Contents

1 Experiments

1.1 Relevant facts

- It is assumed that secure facts can be established by the use of senses
- Most facts can be established using observation
  - Most are irrelevant for science
- Many kinds of processes are at work in the world around us
  - The interact with each other in complicated ways
  - It is necessary to do experiments
  - The discussion take a different perspective when focusing on experiments rather than facts

1.2 Producing and updating experimental results

- It is hard and take time to obtain experimental results
  - A significant new experiment takes month or even years to successfully execute
  - It requires practical trial and error and exploitation of the available technology

  - Judgments about the adequacy of experimental results are not straightforward
  - Experiments are only adequate and interpretable
- Experimental results can be faulty if the knowledge informing them is deficient or faulty
- Experimental results are fallible and can be updated or replaced for straightforward reasons
  - It can be due to advances in technology or advancement in understanding

1.3 Transforming the experimental base of science

- The problem with Hertz experiment was not inadequacies in his observation or lack of repeatability
  - The problem was the experimental setup
- Experiments are typically designed to cast light on some signification question

1.4 Experiments as basis for science

- The experimental basis for science is fallible and revisable
  - This poses a threat to the way scientific theories are borne out of experiments
- One cannot make the outcomes conform to our theories

2 Induction

2.1 Baby logic

- Logic is concerned with deduction of statements from other statements
  - What follows from what
  - If the premises are true then the conclusion must be true
  - An argument is perfectly valid even though the premises may be wrong

- Logic is not alone a source to new truth
  - Logic can reveal what follows from the statements which we already has
  - Logics great strength is it truth preserving character

2.2 Scientific laws from facts?

- Scientific knowledge cannot be logically deduced from the facts
- Arguments who proceed from a finite number of specific facts to a general conclusion is called **inductive** arguments
- **Inductive** arguments are used for general scientific laws need to go beyond what is contained in the premises

2.3 Good inductive argument?

- If an inductive inference from observable facts to laws is to be justified the following conditions must be satisfied
  1. The number of observations forming a basis for the generalization must be large
     - A large number of independent observations is needed
     - A good argument cannot just jump to conclusions
  2. The observations must be repeated under a wide variety of conditions
  3. No accepted observation statement should conflict with the derived law
- **The principle of induction**

If a large number of A's have been observed under a wide variety of conditions, and if all those A's without exception possess the property B, then all A's have the property B.

- Problems with the conditions
  1. How many is large? and in some scenarios a large number of observations might not be a good idea

2. What counts as a signification variation in circumstances?
   - Prior knowledge is used to look at which factors might have some influence
   - What knowledge can one used and what should one require of that knowledge?
3. Little scientific knowledge would survive this demand, that there is no known exceptions

2.4 Problems with inductivism

- **Inductivism** is the position according to which scientific knowledge is to derived from using some kind of inductive interference
  - Those who subscribe to that is called **inductivists**
- Any kind of generalization from facts about the observable world can only yield generalizations about the observable world
  - i.e. inductive reasoning cannot be used for the unobservable world
- Since exact mathematically formulated laws always have some error when measured it is hard to escape the inexactness of the measurements to obtain a law
- A problem about induction is how can it itself be justified
  - To justify it induction is needed
- Another problem with inductiveness is when one tries to be precise about how probable a law or truth is in the light of the specified evidence
  - The probability of any general law is zero per standard probability theory
- One cannot provide a rational argument for the rational argument itself without assuming the rational argument

2.5 The appeal of inductivism

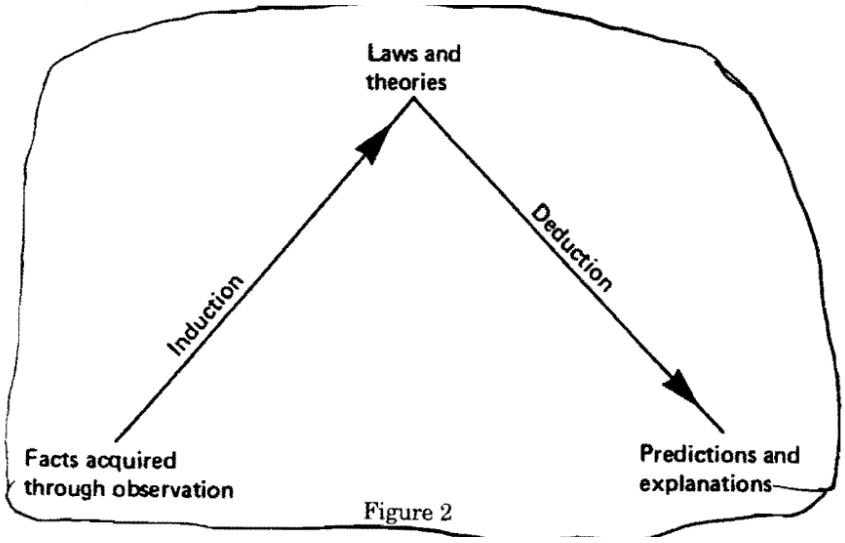

Figure 2

- For the inductivists the source of scientific truth is experience not logic
- Sets of statements which describe the set-up under investigation is referred to as **initial conditions**
- The general form of all scientific explanation and predictions can be summarized as thus

1. Laws and theories
2. Initial conditions

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3. Predictions and explanations