

Science

What is it?

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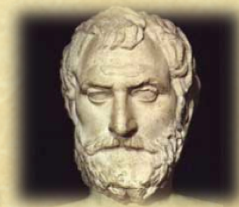


- ♦ It's hard.
- ♦ It's math.
- ♦ Technology --- Rocket science?
- ♦ Knowledge.
- ♦ Collection of facts.
- ♦ A method of understanding the universe.





What is Science Professional View



- ♦ Science is a method for understanding the natural world;
- ♦ Assumes nature is predictable;
- ♦ Requires a hefty dose of skepticism;
- ♦ Results require clear precise and open discussion;
 - ♦ Journal publication --- *First done by Royal Society of London in the 17th century*
 - ♦ Peer review, critical open discussion --- *First known scientific critique 6th century (Thales' basic element)*

Scientific Method

- ♦ Simple form
 - ♦ Observation;
 - ♦ Description;
 - ♦ Experimentation;
 - ♦ Repeat.
- ♦ Truth --- more like a random walk with many wrong turns:
 - ♦ Experiments repeated until they all agree;
 - ♦ Theories and models refined until they agree with experiments.

Examples

- ♦ Kepler, Galileo, Newton, & Newton's laws
 - ♦ Hertz, Mach; the criticism.
- ♦ Faraday & Maxwell;
 - ♦ Charge conservation, Waves & Light; assumptions and results.
 - ♦ Ether; The prejudice.
- ♦ Michelson & Morely, Lorentz, Einstein & Galileo;
 - ♦ Should have seen it coming.

Further Examples

- ♦ Planck, blackbody radiation, and the quanta
 - ♦ I don't believe it
- ♦ Einstein, photoelectric effect and the quanta
 - ♦ Oops not quite right (Lamb, et. al.)
- ♦ Kepler, Rutherford, & Bohr---the hydrogen atom
 - ♦ Discreet spectra, stable atoms?
 - ♦ Schrödinger, Hamilton, Jacobi, & Planck
- ♦ Landau-Ginzberg, Higgs, Duffing
 - ♦ Superconductors, mass, and chaos

Final Examples

- ♦ Weak interactions:
 - ♦ Experiments not quite right
 - ♦ Theory works
- ♦ Strong interaction and Strings
- ♦ The Standard Model of Particle Physics
 - ♦ 19 free parameters?
 - ♦ What is the nature of the Higgs?
 - ♦ Doesn't explain matter antimatter asymmetry.
 - ♦ And gravity?