

Some basics of philosophy and the philosophy of science

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(Cognitive Science)

Epistemology

Epistemological Question 1

What is knowledge?

A. Traditional normative
(Socratic view)

Knowledge = true, justified
belief

Belief = to have information about

Justified= (i) inferable from axioms
(ii) supported by evidence

True = (i) correspondence
(ii) coherence
(iii) consensus
(iv) pragmatic

B. Weaker view

Knowledge = Common belief

- Distinction normative - descriptive

1. Descriptive - what people act
as if
believe/say
they know

2. Normative - what
knowledge
ideally should
be like

- True, justified belief as a “regulative ideal”

Epistemological Question 2

Do we have knowledge?

- Answer depends on our definition of knowledge (classical point of departure = true, justified belief)

A. Dogmatism: Yes we know that we know

B. Academic scepticism: No, we know that we do not have knowledge

C. Pyrrhonic scepticism: We don't

Pyrrhon from Elis know if we
Sextos Empiricos have
 knowledge
 (perhaps we
 do)

D. Fallibilism: Peirce, Popper

- Everything we believe can be wrong
- we must always be prepared to revise our beliefs

Epistemological Question 3

How does what is believed to be knowledge arise?

Three ideal types (Francis Bacon)

- **The Spider (rationalism),**
- **The Ant (empiricism),**
- **The Bee (combinations)**

A. Rationalism (Kant, Descartes)

- The spider (the net)
 - The knowledge seeking agent is active - innate knowledge
- Reason, logic, mathematics, deduction
- Intuition, analysis

B. Empiricism (Hume)

- The ant (the ant hill)
 - The knowledge seeking agent is passive
- tabula rasa (except regarding contiguity and similarly based generalization)
- observation, statistics, botany, geography, association, induction
- observation, synthesis

Example: Hume vs Kant

Hume: The sun rises every morning (generalization underdetermined by data)
cause-effect (2 billiard balls collide)
= repeated contiguity in space and time
+ psychological habit

Kant: Causality innate category (reason is active)

C. Combinations

- Empiricist - Rationalism

or

- Rationalist - Empiricism

- The Bee (Bacon himself) (honey -
extracted and processed from nectar)

- The knowledge seeking agent both
passive and active

Observation and intuition

- Abduction (Pierce) going from the
particular to a general law (principle,
essence)

Deduction

(modus ponens)

$p \rightarrow q$

p

q

Induction $XXX \rightarrow$ All crows
are black

Abduction $X \rightarrow$ All crows
are black

Epistemological Question 4

Knowledge interest

- A. What do we want to have knowledge of?
- B. Why do we strive for knowledge?
- C. In whose interest are we striving for knowledge?

Taxonomies of Knowledge interest

- Nomothetic - idiographic (Dilthey)
- Instrumental - intrinsic
- Descriptive (explanatory) -
interpretative - constructive

- **Nomothetic - idiographic (Dilthey)**

A.1. Nomothetical knowledge -
general principles (natural
science)

2. Idiographic knowledge -
particular phenomenon
(some Humanities)

- **Intrinsic - instrumental**

B.1. Intrinsic value (knowledge-
per-se)

2. Instrumental (knowledge
means for other goals)

Studying a painting

	Intrinsic Knowledge -per-se	Instrumental knowledge as a means
Nomothetical	General principles for pictorial repr.	Understand general law for pictorial rep. in advertising
Idiographic	A picture	Understand the mind of the artist

**• Descriptive (explanatory) -
interpretative - constructive**

- C. 1. Depicting, descriptive and
explanatory
2. Interpretative
(Psychotherapy, lit.
criticism)
3. Constructive (AI
technology)

Epistemological Question 5

How is knowledge justified?

- **Normative views**
 - A. **Authority** (refer to the Bible, Aristotle)
 - B. **Observation** + statistics
(positivism + empiricism)
 - C. **Interpretation** + intuition
(hermeneutics)
 - D. **Conceptual analysis**
 - E. **Deduction** (from axioms)
 - F. **Calculation** of (practical)
consequences

Dogmatism - A

Empiricism - B

Rationalism - C, D, E

Pragmatism - F

Normatively basic: B - E?

The distinction

1. Normative
2. Descriptive

- **Descriptive views**

How is knowledge justified?

Example: Consider a claim

- 1) Made by a friend
- 2) Made by an enemy
- 3) Which gives fame and money
- 4) Which is accompanied by flattery
- 5) Which leads to a job

What criteria of acceptance should we (normative) use? On what grounds do we actually accept the claim (descriptive)?

Epistemological Question 6

How is new knowledge discovered?

Distinction.

1. **Discovery** (creativity -
“Be positive - don’t criticize”)
2. **Justification**
“Be cautious - subject to
criticism”

Discovery

1. Psychology of creativity: Koestler
2. Sociology of knowledge (power):
Woolgar

Example

Thomas Kuhn vs. Positivism

Positivism: Science develops cumulatively through rational and empirical arguments

Kuhn (Hegel, Fleck): No science develops discontinuously through scientific revolutions. Other types of justification are used than those which are normatively justified

- Paradigms are created

Positivism: Normative view

Kuhn: A more descriptive view but also paradigms are idealizations

Epistemological Question 7

How should scientific knowledge be organized (normative)?

How is scientific knowledge actually organized (descriptive)?

Normative

1. **Concepts** (terms/vocabulary)
2. Classifying concepts - **taxonomies**
3. Relations between concepts
(statements/**claims**/sentences)
4. Relations between claims
(**description, explanation, theory**)

Concepts

Concepts can be captured and described through

- **Examples**
- **Characterizations**
- **Definitions**

And measured through

- **Operationalizations**

1. Examples

What is nature?

A. Verbal examples

Forests and lakes

Trees and flowers

B. Ostensive

Brought to attention by pointing (to a tree).

The phenomenon can be unknown

C. Typification

Find a typical representative (using
Some criterion).

- **simple types**
- **prototypes**
- **stereotypes**
- **ideal types**
- **maximal types**

Exemplifications

Examples can be more or less typical according to particular criteria

1. Type (simple)	Example which has a set of properties which can be shared by more than one instance
2. Prototype	Example which is central from some functional point of view
3. Stereotype	Example which captures what most people believe

4. Ideal type	Example often constructed according to certain theoretical or normative principles
5. Maximal type	Example which in some way maximizes the properties a particular type of phenomenon can have

2. Characterizations

(descriptions)

We can also imagine first attempts at definitions which can be called characterizations (i.e. some important properties are given)

A car is a means of transportation
(also true of bikes, trains, etc)

3. Definitions

In science, concepts are traditionally identified through definitions.

A. Factual - lexicographic

1. Factual definitions
(defining real entities)
2. **Lexicographic** (nominal)
(defining words)

B. Descriptive - stipulative

Descriptive - trying to capture what is there

Stipulative - researcher decides and stipulates
(normative)

Modes of defining

1. Most classic

A. Genus proximum + differentia

(closest class)

specifica

(differentiating property)

Gen pr

Dif spec

Man

animal

rational

Car

vehicle

4 wheel and

motor powered

B. Necessary and sufficient conditions

A sound is a **phoneme** **iff** it is a smallest meaning differentiating sound unit

4. Operationalizations

A fourth important way of capturing concepts is by associating them with measuring operations.

- Heat = A numerical value as measured by a thermometer
- Intelligence = A numerical value as measured by an intelligence test

Many concepts can be identified by **combining all of the methods** mentioned above

1. Definition (types A & B)
2. Characterization
3. Exemplification (including typification)
4. Operationalization

It is frequently a good idea to attempt this.

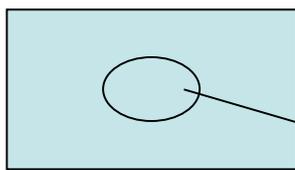
The distinction normative (stipulative) - descriptive can be applied to all types of concept identification

Elementary set theory is a good instrument for investigating **necessary and sufficient conditions**

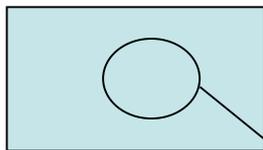
Too wide definition = perhaps necessary,
but not sufficient

Too narrow definition = perhaps sufficient,
but not necessary

Too wide?



Nurse = def. person who
cares



? Transport = def. Transference of something
X from something Y to something Z

? Communication = def. Transference of
something X from something Y to something Z

Too narrow?

?? **Nurse** = def. person who cares
for the sick

Counter example e.g. Wet nurse

?? **Communication** = def.

Transference of
information from something Y to
something Z

Counter example ?? e.g.

Communication by rail

2. Taxonomies - Systems of concepts - classification

Normative requirements

- 1. Homogenous basis for classification**
- 2. Mutually exclusive categories**
- 3. Exhaustive categories**
- 4. Simple**
- 5. Perspicuous**
- 6. Useful/applicable**

Examples of what could be classified

- languages
- types of transport
- types of people

Two kinds of taxonomies

1) Mutually exclusive categories of occurring empirical instances

2) Mutually exclusive analytical properties (but not occurring empirical instances)

1) color

2) size

Example: Big red house

3. Claims, Statements (sentences)

How can the truth/correctness of a claim/statement be corroborated/supported?

Normative requirements

1. Observation (statistics)
2. Interpretation, intuition, analysis
3. Deduction from already accepted statements
4. Authority?
5. Claims about usefulness

To some extent these requirements correspond to traditional “theories of truth”

- Correspondence (1, 2)
- Coherence (2, 3)
- Consensus (4)
- Pragmatic (4?, 5)

4. Theories

Normative requirements

- 1. True**
 - 2. Non-contradictory**
 - 3. Exhaustive**
 - 4. Simple**
 - 5. Perspicuous**
 - 6. Useful**
- To show that these criteria are met is to justify and to support the theory**

Normative criteria and theories of truth

1. True --> correspondence
2. Non-contradictory--> coherence
6. Useful --> pragmatic
- 3, 4, & 5 less clear

Theories of truth and ontology

- **Correspondence** theory often **realism**
- **Coherence** theory often **idealism** (phenomenalism)
- **Pragmatic** theory coming close to:
 - fictionalism
 - conventionalism
 - nominalism

The purpose of a theory

A. Explanation (and description):

- (i) statistical correlation
- (ii) causal connection
- (iii) convention

Less common (Aristotle's - teleological, material and formal causes)

B. Understanding (1): Finding purpose, goal, intention, function or convention (human behavior)

Understand (0) -- Explain
-- Understand(1)

C. Usefulness: Helps in creating useful theories, culture or technology

• **Difference of perspective/difference of degree**

Description - Explanation -
Understanding - Usefulness

The organization of a theory

- (i) **Descriptions, explanations which meet certain normative requirements**
- (ii) **Classical ideal (axiomatized theory)**

Classical example of axiomatized theory Euclid's Geometry (300 B.C.)

Axiomatized theory (Aristotle)

- (i) **Axioms:** Independent basic true statements
- (ii) **Inference Rules:** Truth preserving rules (derivational rules) for deriving new statements
- (iii) **Derived (true) claims (theorems)**

Example of an inference rule:

Modus Ponens: $p \rightarrow q,$

$p,$

q

Desirable properties of an axiomatized theory

Completeness

The theory is **complete** (exhaustive) **iff** all true statements are derivable

Decidability

The theory is **decidable** **iff** it is possible for every statement to determine whether it is derivable

Formalization

The theory is **formalized** **if** it is formulated in a formal language (vocabulary, rules of formation) which has:

syntax

semantics

pragmatics

The hypothetical deductive method

The axiomatic ideal in combination with empirical observation has resulted in

The hypothetical deductive method

Aristotle The points of departure (the axioms) should be evidently true

Later the points of departure can be hypotheses (guesses)

the consequences of
which can be tested empirically

The hypothetical deductive method cont.

From a **theory or hypothesis** we derive
consequences or testable implications

These are tested empirically

Sometimes one needs to add

**postulates or
auxiliary hypotheses**

to be able to derive something
testable

Example: Semmelweiss discovery of bacteria

Hypotheses: we can avoid infection if we wash in an alcoholic solution

Auxiliary (i) Alcohol kills bacteria

hypotheses: (ii) Bacteria attacks patients

Testable If we wash in an

Implication: alcoholic solution we do not infect the patients

Ad Hoc Hypotheses

Auxiliary hypotheses should have independent support.

Otherwise, they are **ad hoc** (for this), i.e they are invented only to save the theory

Back to the justification of a theory

- **The debate on verifiability**

How can theoretical
generalizations be verified?

- **Crows are black**

What does this claim mean/refer
to?

- (i) **All crows right now**
- (ii) **All crows we have observed**
- (iii) **All crows that have existed**
- (iv) **All crows that have existed
and will exist in the future**

Empiricism: The claim should refer to (i) or (ii)

Rationalism: No to (iv) or even to all possible crows i.e. The claim means crows are necessarily black

Empiricism: Perhaps the rationalist is **right** about what the **claim means** but this shows that we must be **uncertain about generalizations. They cannot be verified** (Hume)

Karl Popper: But they **can be falsified**

- As soon as we find a black crow we know the claim is false
- We should **believe not (only) what we can verify but also what we can not falsify**
- Since verification is impossible for generalizations and generalizations are necessary in science we should construct as **strong hypotheses as possible**, so that it is **easier to** see how they can be **falsified** (i.e. have information content)
- **Thinking is cheap** verification impossible and falsification is possible but can be expensive

But

Quine How can we know when something is falsified?

+ other problems

(i) Underdetermination of concepts
rabbit₁ + rabbit₂ + rabbit₃ -->?
the concept rabbit

(ii) Indeterminacy of concepts (vagueness)
Gavagai: (i) rabbit substance
(ii) temporal sausage
rabbit
(iii) time slice rabbit

Solutions to the problem of underdetermination

1. **Conceptual realism:** - an abstract entity outside of time and space
2. **Conceptualism:** - a psychological construct, e.g. prototype, essence or meaning potential
3. **Nominalism:** - name + relevant referents
4. **Operationalism:** (Bridgeman) e.g. Intelligence = what is measured by an intelligence test

Criticism of operationalism:

- (i) surplus meaning - always possible to improve measuring operations
- (ii) understanding the operations presupposes the concept

Ethics

Beliefs concerning how we should act towards others whilst being concerned with their wellbeing

Examples

1. The Golden rule (Jesus, Confucius)
2. The universalizability criterion of Kant “Act so that the rule for your action could become a general law”

**Different views on the nature of
“moral goodness”. In the expression
“X is good”, X is**

(i) A non-cognitive emotional
expression

Value-Nihilism (A. Hägerström)

(ii) A certain subjective feeling,
e.g. Pleasure value

Subjectivism (E. Westermarck)

(iii) An objective property of an
entity (simple, unanalyzable)

Value objectivism

(G. E Moore)

(iv) An efficient means to reach a goal

Value instrumentalism (R B Perry)

(v) A property given by conventional norm

Value conventionalism

A related issue

- What is a "good action"?

A "good action" is

(i) an action with a good purpose

(ii) an action in accordance with an ethical norm

(iii) an action with good results

Another issue - the delimitation of a relevant norm group

The Norm group - the group the wellbeing of which we are concerned. Which group is it?

- everything
- everything living
- all animals
- all humans
- particular group of humans
- my primary group
- myself

Ethics in science

Three general ethical considerations

- (i) Not hurt (give pleasure)
- (ii) Not lie (give correct information)
- (iii) Not force (give freedom)

	Not hurt - Give pleasure	Not lie - Give correct information	Not force - Give freedom
General public	X	XX	X
Funders	X	XX	X
Colaborators	X	XX	X
Students	XX	XX	X
Subjects	X	XX	X

Everything relevant everywhere to some extent
XXs mark more relevant

Esthetics

Esthetics

Beauty

Elegance

Simplicity

In the expression “**X is beautiful**”,

X is

- (i) A non cognitive emotional expression
- (ii) A particular subjective feeling
- (iii) An objective property of a phenomenon
- (iv) An efficient means to reach a goal (advertising, political propaganda)
- (v) A property attained by being produced according to an esthetical norm

Schools of the philosophy of science

Dogmatism	Rationalism	Normativism
Scepticism (akad)	Empiricism	Descriptivism
Fallibilism (pyr shep)	Ration & empir	
Inductivism	Determinism	Nominalism
Deductivism	Indeterminism	Conceptualism
	Voluntarism	Realism
Atomism	Intrinsicalism	Nomothetical
Holism	Instrumentalism	Idiographical
Reductionism	Pragmatism	
Emergentism	Conventionalism	

Description
Interpretation
Construction

Verificationism
Falsificationism

Positivism
Logical
positivism
Logical
empiricism
Critical
rationalism

Hegel-Kuhn
Sociology of
knowledge
Sociology of
scientific
knowledge

Hermeneutics
Structuralism
Functionalism

Christian philosophy
of science

Marxist philosophy of science

Islamic philosophy of
Science

Liberal philosophy of science

Buddhist philosophy of
Science

Conservative philosophy of science

German philosophy of science
English philosophy of science
French philosophy of science