The Nature of Scientific Inquiry

How Science Works

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So many questions…

- The ancestor of science is ignorance.
- Asking a question about the world around you is the first step away from ignorance and towards understanding.
- Science is the tool used to understand how the world works.

Answering your question…

- What you think the answer to your question may be is called a HYPOTHESIS.

- The hypothesis is then tested to see if it is correct.

If it is wrong…

- Go back to the drawing board and formulate another hyp

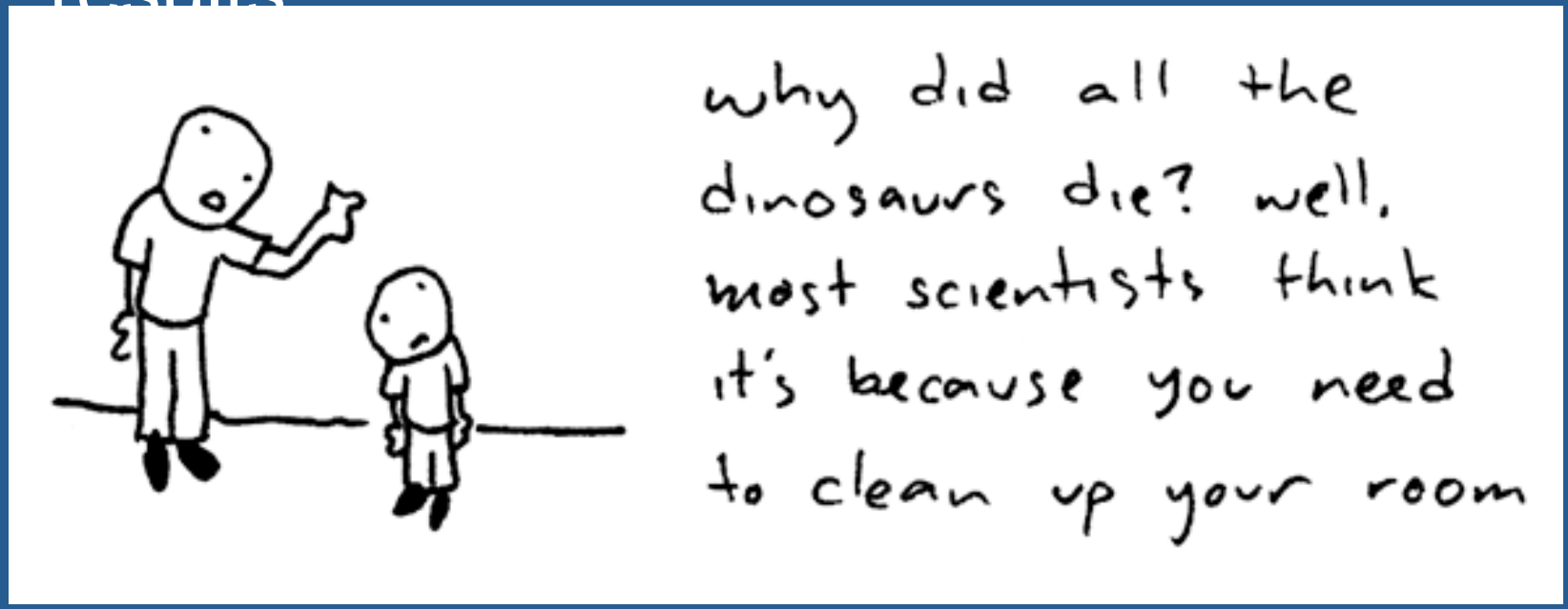
- You have still learned something if your hypothesis is rejected. This is not a bad thing.

Hypothesis

- If it is correct, it is next retested in many different ways and formats, using different experiments, to see if it continues to be correct.
- If the hypothesis is continually correct, under many different circumstances, experiments, trials and formats, it becomes a THEORY.
- Essentially, a scientific theory is true.

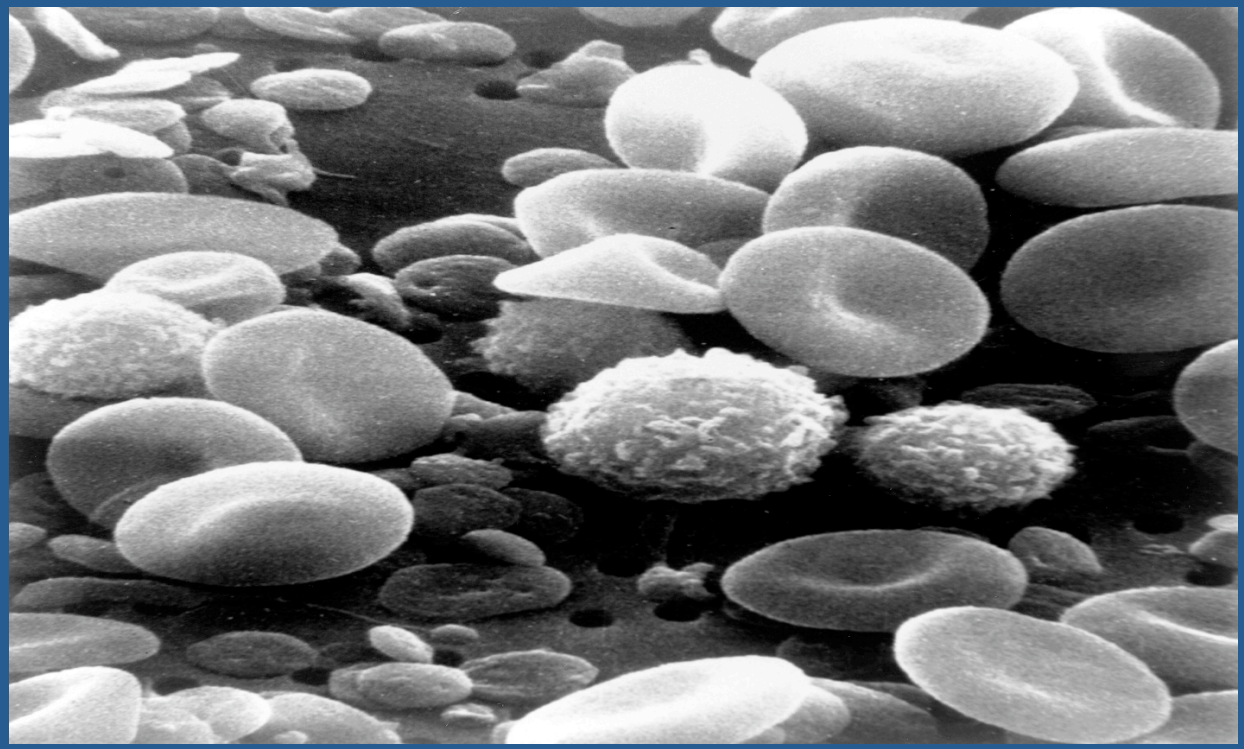
Scientific THEORY

- - A well-tested EXPLANATION for a wide range of observations or experimental results



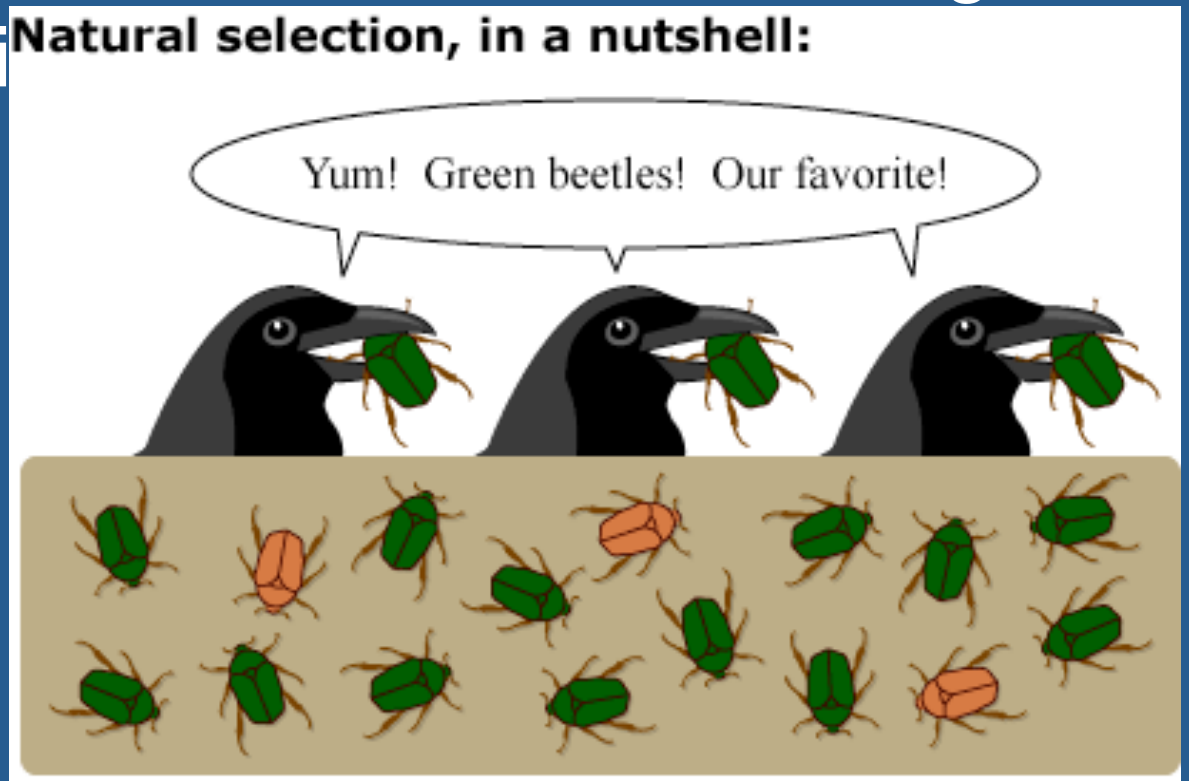
Cell Theory

- Every living thing ever found is made of at least one cell.



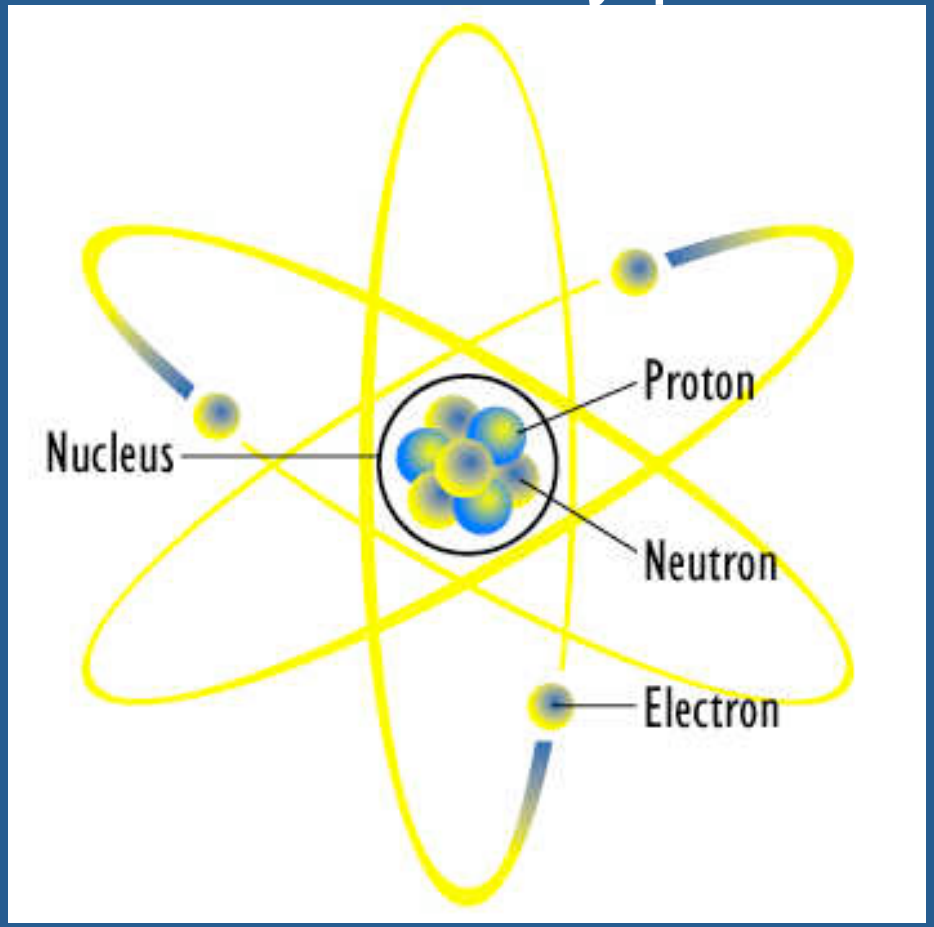
Theory of Natural Selection

- Populations of organisms are changed through interactions with other organisms and their environments, leading to speci



Atomic Theory

- All matter is made of tiny particles called atoms.



Theory of Evolution

- Organisms have descended from common ancestors.

Scientific Laws

- Scientific Laws are statements about the Universe , usually involving a mathematical constant. They specific.

Examples of Scientific Laws

- Archimedes's Principal: Any floating object displaces its own weight of fluid.
- Newton’s Laws of Motion, Universal Gravitation, Law of Cooling, etc.
- Einstein’s E = mc^2, etc

Differences between Laws and Theories

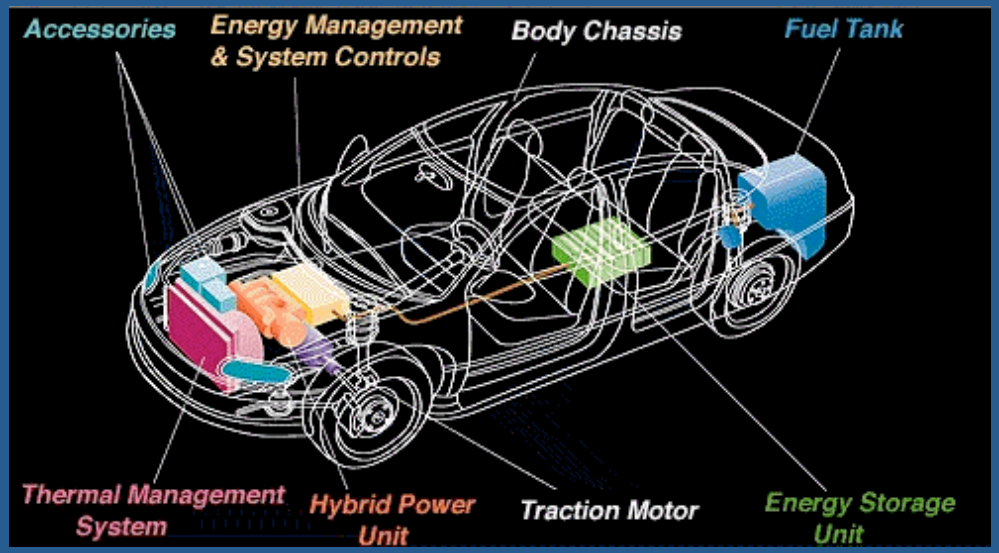
- **Newton's law of universal gravitation** states that every massive particle in the universe attracts every other massive particle **with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.**

- **Theory of Gravity:** All objects with mass attract each other due to the curvature of space-time.

How are Theories and Laws like Slingshots and Automobiles?

- A scientific law is like a slingshot. A slingshot has but one moving part--the rubber band. If you put a rock in it and draw it back, the rock will fly out at a predictable speed, depending upon the distance th back.

- A theory is like the automobile. Components of it can be changed or improved upon, without changing the overall truth of the theory as a whole.



The Nature of Science

- Any Theory or Law can, at any time, be proven false by new evidence or experimental results that contradict it.

- If this happens, the Theory or Law is then adjusted to fit the best available evidence at the time.

Peer Reviewed

- Science is Peer Reviewed!
- This means that scientists check each others' work continually.
- This is also why experiments must be repeatable.

- For example, if you say you have conducted an experiment that allowed you to turn a handful of sand into a fully functional human brain….cool. But… if this is not repeatable it is as if it never happened.

- Think of science as one big math test that gets passed around a classroom full of experts in math.
- They check each others' work, repeat each others' calculations and argue if any differences arise.
- The accepted answers to each question become Theories or Laws.