Block 1.4: History & Methods of Psychology

Philosophy of Science

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Epistemology

Knowledge, truth, reasoning and theory

What is a Theory?

Definition

- a set of statements that organizes, predicts and explains observations
- it tells you how phenomena relate to each other, and what you can expect under as yet unknown conditions.

- **allows predictions that can be tested**
  - formulated in such a way that testable hypotheses can be derived from them
- **refutable** / **falsifiable** (Popper)

Deductive-nomological explanation

- seeks to show how a phenomenon is connected to general laws/principles (**nomological**).
- follows a **deductive**[1] logical structure

Related concepts and terms

Scientific laws

- must necessarily hold, **counterfactual**
- **empirical laws**: empirical generalizations, only observables occur
- **theoretical laws**: laws with unobservables

Models

- kind of mini-theory
- visualizable representation of the theory, as in some kind of analogy
- **Example**: the model of the *atom* as a collection of coloured balls (electrons) circling around a core composed of differently coloured balls (protons and neutrons).

Knowledge, Theory and Truth I

Realism

"The world is like it is, independent of human exploration and theorizing"

- **Knowledge** pictures the objective world
- **Truth** is a correspondence between knowledge and the world
- **Theories** are true if they correspond with nature

- Problem: measurement agreement between **language/theory and reality**

Idealism

"The mind makes up the world"

- **Knowledge** is a subjective (or social) construction
- **Truth** is a coherence with the rest of knowledge
- **Theories** are true if they are consistent with the rest of our knowledge

- Problem: Idealism suggests there's no objective way to choose between different points of view, if all knowledge is subjective.

Knowledge, Theory and Truth II

Pragmatism

- **Knowledge** is functional and interactive, "coping with the world"
- **Truth** is success
- **Theory**: Meaning of theories comes from their practical use, which aligns with the theory of truth known as pragmatism

Reasoning: Deduction

From general statements to individual observations

Example A	*Example B*
1. All humans are mortal	1. All beans in that bag are white.
2. and Socrates is human	2. These beans are from that bag.
3. **Therefore**, Socrates is mortal	3. **Therefore**, these beans are white.

- Deductions is always being true (logically correct)
- **Logical certainty**, because the conclusion is contained in premises: no new knowledge.
- form of re-stating what is already know,

Reasoning: Induction

From individual observations to general statements

Example A	*Example B*
1. Lots of swans were observed	1. These beans are from that bag.
2. All were white	2. These beans are white.
3. **Therefore**: all swans are white	3. **Therefore**, all beans in that bag are white.

- General conclusion about the sample is drawn on the basis that the observed pattern.
- Induction is a form of generalization
- Induction is **not necessarily true** (logically not correct)

Reasoning: Abduction

Inference to the best explanation

Example A	*Example B*
• You see outside that the street is wet. (*Observation*) • **Therefore**: It had been raining. (*Explanation*)	1. These beans are white. 2. All beans in that bag are white. 3. **Therefore**, these beans are from that bag.

- Explanatory reasoning by generating hypotheses
- **No logical certainty**, but suggest new ways of explaining things. **new theory**.
- Considering a given outcome along with some possible preconditions, and concluding that the outcome is likely to have been caused by those preconditions.

What is science?

Characteristics of Science

1. **Systematicity**: Theories must board, coherent and (if possible) hierarchical
2. **Well-defined methods**. Methods specify what will count as legitimate subject matter, facts and *explananda*.
3. **Reduction**: Reducing phenomena to underlying principles at the explanatory level and ignoring aspects of reality, which are supposedly accidental.
4. **Objectivity**: In the sense of being controllable, reliable and intersubjectively observable.
5. **Clarity**: Scientific statements are phrased unambiguously, in principle addressed to the public domain.
6. **Revisable**: Scientific knowledge is open, at all times revisable, and never definitive.

Norms of Science ("Ethos of Science")

"C.U.D.OS norms" summarized by *Merton* (1942)

1. **C Communism**: (somethings also *Communalism*)
   - Science is product of social collaboration and are assigned to the community.
2. **U Universalism**
   - Acceptance of claims is not to be based on personal or social attributes of the claim maker.
3. **D Disinterestedness**
   - Scientists should not have other interest then the truth.
4. **OS Organized Skepticism**:
   - Science should be always open to falsify the currently accepted theories. Central criterion that distinguishes science from *pseudo-science*.

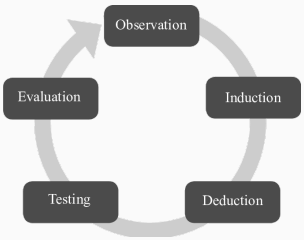
Everyday (common-sense) and scientific knowledge

Differences

- scientific methodology
- reductionism vs.phenomenological experience

Sellars (1963): science and common sense not as a conflict but a **continuum**, with science as an extension of human practice.

Empirical Research Cycle



1. Direct, unbiased, impartial or theory-free **observation**
2. Empirical laws are based on **induction** (inductive generalization or normal generalization)
3. You try to explain empirical observations by developing a theory. This theory also enables you to deduce new hypotheses (**Deduction**).
4. **Testing** of the hypotheses based on new empirical material.
5. **Evaluating** the findings: Predictions are tested through direct observation.

Philosophy of science

- What defines science?
- How and why science is successful?
- What are the criteria and standards for a good scientific method?

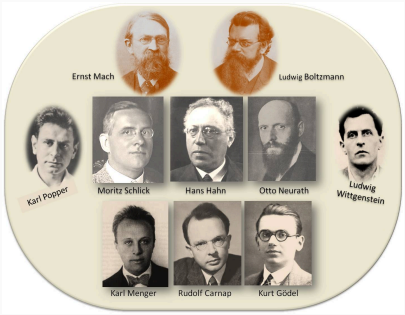
Demarcation Problem: Science vs. Non-science

The demarcation criterion separates rational scientific knowledge from metaphysical speculation, irrationality, superstition and pseudo-science.

Different Views

- Logical positivists: **Verifiability**
- Popper: **Falsifiability**
- Post-positivism
  - **no rule can guarantee** scientific rationality
  - scientists have a dogmatic faith in their theories
  - theory choice is socially and historically determined

"Vienna Circle", 1924–1936



Logical positivism

Philosophy of Science in the 20th century

- Empiricism
- Verification of Theories
- Demarcation criterion: **Verifiability**

- Science proceeds best when it combines
  - **logical reasoning** with
  - empirical observation to **verify hypotheses**.

Logical positivism: Standard View of Science

- The basic elements of scientific knowledge is **observation** (*sense data*)
  - Empiricism: the senses give us access to the world
- **Theories**: Science also contains theoretical terms and expressions that are not directly observed
  - allow for **deduction**
  - knowledge is only knowledge if embedded in statements and logical structures of explanations.
- Unobservable **theoretical terms** must be **translated** in terms of **observations**.
- All sciences should be **unified**: use the same methods
- Scientific progress is **cumulative**, getting ever closer to a "truth"

Assumptions of Positivism

- **verification** of a statement by observations.
- **theory-neutral** observation are possible
- **Every statements can be verified**. The meaning of a statement is the way it can be verified (*unverifiable talk is non-sense*).

Problem

- Theory and observation are never independent
- **completely objective observation is impossible**

Problems of Positivism

(Summary from the book chapter. Merely these main points are relevant)

- **Theories a linguistic constructs**. But language is an instrument of social exchange, not a picture of a state of affairs (*Wittgenstein*)
- **Underdetermination**: The *Quine-Duhem thesis* says that for every observation there can be multiple competing theories that are equally consistent with that finding.
- There are **no theory-neutral observations**
  - there is **no objective observations** (*indubitable sense data*). All knowledge was "theoretical". (*Sellars* "myth of the given')
  - No clear-cut separation of observation and theory (*Quine* "Two dogmas of empiricism")
  - Every observations is **theory-laden**. There are no uninterpreted data. Having different theories made observers literally see different worlds (*Hanson*)

Karl Popper's Philosophy of Science

- Popper argued against the common approach that science needed refinement/confirmation (**Logical Positivism**)
- instead science should try to **falsify** theories by 'testing' or challenging them (cf. *falsificationism*)

Deduction

- *Popper's critique of positivism*
  Science does not proceed by induction (generalize from observations)
- Science has to formulate theories and test them in different situations (deduction)

Popper: Demarcation criterion is the Falsifiability

Only falsification is possible, not verification (or confirmation).

- Scientific theories have to predict an outcome that are empirically testable and **falsifiable**
- Empirical content of a theory increases with the **degree of falsifiability**
  - *"A theory that explains everything is explains nothing."*
  - *"The more a theory forbids, the more it says about the world."*

Example: Black swan example

Since confirmation is not possible, Popper accepted the uncertainty and provisional nature of theories.

Popper: Critical vs. Dogmatic Thinking

Popper was a radical **anti-dogmatist**

- discussions should be absolutely free, any claim should be criticized. Any hypothesis was in principle legitimate, as long as it was refutable.
- Criticism then was the mark of real scientific rationality.

- **Theories that are immune to criticism are pseudo-science**
  - cf. psychoanalysis debate in Vienna at that time
  - marxism

> **Science & Politics**
>
> Popper: Dogmatic systems are greatest danger to both science and democracy.

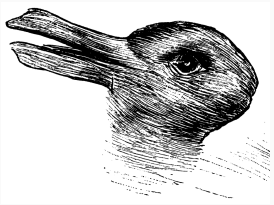
Thomas Kuhn: Paradigms

Paradigms

- generally agreed framework in normal science
- creates the reality that Researchers' are studying
- Two paradigms are **incommensurable**
  - they make sense of the world in terms of completely different categories, concepts and meanings
  - *Truth* does not really exists and depends on the paradigm.
  - you have to choose one paradigm, you can cannot have both (like in the case of an ambiguous figure; see next slide)
- There is no demarcation criterion *between* paradigms

Revolutions are a change of paradigm

Optical illusion: Duck or rabbit



Kuhn: Phase model of scientific development

1. **Preparadigmatic Phase**
   - no common single view, disagreement on framework and core problem
2. **Paradigmatic or Normal Science**
   - normal science, agreement concerning what legitimate methods, problems and standards
   - "**dogmatic attitude**", scientists do not seek novel facts or theories
3. **Crisis**
   - Anomalies during normal science can result in a **crisis**
4. **Revolutionary Science**
   - A crisis may end with the proposal of a **new paradigm**.
   - The change of one paradigm to another is not cumulative, due to the often radically different conceptual framework of the new paradigm.
5. **New Paradigm or New Normal Science**
   - normal science, until next crisis

Lakatos: Integrating Popper's & Kuhn's philosophy

- Problem of Relativism:
  - According Kuhn, social and historical factors (and not truth!) decide the outcome of a crisis
- Progress is possible also through **competition between research programmes**
- **Empirical content** to evaluate research programmes
  - If these hypotheses lead to new discoveries and further research, the programme is considered progressive.
  - *Example:* In astronomy, Kepler's mathematical theory led to the prediction of unknown planets (discovery of Uranus)

Questions?

Thank you very much