

Welcome Back!

Take a clicker from the
bag in front

Experimental Psychology

Lecture #1

How to Ask and Answer Questions

- Is drinking/eating too much X bad for you?
- Is eating genetically modified food harmful?
- Should a mother stop taking medication X when they are pregnant?
- Should I vaccinate my child?
- What are the risks associated with X medical procedure?

- Ask a Question
- Get the Facts
- Use the facts to make an inference about the question (get an answer)

- Psychologists ask and answer questions by conducting research and reporting the results in scientific journals
- Course goal: to help you understand the methods used to produce research, and the analytical tools evaluating what findings from research actually mean

What is replication?

Why is replication important?

Question:

Imagine sampling 100 recent studies published in Psychology.
What percentage would replicate?

Course Overview Syllabus Questions

First Lecture

Ground Rules

- Be on time
- Read the textbook
- Think, Ask questions

Course Goals

- Critical thinking
- Communication
- Data-sense
- Learn about Experimental Psychology

This Course

- Lecture
- Lab

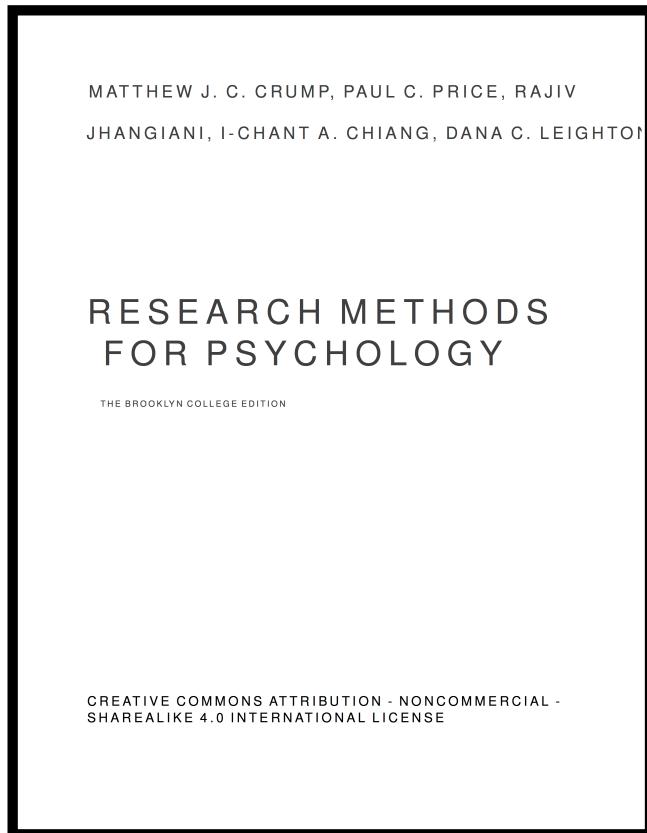
Lecture

- Discuss an article or claim
- Course concepts
- Lab prep
- Weekly assignments
- Midterm & Final

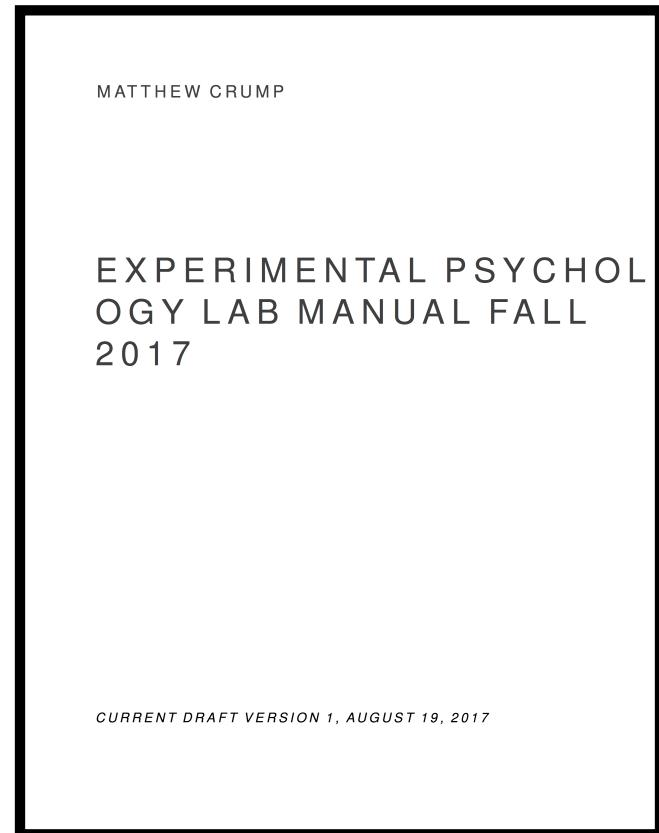
Lab

- Design, run, analyze experiments
- 3 written papers (apa format)
- 2 oral presentations

Textbook



Lab manual



Available online for free!

Course Materials

[http://crumplab.github.io/courses/
experimental/](http://crumplab.github.io/courses/experimental/)

Questions?

Lecture #1

- Textbook reading: Chpt 1

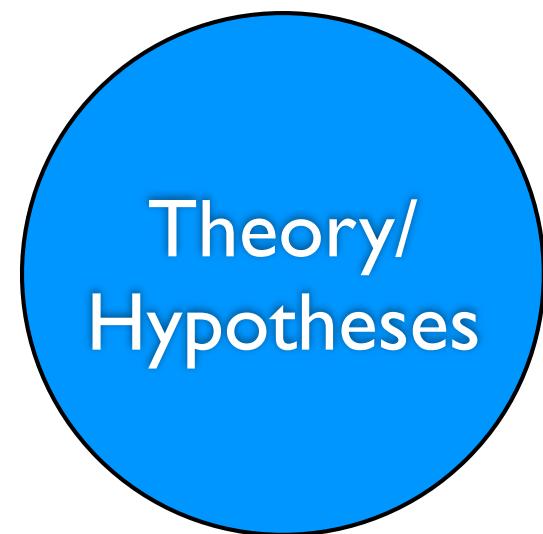
What is Science?

Science is a way of
knowing about the world

Experiences

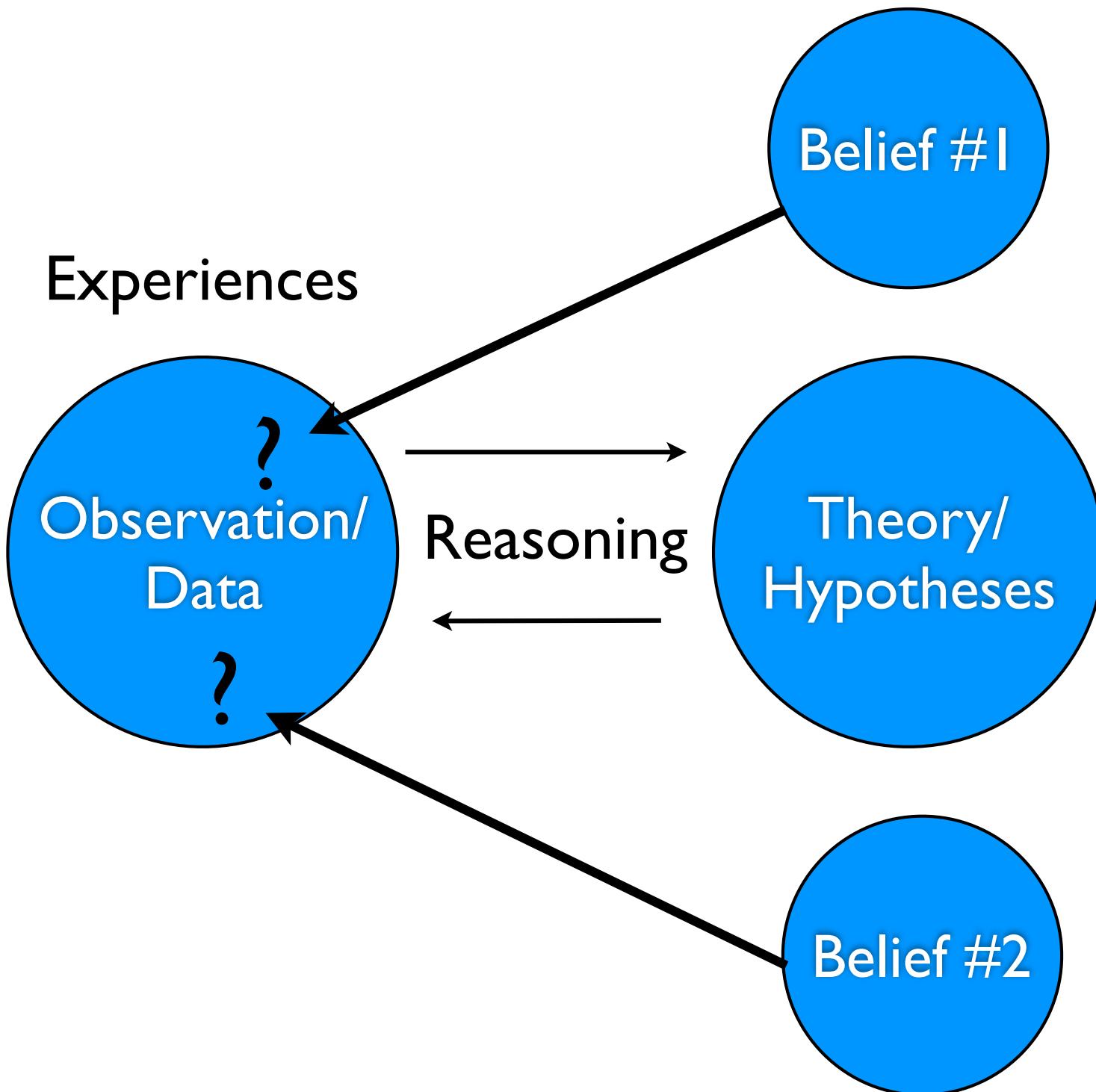


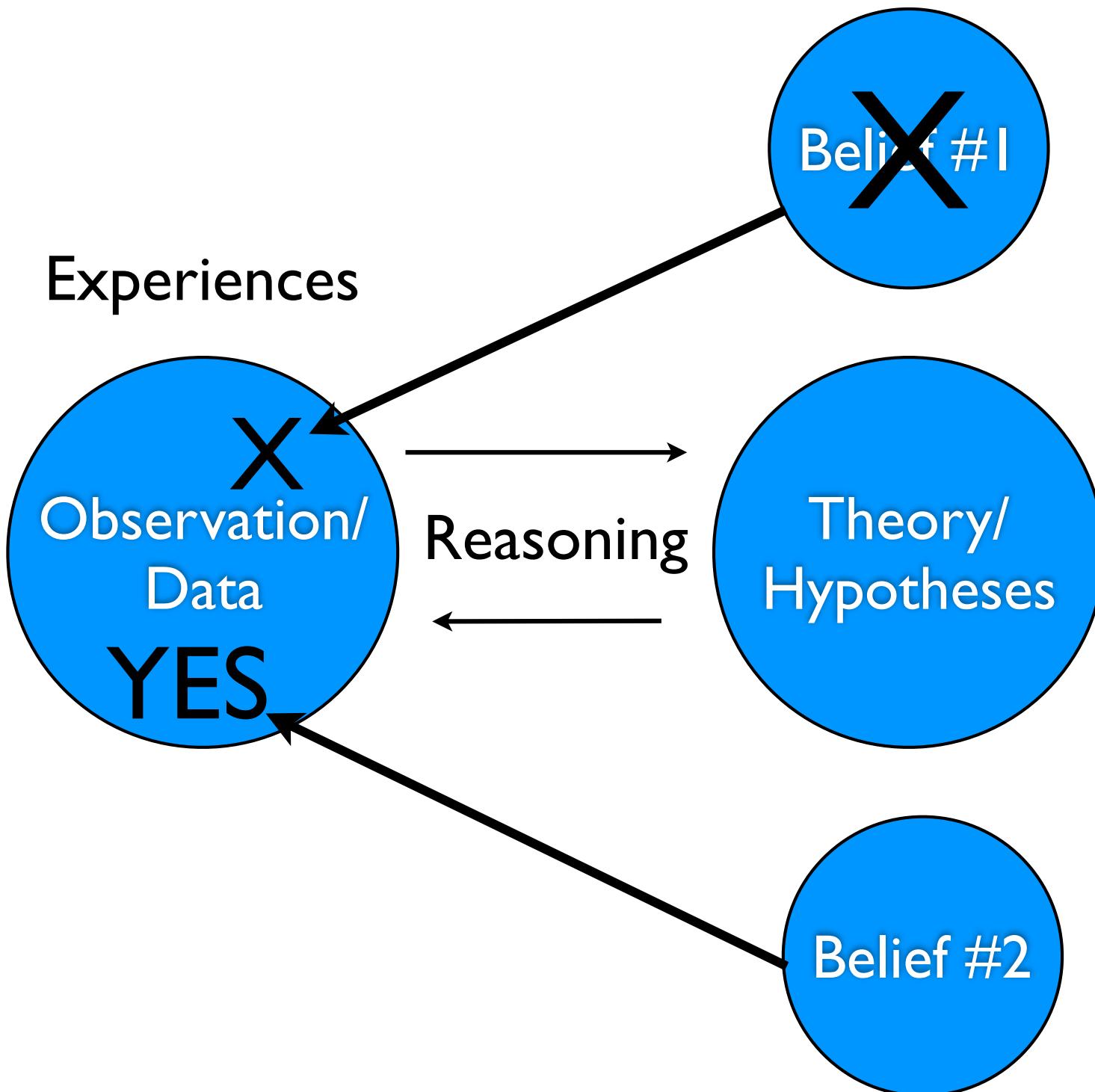
Beliefs



Reasoning

A horizontal double-headed arrow with a black outline, positioned between the two circles. The word "Reasoning" is written in black capital letters below the arrow.





Ways of knowing

Experience

Authority

Reason

Belief

EXPERIENCE

Everything else

Friends
TV
Magazines
Parents
Strangers
Internet
Respected groups
Journals

Video games
Comics
Movies
Religion
Politicians
Society
The media
Science
History ...

School K-12

College

Teachers &
books tell you
things

4-5
Conversational speech

You can talk back

18 mo
Begin to understand speech

People start
telling you things

0

10

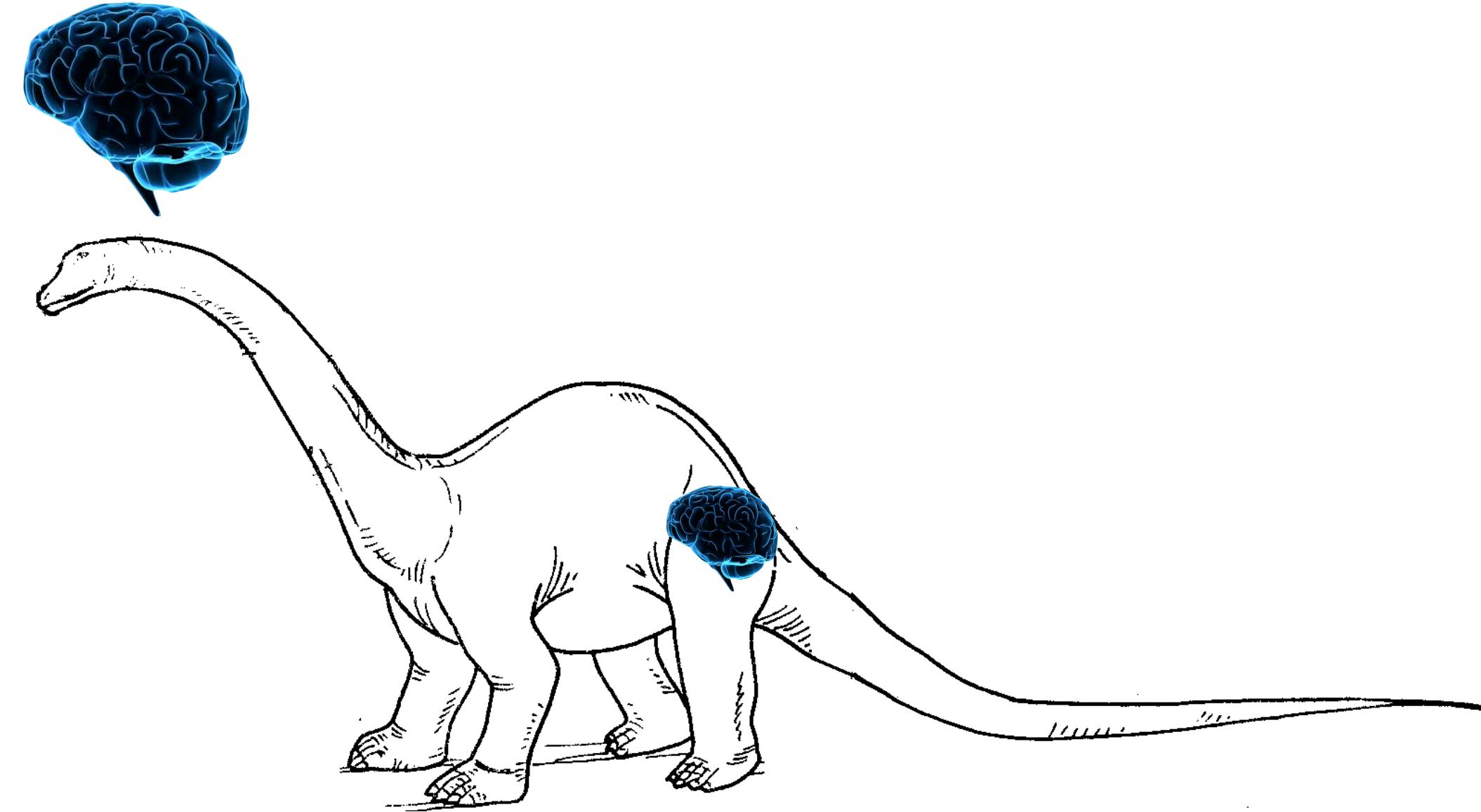
20

30

Exploration through senses

The world treats your brain
like an information dump







Experience

- The knowledge we receive from the world is interpreted by us
- We have blind spots, gaps in knowledge
- We do not always have the best interpretations

REASON

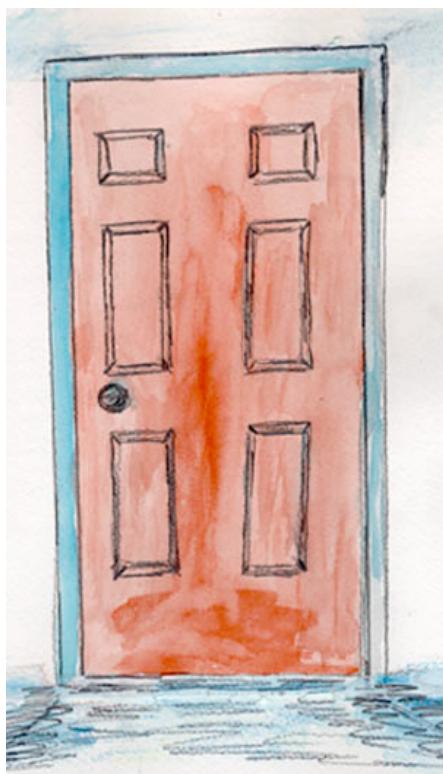
Reason

God is Love
Love is Blind
Stevie Wonder is Blind

Therefore,
Stevie Wonder is God

The Monte Hall Problem

There is a prize behind one of the doors, pick a door



The other doors have a goat behind them

You pick this door





The game show host
opens this door, shows
you a goat



You pick this door



You get one more chance to choose,
should you STAY or SWITCH?

Switch



Stay?



Argument for staying

1. You had no way of knowing which door has the prize, your choice is as good as random
2. There are only 2 doors left, that means a 50/50 chance for the door you chose
3. Why bother switching, your odds are the same whether or not you switch

Argument for switching

1. You had no way of knowing which door has the prize, your choice is as good as random
2. Your first choice was probably wrong, there are 2 wrong choices, and 1 right choice. Odds are 2/3 that you made the wrong choice the first time.
3. Assuming your first choice was wrong, the game show host then opens a different door, that you did not choose, and shows you that it was a wrong door.
4. You probably started with the wrong door, the game show host shows you the other wrong door, there is only one door left, the one that you didn't choose, YOU SHOULD SWITCH, the other door probably has the prize.

Reasoning through Monte Hall

1. There is a correct answer, you should switch
2. We found the correct answer through reasoning, but different lines of reasoning could easily lead to the wrong answer
3. Another way to find out would be to run an experiment

Reasoning

- We can hone our knowledge through reasoning
- But, our reasoning can lead us down the wrong path
- Reasoning without evidence is not enough

BELIEF

Belief

- People believe all sorts of things
- Let's find out what the class believes...

You are currently in this classroom

0 - False

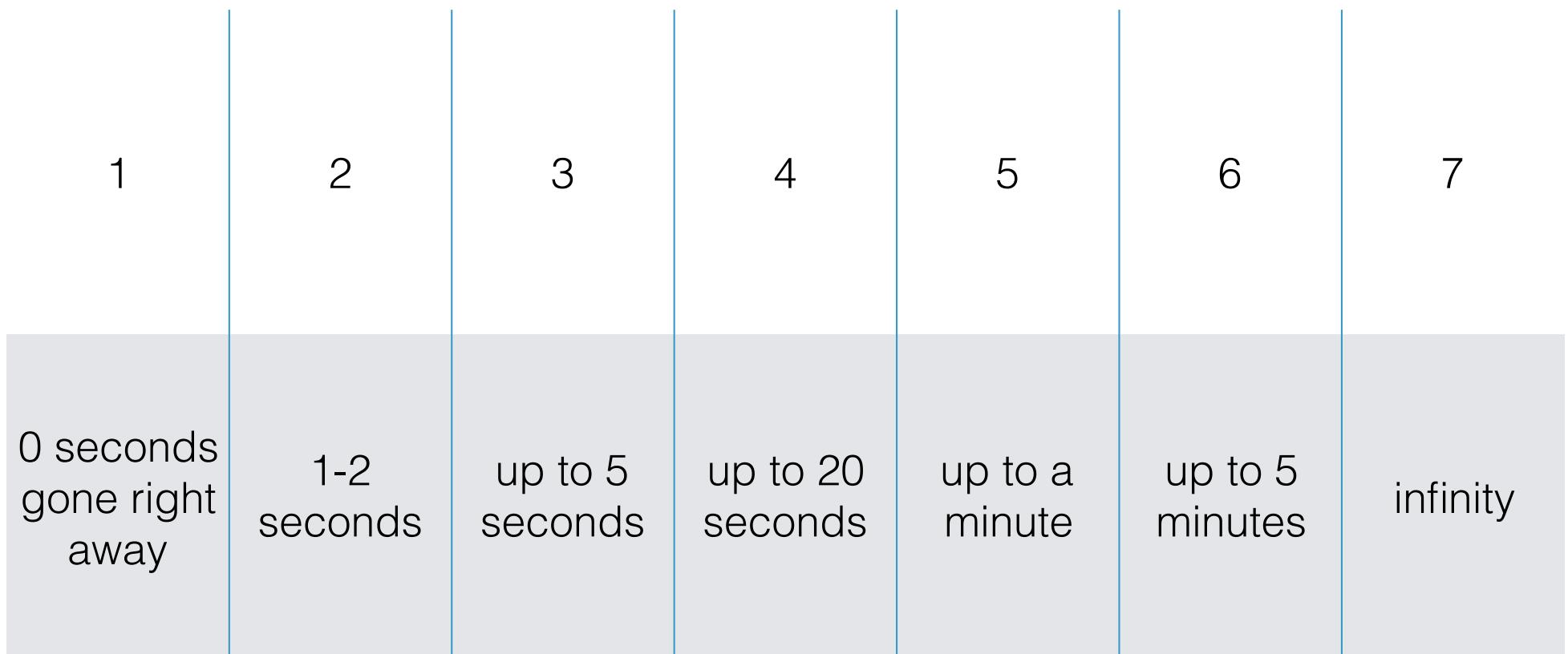
1-True

Cat's and dog's have consciousness

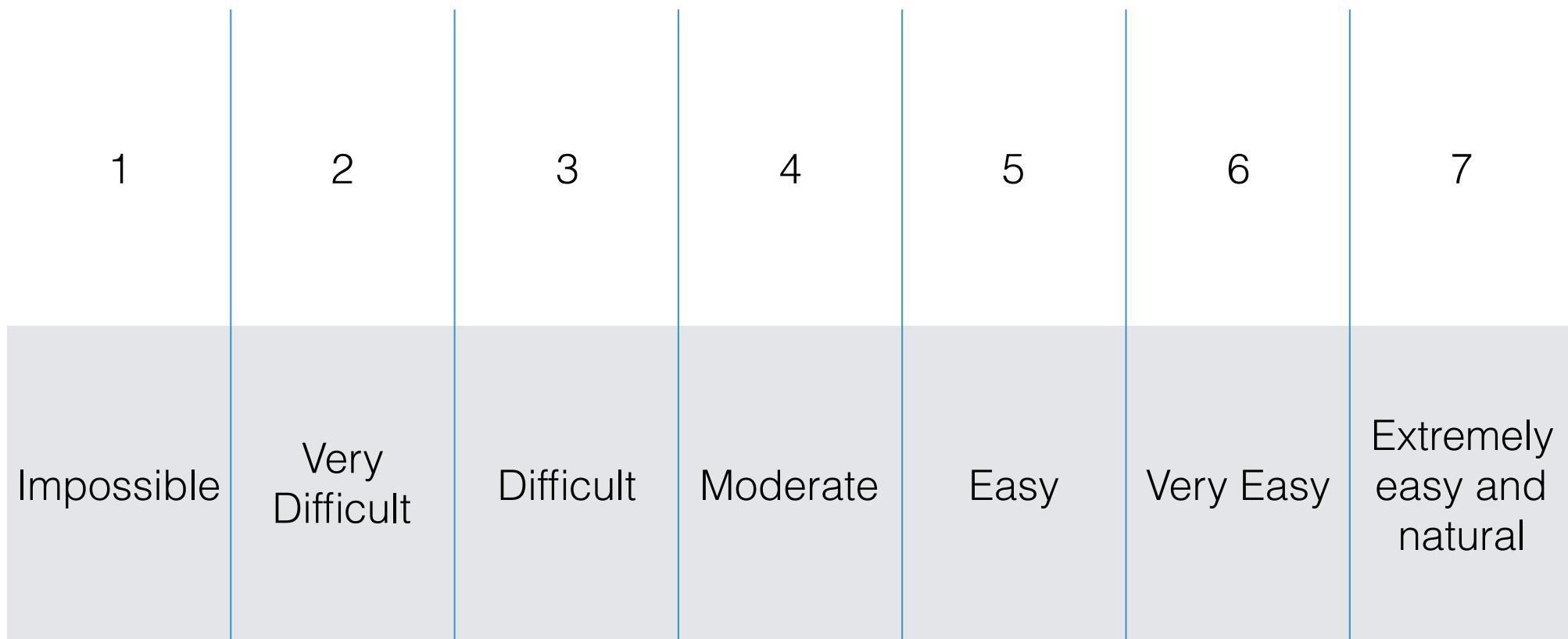
0 - False

I-True

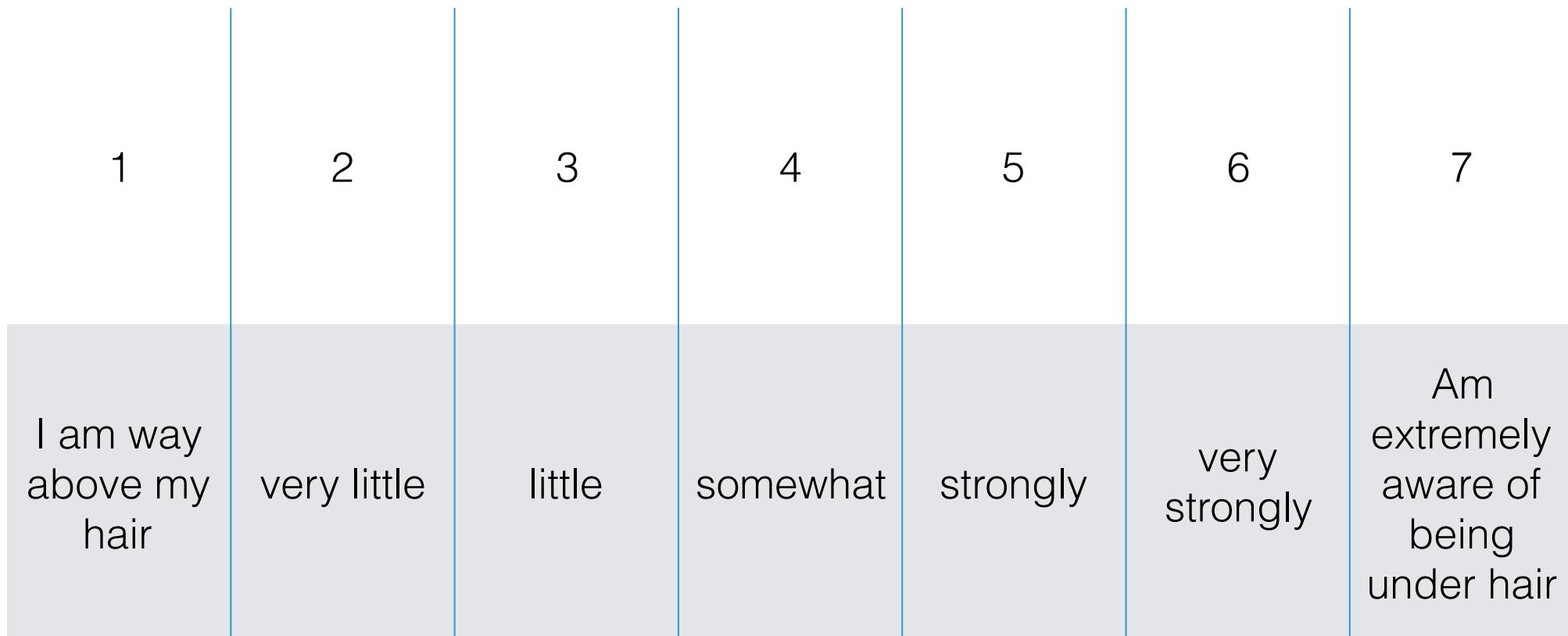
Look at your surroundings. Estimate how long you can hold on to this perception when you close your eyes



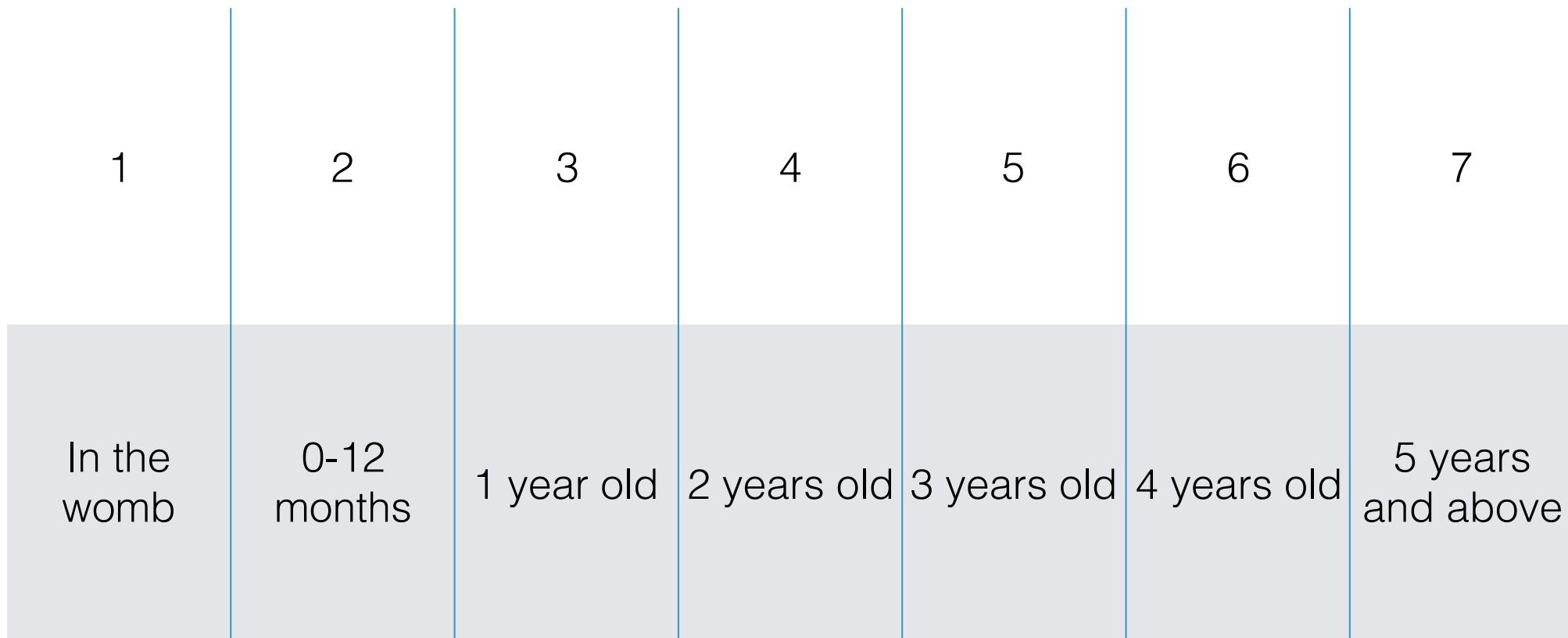
How easy is it for you to imagine you have another set of invisible arms that you can control independently from your real arms



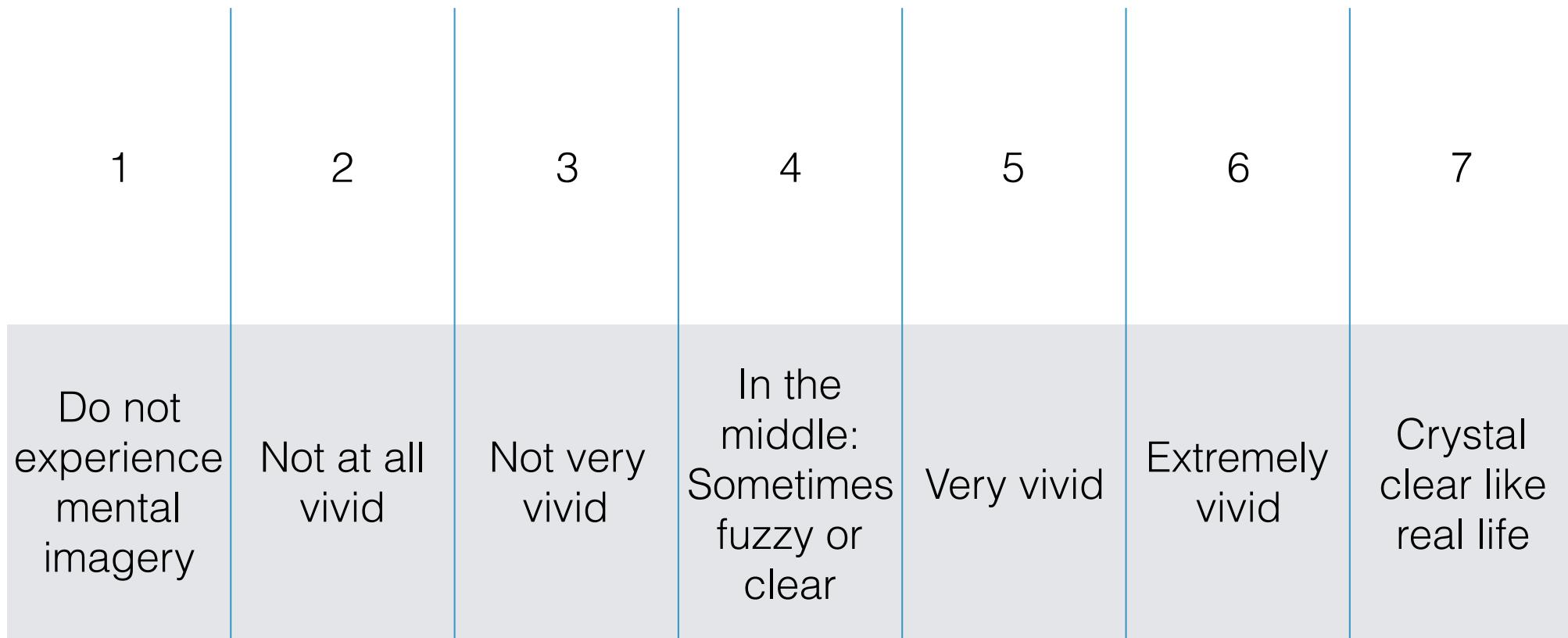
Think about your inner mental space, imagine its boundaries. Go to the very top of your mental space. How strongly do you feel that your mental space is underneath your hair?



How old were you when you had your first conscious memory?



How vivid is your mental imagery?



Imagine the future in your mind. How far away in time is the future?



Ways of knowing

Experience

Authority

Reason

Belief

Why do we need science?

Biases

Can we trust our information?

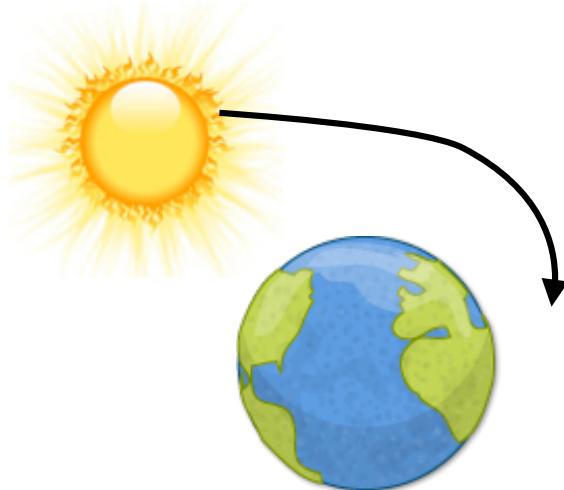
Can we trust what we think we know?

Belief Perseveration

Endlessly holding on to a belief, in the face of overwhelming evidence to the contrary

Geocentric

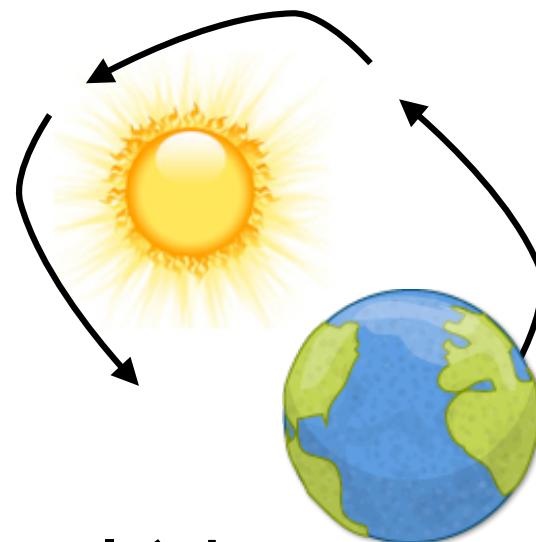
(sun revolves around earth)



1500 years

Heliocentric

(earth revolves around sun)



16th century
Copernican Revolution

1 in 6 Americans and Britons believe the sun revolves around the earth...

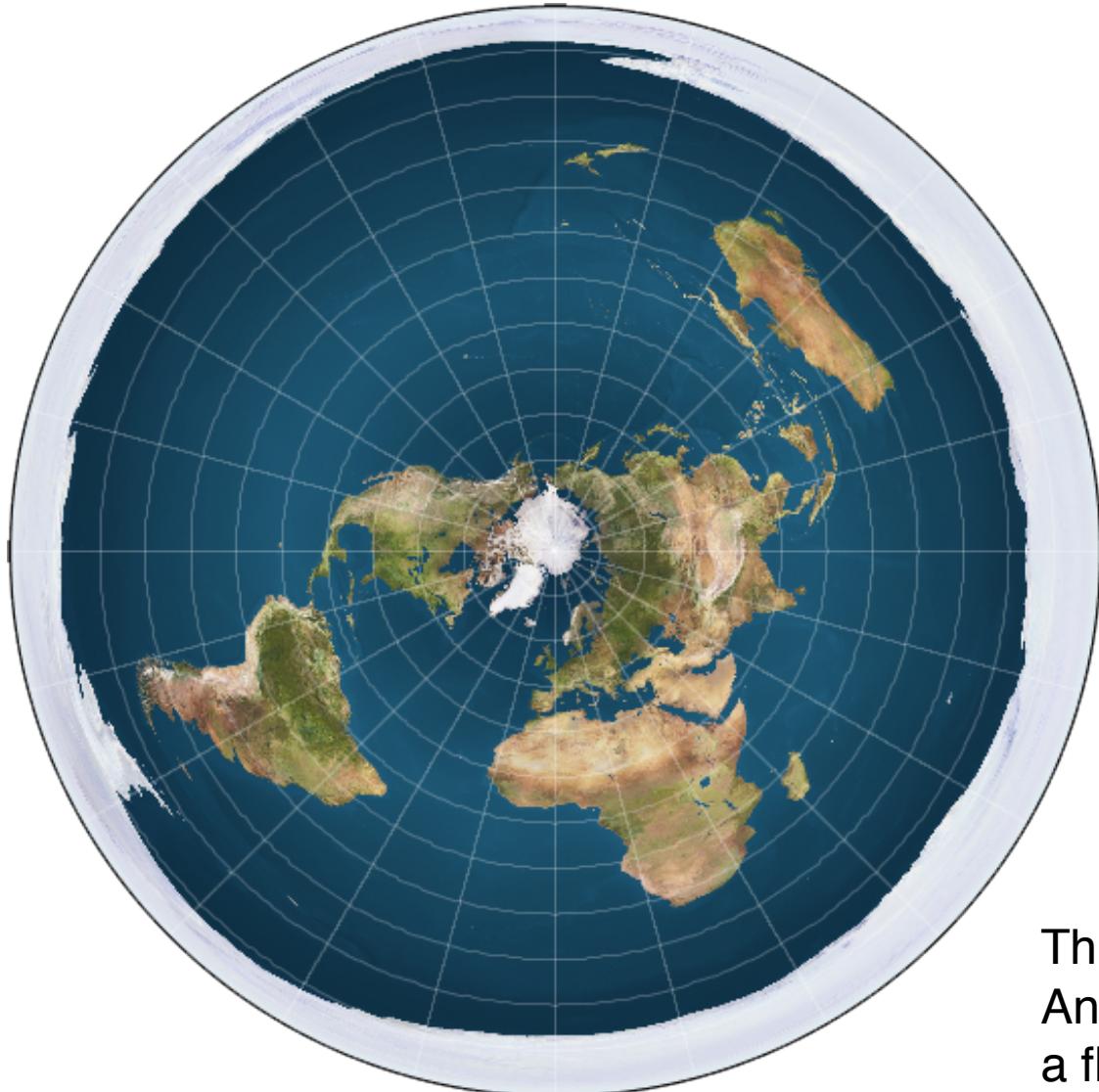
That's according to wikipedia, should we believe wikipedia?

<http://www.gallup.com/poll/3742/new-poll-gauges-americans-general-knowledge-levels.aspx>

<http://orgtheory.wordpress.com/2007/06/06/eppure-si-muoveor-does-it/>

The Flat Earth Society

(theflatearthsociety.org)



This flat Earth model depicts Antarctica as an ice wall surrounding a flat disk shaped Earth

Confirmation Bias

Paying special attention to evidence that fits your beliefs

Availability Heuristic

Tendency to estimate frequency of an event based on how easy it is to bring to mind

If you can think of it, it must be important

Availability Heuristic

Chiropractic treatments work well and have lots of science to back up how they work

You might be biased to accept this claim if you can easily think of someone who swears by going to the chiropractor

In fact, chiropractic care is extremely controversial and do not have wide scientific support

There are loads of biases

http://en.wikipedia.org/wiki/List_of_cognitive_biases

Biases Summary

Seemingly endless list of reasons why our personal knowledge could be deeply flawed

How can we overcome our biases and get knowledge we can trust?

So why do we need science?

Scientific Method

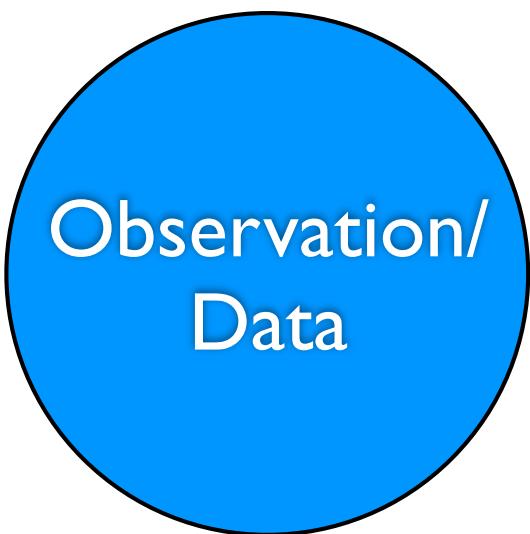
The aim of science is to produce verifiable, objective knowledge

Let's anybody put the world to the test, and get answers

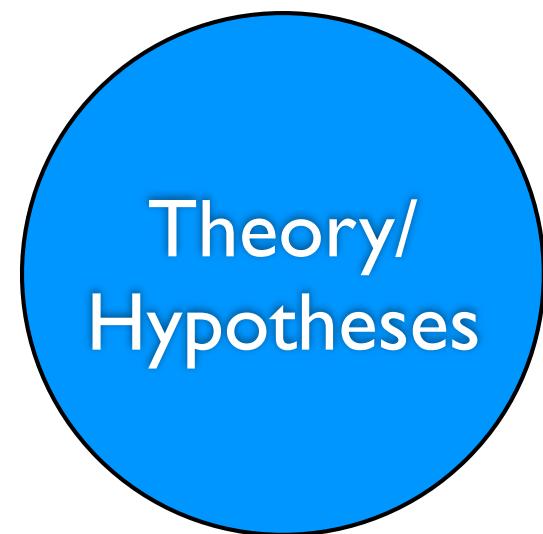
Science combines our ways of knowing to produce verifiable objective knowledge

Experience
Authority
Reason
Belief

Experiences



Beliefs



Reasoning

A horizontal double-headed arrow with a black outline, positioned between the two circles. The word "Reasoning" is written in black capital letters below the arrow.

Important aspects of science

Determinism

Discoverability

Systematic observations

Public Knowledge

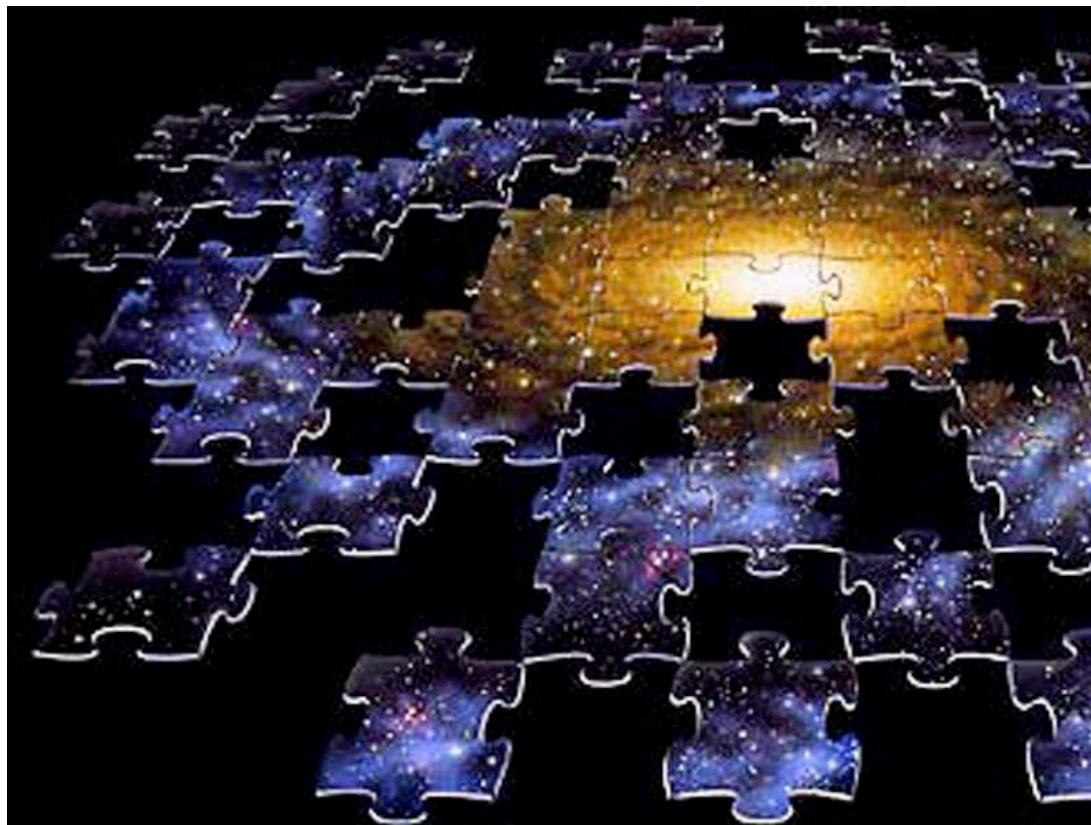
Data-based conclusions

Tentative conclusions

Asks answerable questions

Develops falsifiable theories

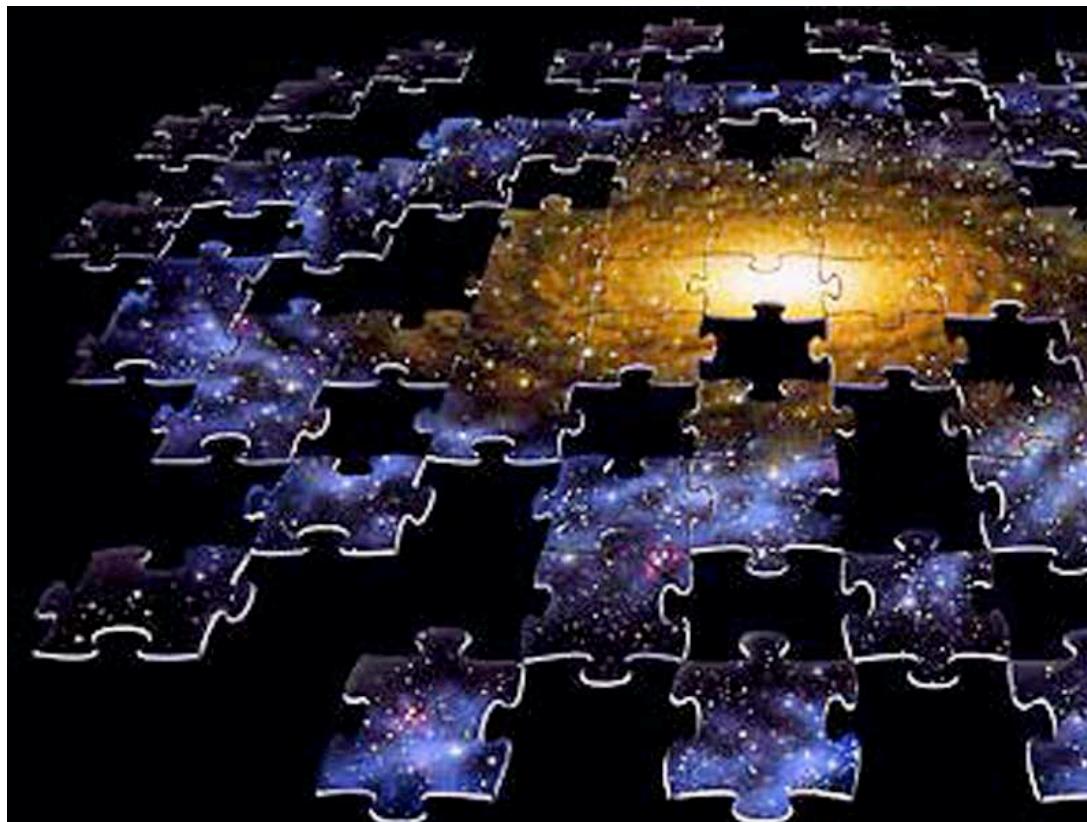
Determinism



The universe has
a causal structure

If we can explain it,
we can “predict” it

Discoverability



The universe has
a causal structure

If we can explain it,
we can “predict” it

We can uncover
this structure
through
observation

Systematic observation

Good definitions

Good measurement tools

Accepted methods

Logical conclusions

Public Knowledge

Findings replicate
Findings are communicated
Peer-reviewed
Published

Data-based conclusions

The results from having measured the world
The numbers
The facts of what we measured

Tentative conclusions

Careful not to over generalize
Understand limitations

Answerable Questions

Can we put it to the test?

Falsifiable theories

Science does NOT prove things to be true

Science progresses by proving theories false

As a result, we remove bad explanations,
and keep the best explanations