowledge claim

- Metaphysical statement (Meta - beyond)
- An assertion of spiritual belief



Knowledge claim

- Definition
- Places ideas in relation with each other using language



Knowledge question

- Questions about knowledge and the methods by which we create it
- Opened
- General

Knowledge questioning (from broad to narrow)

- How do I know what I know?
- How do we gain knowledge? How do we test it? How do we accept knowledge claims?
- How do we know in the human science as compared with the natural science?
- How do we know in anthropology is compared to economics?
- What characterizes the method of participant observation in anthropology?

Knowledge questioning (from narrow to broad)

- Baptism of Russia happened in 989
- What evidence is available for the date?
- How do we know that it happened?
- How do we know what happened in the past?



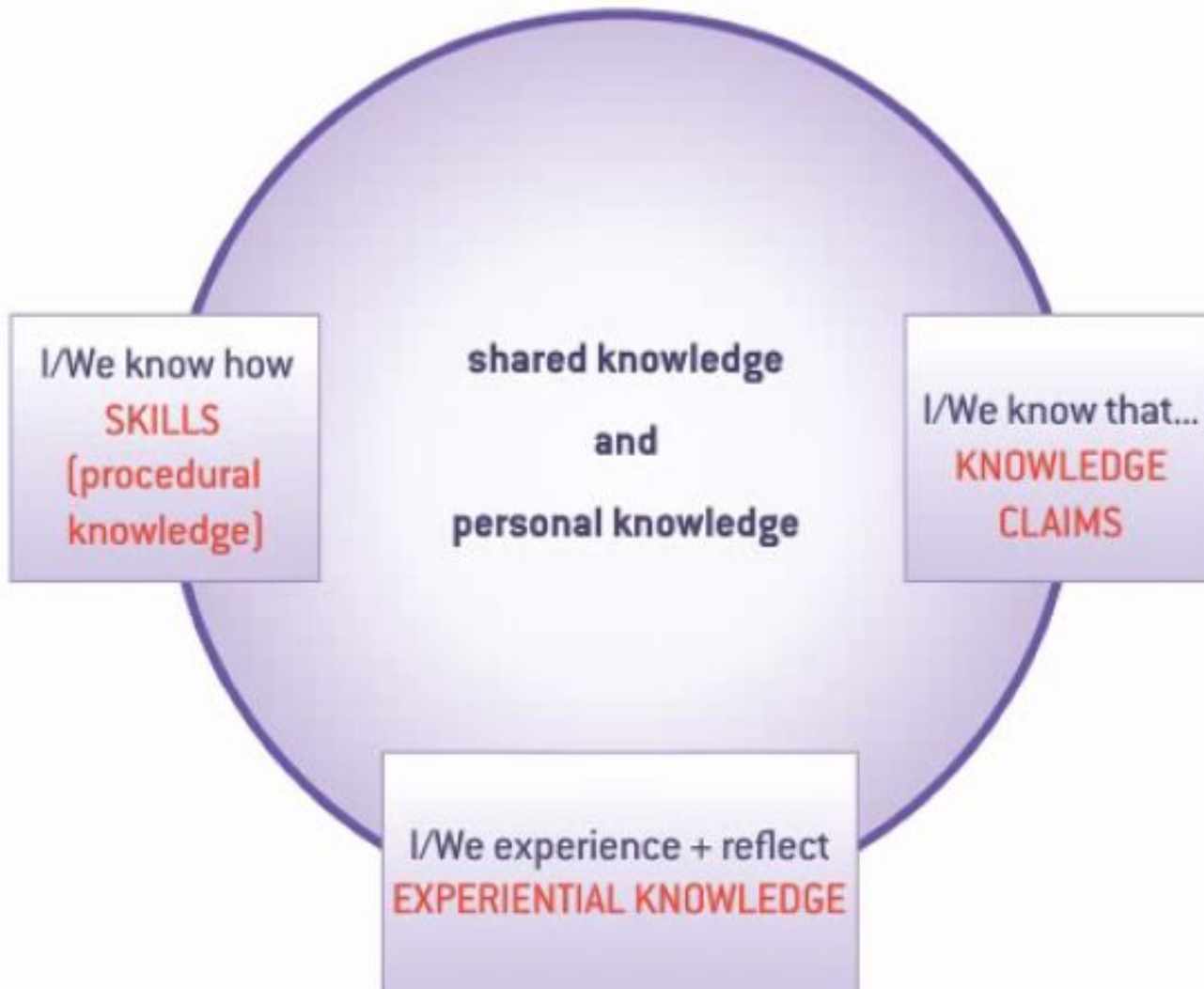
Practice in pairs

- Take one knowledge claim
- What knowledge questions will you ask about it? (from narrow to broad)
- Ask at list 4-5 questions



“How do we know?”

Kinds of knowledge



How do we know that the knowledge claim is true?



Coherence check for truth

- It this knowledge claim consistent with what I already know?
- Are there any contradictions?

Check for truth game

- Write 4 personal knowledge claims about yourself
- 3 true
- 1 false (it should not be obvious!)



Limitations of coherence test

- Are we right in beliefs that we previously held? (Be open-minded, please!)
- Confirmation bias – seeking for evidence for your position ignoring the evidence against
- Problems with relativism and subjectivity



Correspondence test

- Does the knowledge claim correspond to things actually are in the world?
- Observe
- Find evidence

“
If it disagrees with experiment it is wrong. In that simple statement is the key to science. It does not make any difference how beautiful your guess is. It does not make any difference how smart you are, who made the guess, or what his name is – if it disagrees with experiment it is wrong. That's all there is to it.”³

Richard Feynman

”

Think about this

- What problems can you identify in establishing truth on the basis of sufficient evidence?
- Is it possible for two people using the correspondence test to reach different conclusions?

Limitations of the correspondence test

- Not all knowledge claims can be checked by correspondence since not all are OBSERVATIONAL CLAIMS
- Reliability depends of quantity and quality of observation

Pragmatic test for truth

- Does it work?
- If it is useful, it is true

“
Ideas ... become true just in so far as they help us to
get into satisfactory relations with other parts of our
experience.⁴

William James

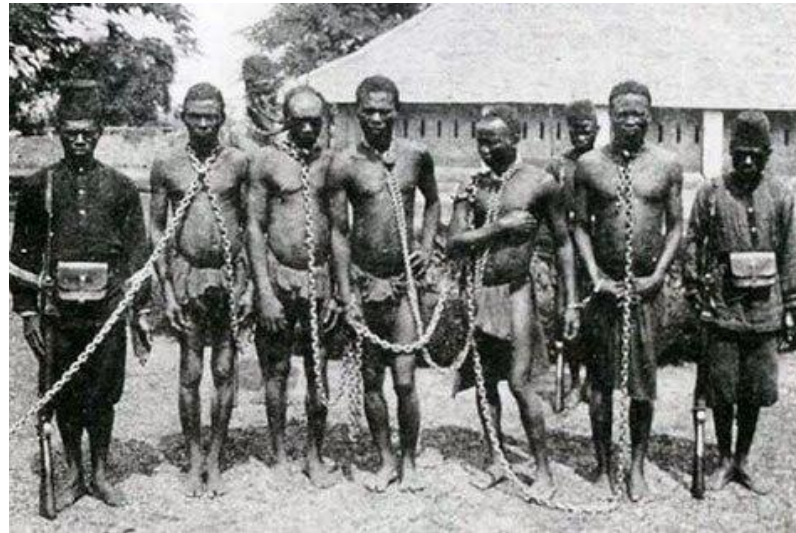
”

Pragmatic test

- The practical results of a theoretical concept may give us a reason to trust
- What problems can you see with a society accepting what works for it, and calling it truth?
- Is it possible for two people using the pragmatic test to reach different conclusion?

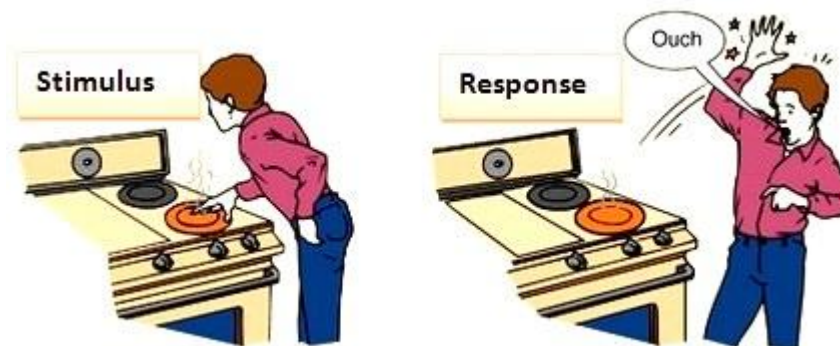
Limitations of Pragmatism

- When people find a way that works, they tend to ignore that thought that something could work better.
- How can we define usefulness?

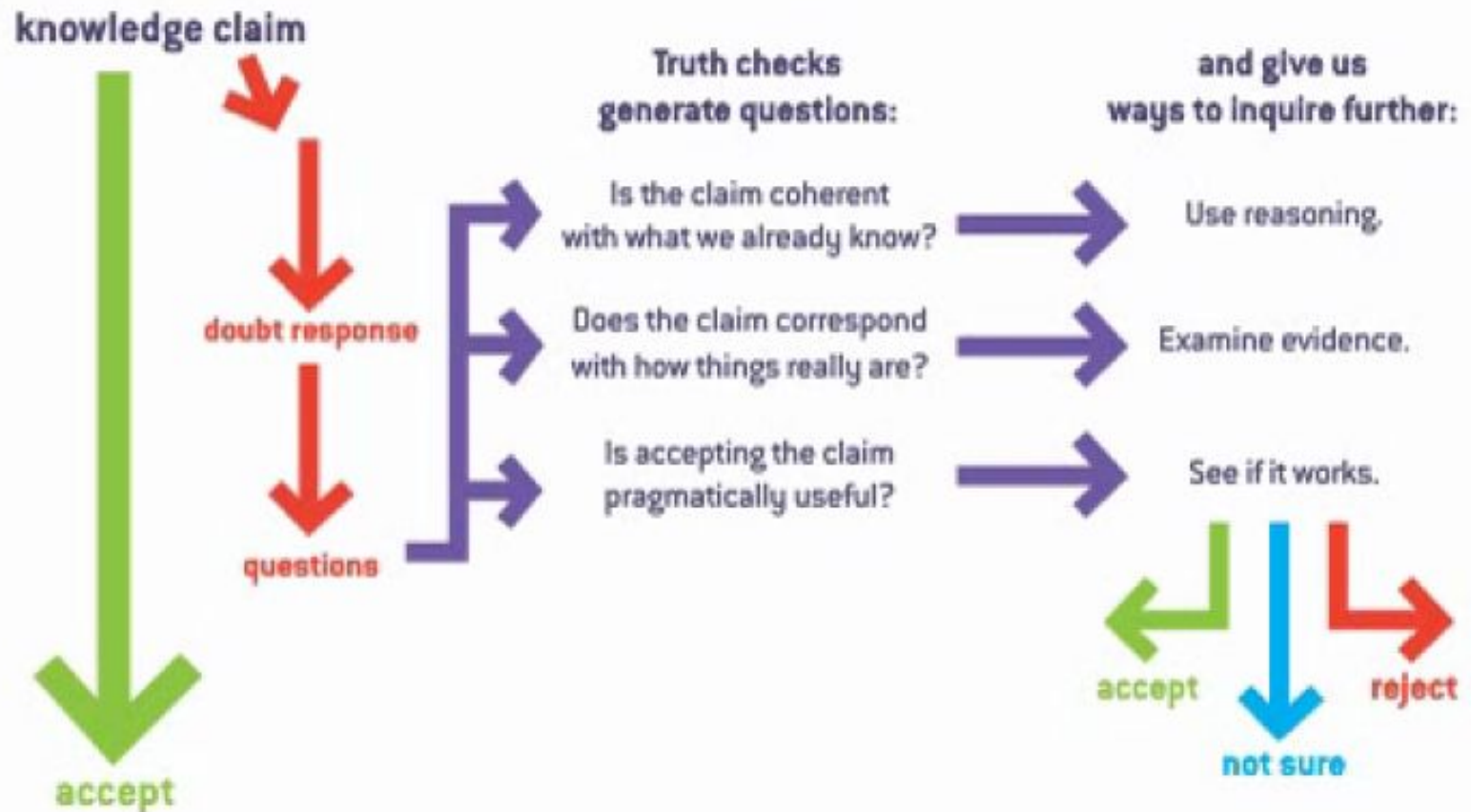


Limitations of Pragmatism

- It deals with consequences, not with explanations
- Stimulus to ask further questions and examine the claim using two more checks



Knowledge questions, high-in-sky level: What is truth? How do we know if a knowledge claim is true?



Ways of knowing

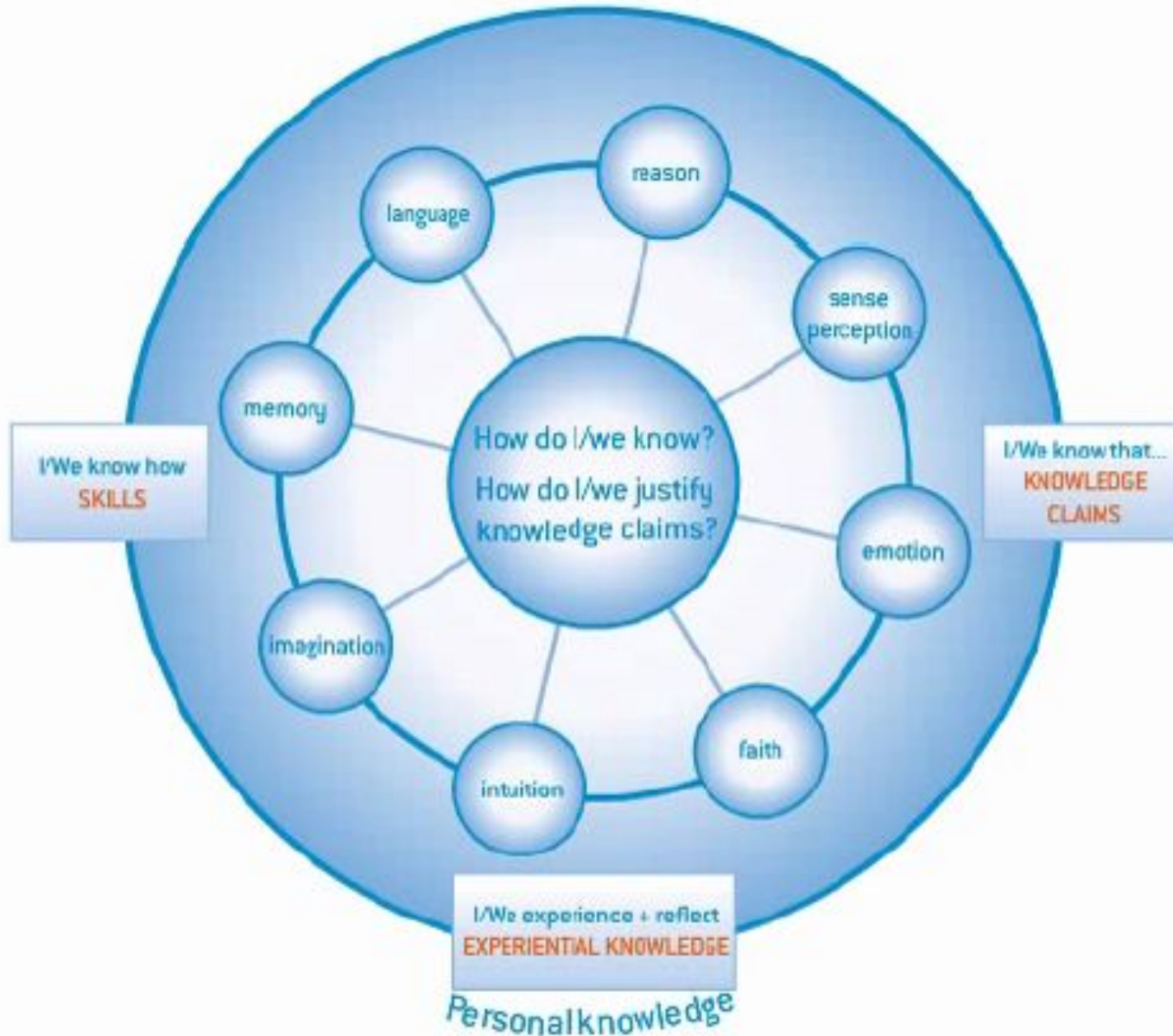
- Ways that people have claimed lead them to knowledge



Reason, Sense Perception, Faith

- Reason – capacity of mind to be logical and figure things out
- Sense Perception – sensation + interpretation
- Faith – all about religious knowledge (not serious)

Shared knowledge





Nutrition Facts

Tomatoes, red, ripe, raw
Serving Size 149g

Calories 27

GM food

Total Fat 0g 0%

Cholesterol 0mg 0%

Vitamins

Vitamin A 1241IU 25%

Vitamin C 18.9mg 32%

Vitamin K 11.8mcg 15%

GM FOOD

- What are they?
- What is your position on them – and how have you arrived at that position?
- How are they commonly perceived – do most people arrive at their position using the same ways of knowing as you?

<https://www.youtube.com/watch?v=EzEr23XJwFY>

Questions on GM foods

- Should we use reason alone to determine whether GM food should be promoted or limited?
- Are other ways of knowing - faith, intuition, emotion - valid?
- What role does language play in persuading us of either side's point of view?
- Should we apply imagination to help us understand what might happen if GM food was either halted completely, or pursued with no limitations?

Daniel Tammet: different ways of knowing

- In pairs, watch Daniel Tammet's talk
- Compose six questions you'd like to ask Daniel Tammet based on what he talks about
- Imagine the answers that he might provide, and write them down

https://www.ted.com/talks/daniel_tammet_different_ways_of_knowing?language=ru#t-29516

Sense perception

- Sensation (taste, vision, smell etc.)
- Interpretation

MORE THAN MEETS THE EYE

- ***Empiricism***: all knowledge is ultimately based on perceptual experience.
- ***Common-sense Realism***: our sensory apparatuses are relatively straight-forward and passive, giving us an accurate picture of reality.
- ***Problem***: interpretation plays a big role in what we perceive.

Only smart people can read this. I don't believe that I could actually understand what I was reading. Because of the phonemic power of the human mind, according to research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be in the right place. The rest can be a total mess and you can still read it without a problem. This is because the human mind does not read every letter by itself, but the word as a whole. Amazing, huh? Yeah and I always thought spelling was important!

*Sense perception is the
active, selective and
interpretive process of
recording or becoming
conscious of the external
world*

- Perception can be thought of consisting of two distinct parts
- *Sensation*: The part provided by the world around us
- *Interpretation*: The part provided by our minds

Our experience of the world is
affected not only by what is 'out
there' but also by *our sense organs*
AND our minds

DECISION

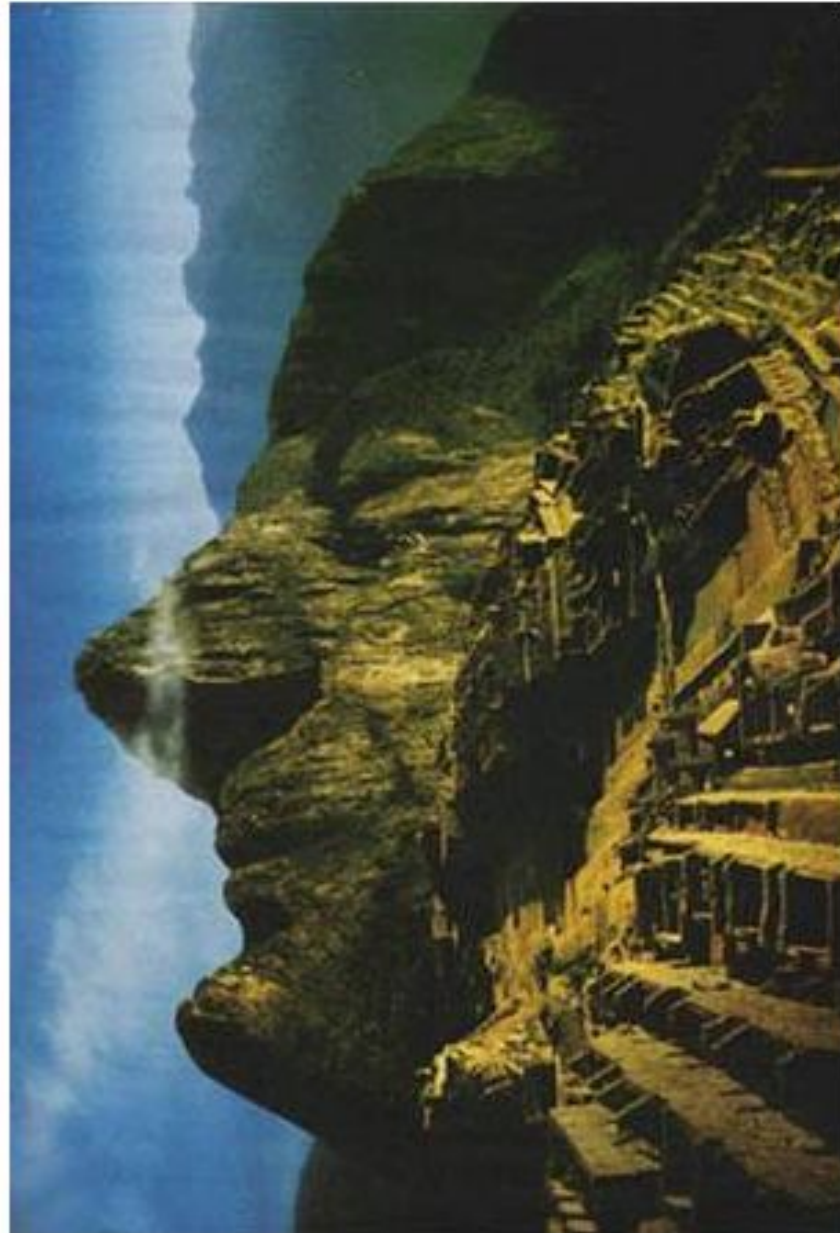
- If for some reason you had to sacrifice one of your senses, which would you be most willing to lose and which would you be least willing to lose?

- Why?





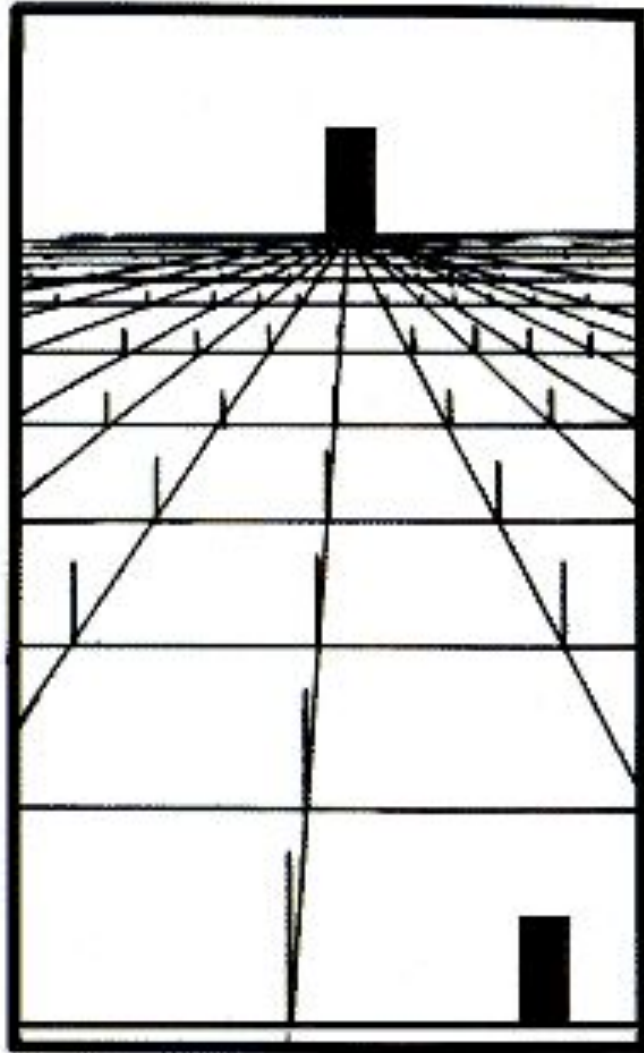
Take a look at this picture of some ancient ruins...
Notice anything unusual about the mountains?



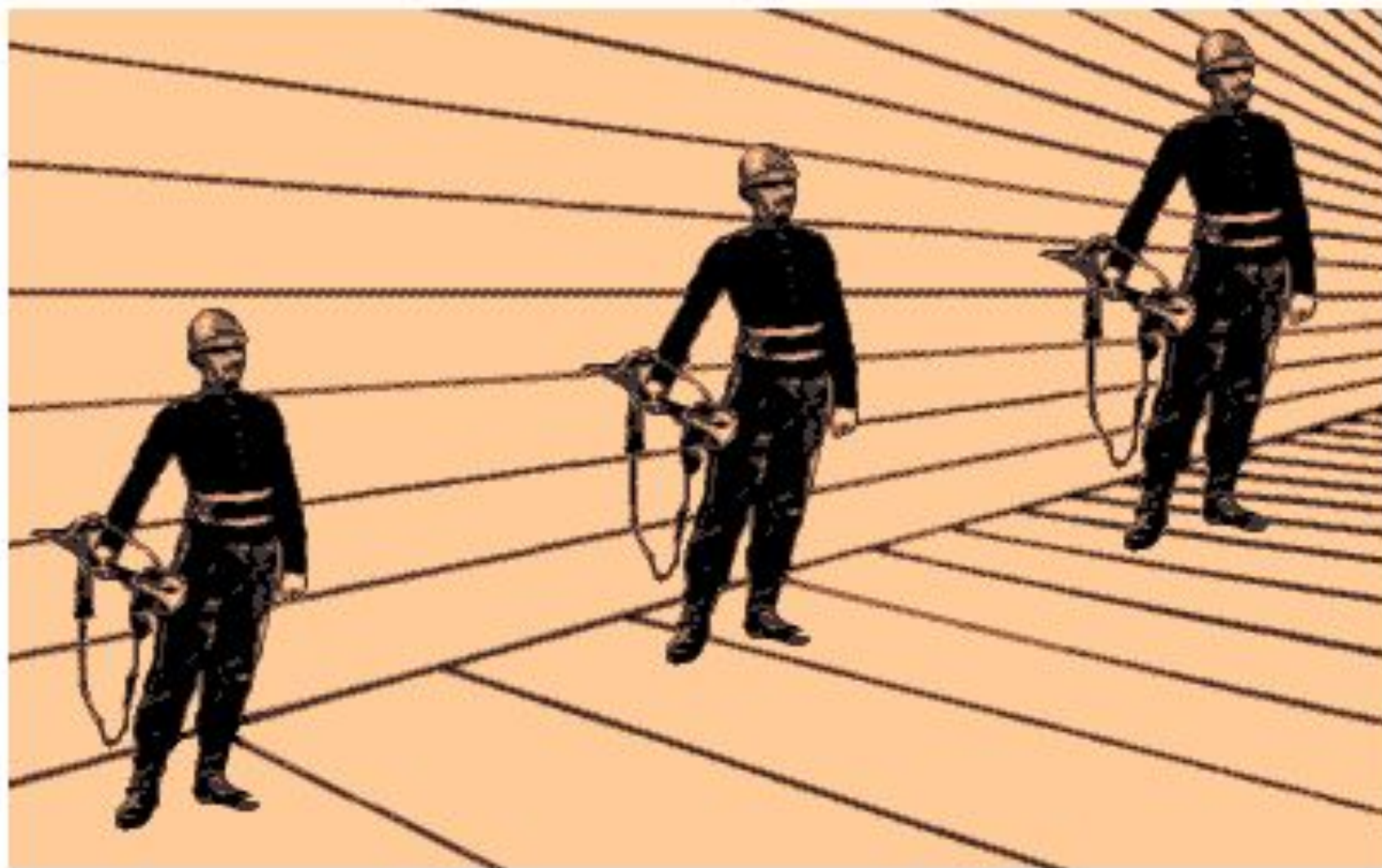
PERCEPTUAL ILLUSIONS

- **FIGURE AND GROUND**: tendency to highlight certain aspects (figure) and treat other parts as background (ground).
- **VISUAL GROUPING**: tendency to look for meaning in what we see and group things into patterns and shapes
- **CONTEXT**: the way we see something depends in part on the surrounding context
- **EXPECTATION**: we see what we expect to see

CONTEXT



Which soldier is taller?

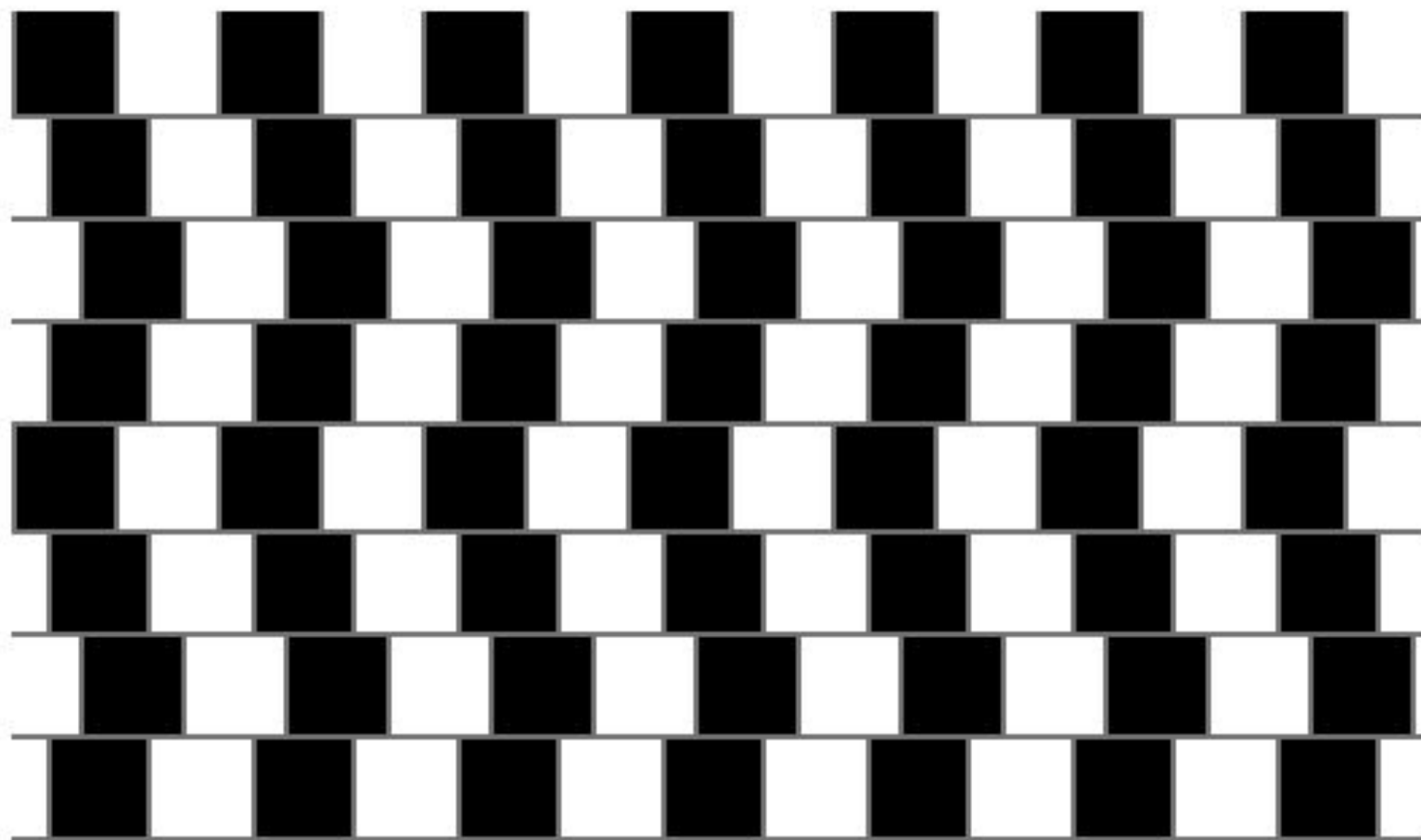


VISUAL GROUPING



Do you see a musician or a girl's face?

Are the horizontal lines parallel or do they slope?



DAILY LIFE ILLUSIONS

- You are also facing visual illusions in your daily life:
- TV ----- All the colors you see on TV are just due to 3 colors (red, green and blue). Because they are so close, the retinal images overlap and different colors result.
- Clothes with vertical stripes make a person look thinner than clothes with horizontal stripes.
- The moon racing through the clouds ----- we tend to view large objects (the large clouds) as stationary and the smaller object (the moon) as the one moving.
- A red car looks larger than a green car of the same model when viewed from far above, because of different speeds of light.

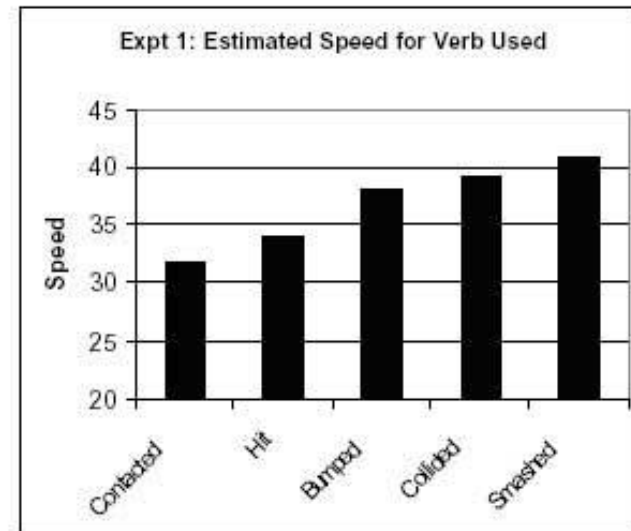
EYEWITNESS TESTIMONY

- <https://www.youtube.com/watch?v=-KffGHRXED0>
- <https://www.youtube.com/watch?v=UuqFX9EQ9zw>



Loftus and Palmer (1974) Study

- **Aim:** To test their hypothesis that the language used in eyewitness testimony can alter memory.
- To test this Loftus and Palmer (1974) asked people to estimate the speed of motor vehicles using different forms of questions. Estimating vehicle speed is something people are generally poor at and so they may be more open to suggestion.



Loftus and Palmer (1974) Study

- **Findings:** The estimated speed was affected by the verb used. The verb implied information about the speed, which systematically affected the participants' memory of the accident.
- **Response-bias factors:** The misleading information provided may have simply influenced the answer a person gave (a 'response-bias') but didn't actually lead to a false memory of the event. For example, the different speed estimates occur because because the critical word (e.g. 'smash' or 'hit') influences or biases a person's response.
- **The memory representation is altered:** The critical verb changes a person's perception of the accident - some critical words would lead someone to have a perception of the accident being more serious. This perception is then stored in a person's memory of the event.

THREE CONFIRMATION TESTS

- Confirmation by another sense—touching is believing
- Coherence—something fits in with our overall experience
- Independent testimony—other witnesses see the same thing

LINKING QUESTIONS

- *Do we have the right interpretation of our senses ?*
- *How do we know ?*
- *Is perception or reason the more reliable source of knowledge?*
- *How does the way we describe something affect how we see it?*
- *How does your mood affect your perception of things?*
- *Does perception play any role in mathematics?*
- *How far do expectations influence observations?*
- *How does the act of observation influence that which is observed?*
- *Should we trust eyewitness evidence?*
- *To what extent do the arts help us see with new eyes?*
- *Do good people see the world differently from bad people?*

