The Scientific Method…Cont'd

What is the difference between a hypothesis and a theory?

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Session’s Outline

By the end of this session, you will be able to:

- Recognise and understand the different scientific claims.
- Differentiate laws from theories and demonstrate an awareness of how they speak to scientific (un) certainty.

Which is more certain: a theory or a hypothesis?

Scientific Claims

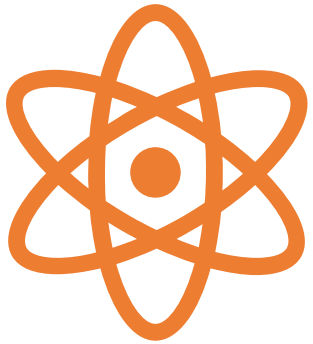
Observation

Hypothesis

Theory

Law

Observation



The most basic claim in science

It can be accurate or inaccurate

Example

- The cat weighs 5.5 Kg.
- Not very informative on its own.
- It doesn’t describe a general relationship between properties.

Hypothesis

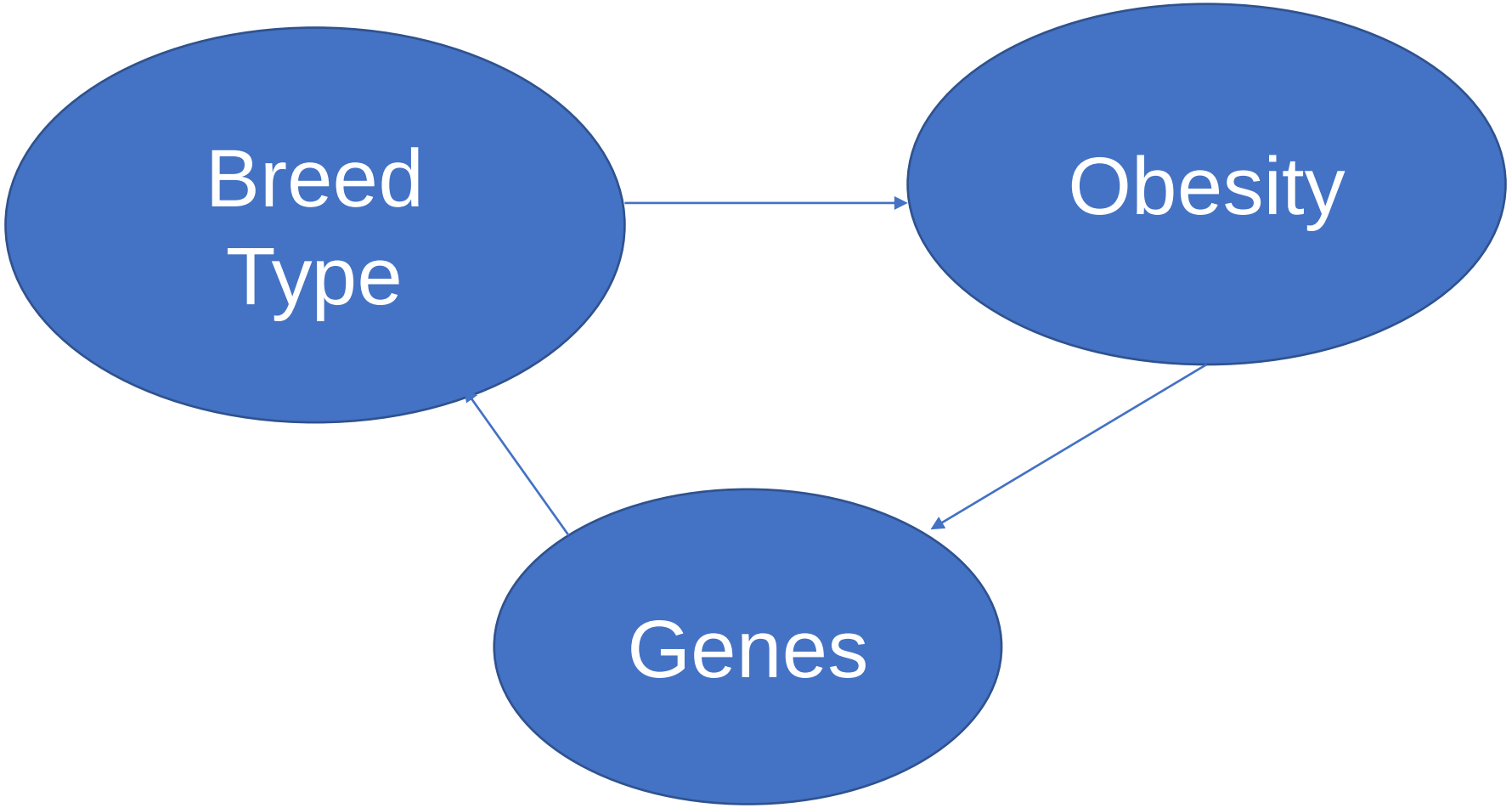
A hypothesis is a statement that describes a pattern or general relation between properties.

A hypothesis can also explain the pattern that it describes.

Example

- Siamese cats will, on average, be overweight, more than cats of a different breed.

Extending the explanation



Certainty?

- The plausibility of a hypothesis can range from very uncertain, to very certain.
- A hypothesis can be unsupported and therefore uncertain.
- For example, if it's new and still untested, a hypothesis can also be strongly supported by many empirical studies, and therefore more certain.

Law

- Laws are very precise descriptions of relations or patterns.
- So precise that they're usually expressed as mathematical equations.

Example

$$F_g = \frac{Gm_1m_2}{r^2}$$

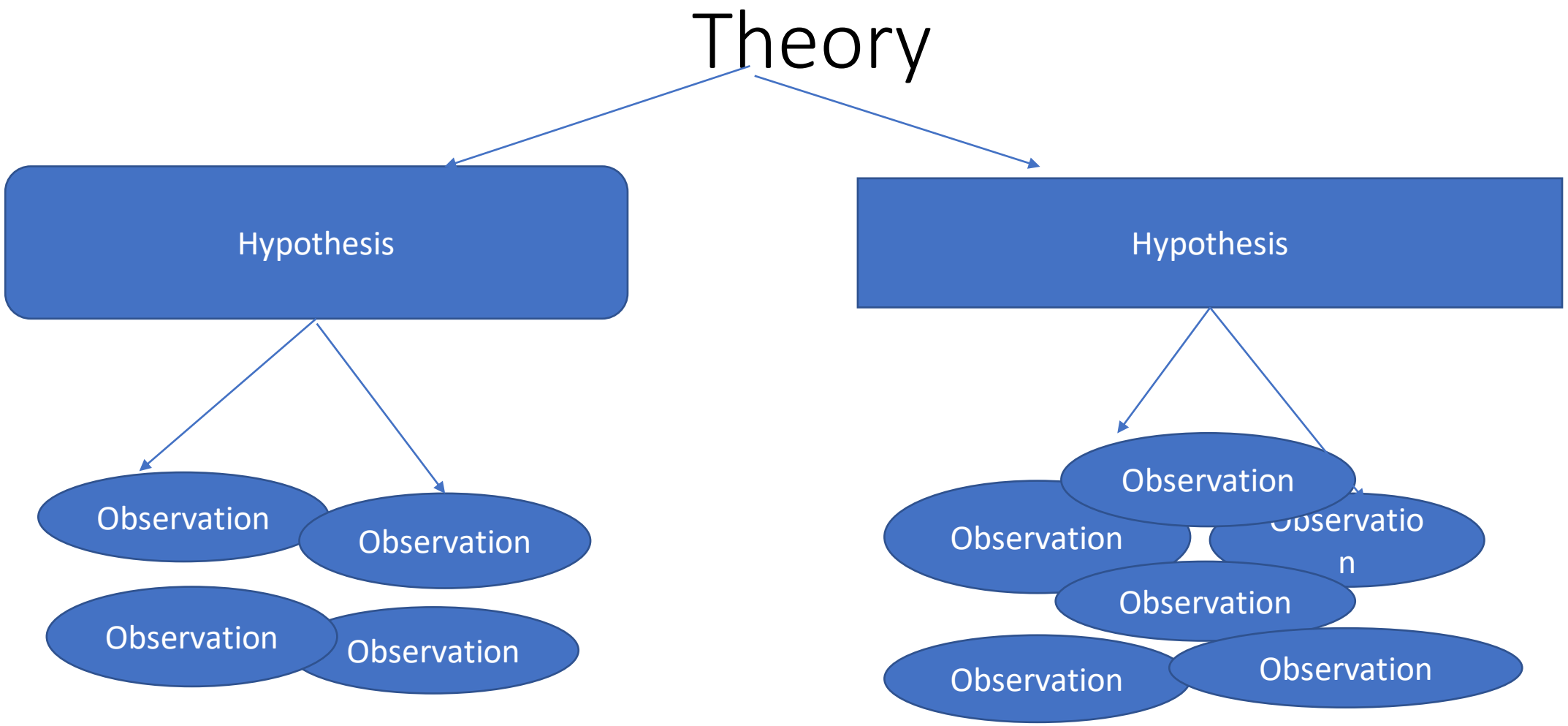
Certainty!

- Laws allow for very precise predictions, but they usually don't explain the relationships that they describe.
- In this case, between distance, time, and gravity.
- In the social sciences, laws are hardly ever formulated, because we understand too little of people and groups yet to be able to specify patterns in their behaviour with such a degree of precision that we can postulate scientific laws.

Theory

In day to day life, theory means an unsubstantiated statement, an educated guess.

In science however, theory refers to a broad overarching explanation of many related phenomena.


Theory
Hypothesis
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Conclusions

- Theories are the most well-established explanations, the closest thing to certainty that we have, because they consist of hypothesis that have survived the scrutiny of the scientific method.
- This doesn't mean that scientific theories are certain or true.
- There have been many well-substantiated theories that were ultimately replaced, like Newton's mechanics that made wave for the special theory of relativity.
- In science, there is no certainty. Only a provisional best explanation.

Bibliography and references

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