

SCI2015 Notes (SCI2010 Compatible)

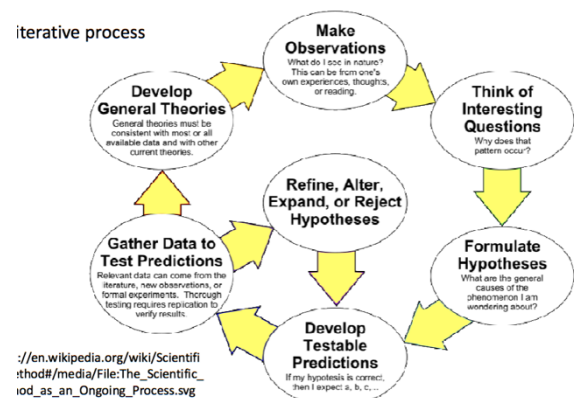
Lecture 1: Life of Science

Gaining Scientific Expertise

- Accumulation of data
- Repeated experimentation
- Theoretical framework in order to interpret it
- Public discussion

Scientific Method (QRHTAR)

1. Question/ Research
2. Propose a hypothesis
3. Experiment and observe
4. Analyse results
5. Report and make predictions



Stephen Hawking's Theory

1. Must make definitive predictions about the results of future observations
2. Must accurately describe a large class of observations

Peter Doherty's Scientific Process

1. Hypothesis
2. Experiment
3. Publish
4. Discuss

Lecture 2: Scientific Thinking

Science Is...

- Iterative rather than linear
- Some things are able to be known within limitations
- Never ending
- Progressive

Science is Not...

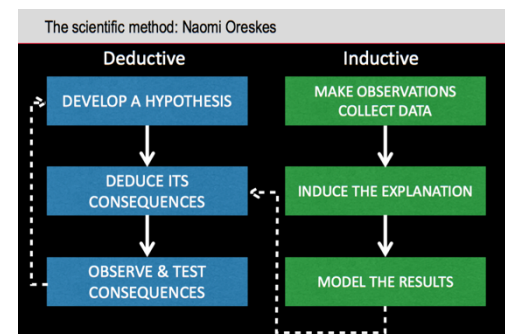
- Opinion
- Trial and error
- Hearsay
- Testimonial evidence
- Religion

Case Study: Japanese Whaling

- Assembled a panel of 3 eminent scientists
- Presented them with 18 years of Japanese whaling research
- Only **four papers** met the criteria as followed:
 - Peer reviewed
 - Relevance to maintaining a whaling industry
 - Required killing of whales
- Japanese whaling was **outlawed** in 2014

Three Components of Scientific Thinking

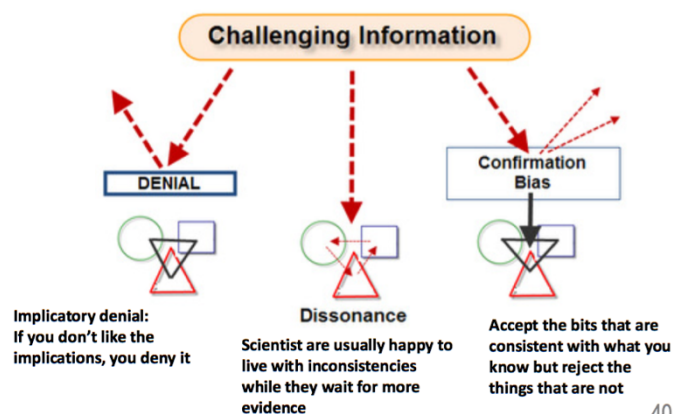
- **Empiricism** (Feynman)
 - **Data**
 - **Verification**
 - ❖ Is it **true**?
 - ❖ How do you know? (controlled experiments)
 - **Objectivity**
 - ❖ How much of you is tied up in the experiment?
 - ❖ No preconceived ideas, **no bias**
 - **Replication**
 - ❖ Is it **always** true?
- **Rationalism** (Oreskes)
 - **Deductive reasoning**
 - ❖ **Aristotle** believed any argument can be reduced to **2 premises and a conclusion**
 - ❖ **Valid**: Covers all steps but if premise is incorrect, can lead to false conclusions
 - ❖ **Sound**: Also valid and premises are correct



- Broken logic
- Inductive reasoning
 - ❖ Careful observations are made
 - ❖ Data is compiled
 - ❖ Derive theory
 - ❖ Test theory
- Scepticism (Einstein)
 - Want to see all the evidence
 - Weigh the arguments
 - Willing to be convinced
 - Not 'cherry-picking' the evidence

Cognitive Dissonance and Denial (Leon Festinger)

- Believes that people reject ideas as stress is caused by:
 - Holding two or more contradictory beliefs, ideas or values at the same time
 - Being confronted by new information that conflicts with existing beliefs, ideas or values
- Humans avoid situations and information which are likely to increase dissonance
- Worldview backfire effect
 - When you present evidence that threatens a person's worldview, it can actually strengthen their beliefs



Lecture 3: Illusionist Performance (Not Examinable)

- No notes as this was a visual performance