

Critical Rationalism

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Introduction

Questions:

- What is the **truth**?
- What is **subjective** and what is **objective** knowledge?
- How to **develop** scientific theories?

Definition

The **critical rationalism** is a philosophic way of thinking. The basic principle of knowledge improvement and problem solving is try and error.

Critical rationalists hold that scientific theories, and any other claims to knowledge, can and should be **rationally criticized**, and (if they have empirical content) can and should be subjected to **tests which may refute them**.

History

- Founded by **Karl R. Popper**
- Book 'The Logic of Scientific Discovery' (original 'Logik der Forschung') appeared in 1934
- Caused by **critic** of how **logical positivists** developed their scientific theories (through observation and experiment)
- Advanced by Hans Albert for the social sciences

Philosophy of Science

Critic of induction

- Through a large number of observations one can verify the statement 'all swans are white', but the first observation of a black swan can falsify it
- Induction can not be proven, but induction can help to propose a theory
- Empirical theories can not be verified but falsified

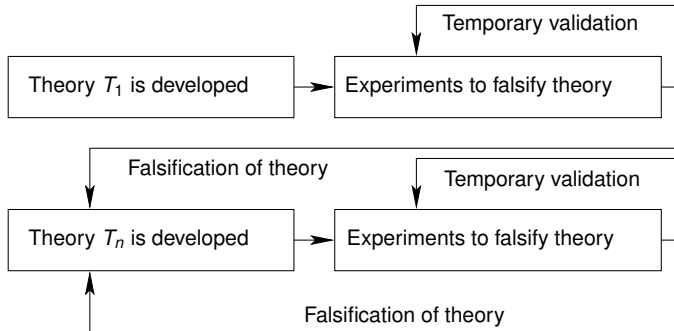
Philosophy of Science

Falsifiability

- Theory is testable if at least one imaginable observation can falsify it
- Popper divides falsifiability into **logical** and **practical**
 - *Logical falsifiability* means that there exists an experiment which can falsify the theory
 - *Practical falsifiability* means that the experiment is realizable in practice, too (e.g. impossible for some experiments in astronomy or astrophysics)

Philosophy of Science

Development of knowledge



Philosophy of Science

Metaphysics

Popper divided existence and the products of cognition into **three** ontologically related **domains**

- *World 1*, the world of physical objects or of physical states, independent of any perceptions
- *World 2*, the subjective world of private mental states
- *World 3*, the objective but intangible world of products of the human mind

Philosophy of Science

Open and Critical Discussion Qualities

Are essential to the progression of Knowledge in a scientific community.

Popper believes that

The objectivity of science [is] in the hands not of individual scientists alone, but of scientists in a scientific community."

Further Opinions and Developments

- Imre Lakatos and Thomas Kuhn modified the original Popper's model of critical rationalism
- Kuhn doubt that the procedure of development, testing, modification, and rejection of theories leads to permanent changing of science
- A weakness of critical rationalism is that some of its theories cannot be ultimately falsified(e.g. gravity)

Guidelines

- 1 Theoretical framework must be set at the beginning of the process
- 2 The use of cycles is strongly encouraged
- 3 Research methodology should be critically analyzed and refined in each cycle
- 4 Data collection and interpretation should be a part of each cycle
- 5 In each cycle the focus is only on agreements and disagreements, ignoring the idiosyncratic data

Guidelines

- 6 Divergent data should be deliberately sought
- 7 Multiple sources of information should be sought (or different perspectives concerning the same source) in order to create a dialectic
- 8 Results from change induced into the research situation should be used as an additional source of information for challenging emerging theories
- 9 Publish the emerged theory and results in conferences and workshops. Which make them open for public criticism.
- 10 Improve the theory according to the feedback from the scientific society.

Guidelines - Example

Example (Network protocols development)

- A theoretical proposal of the protocol
- Implementation of the proposed protocol in order to be tested in a network simulator
- Testing the protocol against different scenarios
- Evaluating the results and make changes in the design of the protocol and its implementation. Retesting.
- Publication about the new developed protocol
- Feedback from the scientific society




Conclusion

- Truth is an endless quest
- Observations and surprising phenomena help in discovering theories
- Theories must be tested through falsification
- Knowledge is a product of an evolutionary process
- Objective knowledge is a product of the researcher's collective efforts which cannot be reduced to the sum of their individual subjective knowledge contributions

Thank you for your attention.

Any questions?

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