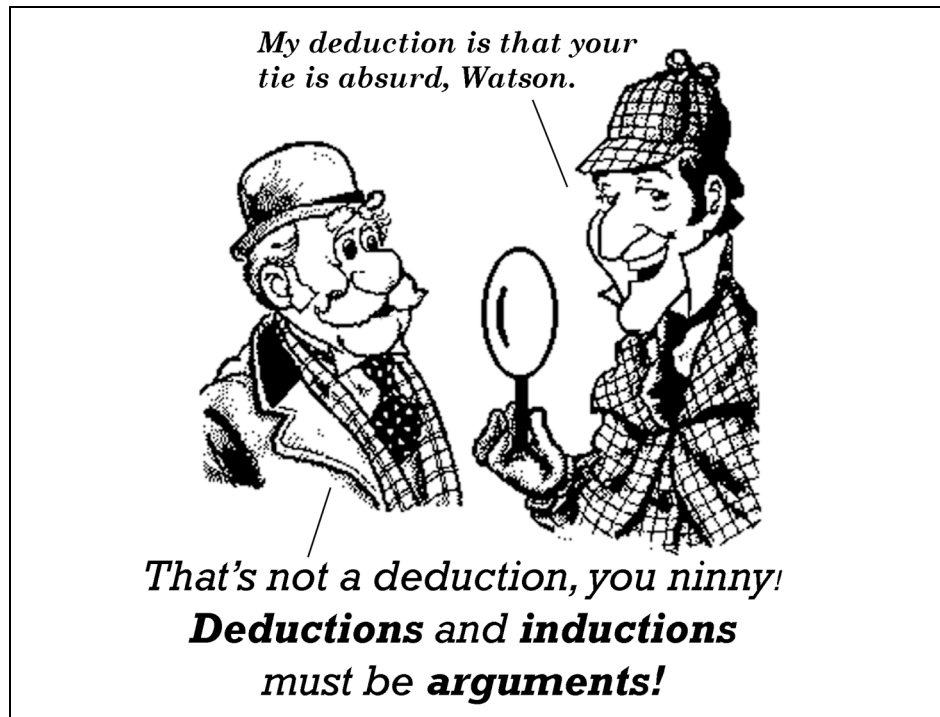


Deductive vs. Inductive Arguments



Rule of Thumb #1:

The conclusion of a **deduction** is **not** more informative than its premises.

Rule of Thumb #2:

The conclusion of an **induction** is **more** informative than its premises.

Examples of Induction and Deduction

- Example 1:* P1. Wendy is a cat and Wendy is black.
C. Wendy is a cat.

This is an example of _____.

- Example 2:* P1. The sun rose yesterday.
P2. The sun rose today.
C. The sun will rise tomorrow.

This is an example of _____.

- Example 3:* P1. Watson's socks are black or white.
P2. Watson's socks are not black.
C. Watson's socks are white.

This is an example of _____.

- Example 4:* P1. There is an elephant in this classroom.
P2. All elephants are pink.
C. There is a pink elephant in this classroom.

This is an example of _____.

- Example 5:* P1. Experimental evidence has shown that **some** human genetic information is contained in the DNA molecule.
C. Experimental evidence has shown that **all** human genetic information is contained in the DNA molecule.

This is an example of _____.

Accident vs. Law

1. **Goal:** to explain the difference between “accidental” facts and “law-like” facts.
- a. **Non-empiricist attempt:** “Nomic necessity.”
 - b. **Empiricist attempt:** “Humean supervenience.” *The idea:* the *totality of particular, physical facts* is what determines the laws. *Claim:* the laws are those facts that cannot be changed without also changing the totality of particular physical facts.
Write this claim as a supervenience relation: _____

2. **Carroll’s Objection.** You can construct a situation in which you have all the same facts, but difference physical laws.
Write down the point of Carroll’s objection as a supervenience relation:

Carroll’s Counterexample

- i) *Define L:* “All X-particles that enter a Y-field have spin up.”
- ii) *Construction.* Describe two Worlds 1* and 2* with the properties that:
 - a. They have identical physical facts; and
 - b. World 1* differs only “accidentally” from World 1, and World 2* differs only “accidentally” from World 2.

World 1:
“L is a law”

World 2:
“L is not a law”

World 1*
*Identical to World 1 except for
an “accidental” difference.*

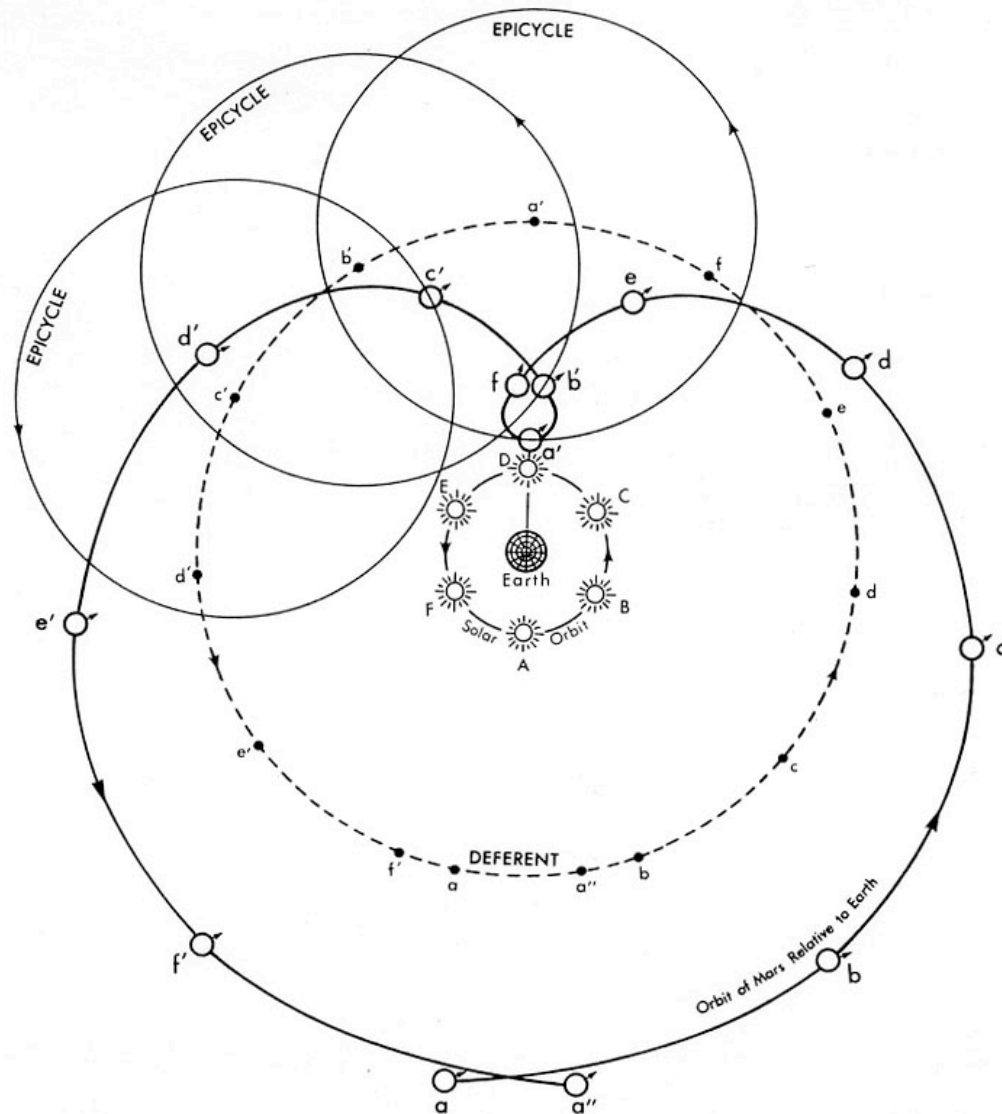
World 2*
*Identical to World 2 except
for an “accidental” difference.*

- iii) *Conclusion.* Carroll’s has constructed a situation in which World 1* and World 2* have the same physical facts. But his intuition is that “accidental” difference should not change the laws. So *L* is a law in World 1*, and *L* is not a law in World 2*. –That is, World 1* and World 2* are **physically identical, but have different laws.**

Past Success: *A Few Episodes in the History of Science*

Crystalline Sphere Astronomy

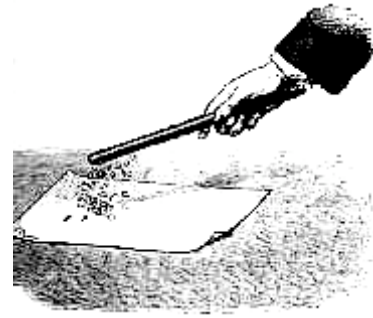
- *Some Proponents:* Aristotle, Ptolemy
- *Paradigm:* The earth is surrounded by crystal spheres. Each heavenly body (the star field, the planets, the sun) lies on one such sphere.
- *Some successes:* Offered a cogent explanation of many stellar phenomena, including the lack of stellar parallax and the motion of heavenly bodies. Very accurate description of planetary motion through epicycles.
- *False?* Yes; geocentric model rejected.



Effluvial Theory of Static Electricity

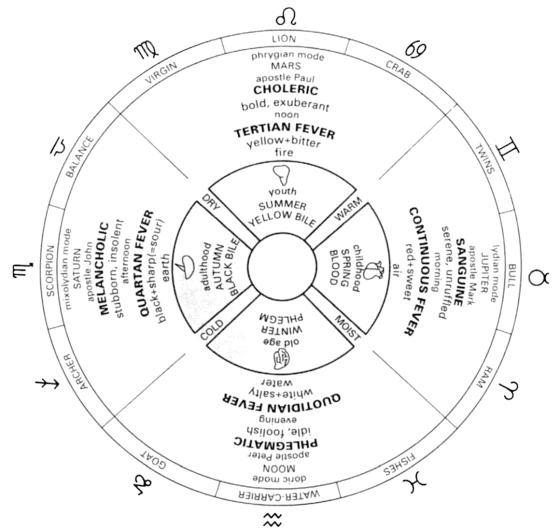
- *Some Proponents:* Gilbert, Hauksbee
- *Paradigm:* Static electricity, magnetism, and other forces of “attraction” were mediated by a stream of particles called an *effluvium* (plural: *effluvia*).

Some successes: Explained why attraction disappeared when certain media are placed between attracted objects.



Humorism in Medicine

- *Some Proponents:* Hippocrates, Galen
- *Paradigm:* Health and sickness are determined by the balance of the humors (literally, “juices” – from the Greek *chymos*) in the body.
- *Some successes:* Various successful prognoses. An excess of the “phlegm” humor was said to cause cold sicknesses; ejection of this humor often led to recovery. Bandages soaked in “warm” wine were thought to be useful on “cold” open wounds.
- *False?* Yes; displaced by germ theory and other paradigms of modern medicine.



Phlogiston Theory of Combustion

- *Some Proponents:* Becher, Black, Priestly
- *Paradigm:* All flammable things contain a substance called *phlogiston*, which is released upon combustion.
- *Some successes:* Explained why the mass of a substance is reduced after burning. Led to a cogent theory describing how long a given substance would burn, based on the “specific capacity for phlogiston” in each substance.



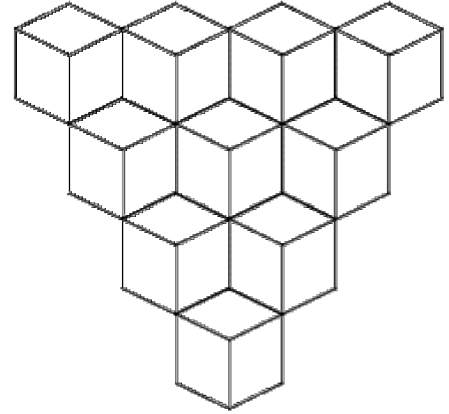
Other candidates for investigation... the caloric theories of heat; vibratory theories of heat; vitalist physiology, theories positing a subtle aether; theories of spontaneous generation; Lamarckianism; etc.

You are encourage to extend the list!

Thinking About Kuhn

1. What is “normal science” like?

- a) What kinds of activities does it involve?
- b) How does it involve a “paradigm”?
- c) How often do new discoveries occur? (Why?)
- d) Does normal science encourage novelty? (Why?)



2. How does a scientific revolution occur?

- a) Is science ever in a state of *crisis*? (Why?)
- b) How might one know that revolution is occurring?
- c) How does a new paradigm come to be accepted?

3. What is the relationship between new and old theories?

- a) Are pre-revolution and post-revolution theories ever compatible? (Why?)
- b) What rational can be given for accepting a new theory over an old one?
- c) Is more knowledge accumulated as our theories progress? (Why?)