The Landscape of Philosophy of Science

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Overview

• Viewing philosophy of science through the lens of paradigms
• The Rock Ontology
• Basic principles of terminological ontologies
• The backbone of the ROCK Ontology
• The nature of the characteristics
• Perspectives
Viewing philosophy of science through the lens of paradigms

• In general the obligatory philosophy of science course at bachelor level in all Danish university education programs is pretty though for the students to enter into.

• One of the problems for them is to leave their common sense view of the world, knowledge and science and accept a much more detailed and complex view.

• When they accept the necessity of that new complexity, it is a problem for them to understand the rationality behind the differences between the paradigms, and then to establish an overview that can help them navigate when forced to choose relevant paradigms to combine and use methods from relevant paradigms in order to shed light on the problem they have defined to solve through empirical investigation.
Viewing philosophy of science through the lens of paradigms

• For categorizing purposes we have chosen Thomas Kuhn’s paradigm theory to flesh out the smallest of the elements from which we build our ontology. Therefore Paradigm theory is not categorized in the ontology.

• We have here chosen those paradigms that are most used in the cognition and communication areas. Our selection looks like this:
Philosophy of science paradigms covered

Classical positivism: Comte
Logical positivism: Carnap og Neurath
Critical Rationalism, Popper
Critical realism: Bhaskar
Phenomenology: Husserl, Heidegger, Merleau-Ponty, Ricoeur
Hermeneutics: Dilthey, Schleiermacher, Gadamer
Marxism: Marx og Engels
Critical theory: Adorno og Horkheimer, Habermas
Constructivisms: Berger og Luckmann, Arnbor og Bjerke, Collin’s matrix
Postmodernism: Lyotard
Semiotics: Saussure and Peirce
Discourse analysis: Foucault, Fairclough, Laclau og Mouffe
Systems theory: Luhmann
Sociological Field analysis: Bourdieu
Structuralism: Saussure, Foucault
Grounded Theory: Glaser and Strauss
Actor Network Theory: Latour
System theory: Luhmann
Cybersemiotics: Brier
Meta Criteria for ordering Paradigms into super categories

• We wanted to use some general historical movements of culture for framing the paradigms into social reality. Here we chose the difference between modernism and postmodernism as a meta frame.

• At the middle level we then needed a first way to differentiate the paradigms from a historical point of view and chose the concepts classical and post-classical.

• As a general qualifier to order paradigms and an important aspect to make the students aware of we chose: Realism, dialectical realism, non-realism and process philosophy.

• We have visually organized the ontology in these four categories to obtain a simple ordering.
Extract of the ROCK Ontology with temporal and selected associative relations
Basic principles of Terminological Ontologies

1. Concept:
   - Disease prevention

2. Dimension (Subdivision criterion):
   - TARGET GROUP: population
     - 1.1 universal prevention
     - 1.2 selective prevention
     - 1.3 indicated prevention
   - TARGET GROUP: high-risk groups
     - 1.4 primary prevention
     - 1.5 secondary prevention
     - 1.6 tertiary prevention
   - TARGET GROUP: high-risk individuals
     - PHASE IN CLINICAL COURSE: before
     - PHASE IN CLINICAL COURSE: during
     - PHASE IN CLINICAL COURSE: after

3. Relation (Type of):
   - Target Group
   - Phase in Clinical Course

4. Characteristic (Feature specification: Attribute + value)
Several potential subdivision criteria

AIM: inherited from superordinate concept

Potential subdivision criteria: TARGET GROUP, ARENA, AGENT
One distinguishing subdivision criterion must be chosen

TARGET GROUP is chosen (ARENA and AGENT depend on TARGET GROUP)
Backbone of the ROCK Ontology (1)
Backbone of the ROCK Ontology (2)
Example of an entry in the ROCK Ontology

**Subject:** Videnskabsteori

**English:** paradigm

**Reference for term:** Hjørland: The Epistemological Lifeboat

**General definition:** set of basic principles that direct a research field

**Reference for def.:** KELJ: Kathrine Elizabeth Lorena Johansson

**Technical definition:** Paradigm

Thomas Kuhn most renown work is The Structure of Scientific Revolutions (1962), which he wrote while a graduate student in theoretical physics at Harvard. Kuhn argued that science is not a steady, cumulative acquisition of knowledge. Instead, science is shifting between phases of "normal science", crises and revolutions. Kuhn was responsible for popularizing the term paradigm, which he described as essentially a collection of beliefs shared by scientists, a set of agreements about how problems are to be understood. According to Kuhn, paradigms are essential to scientific inquiry, for "no natural history can be interpreted in the absence of at least some implicit body of intertwined theoretical and methodological belief that permits selection, evaluation, and criticism." Indeed, a paradigm guides the research efforts of scientific communities, and it is this criterion that most clearly identifies a field as a science.

"[In its role] as a vehicle for scientific theory, [the paradigm] functions by telling the scientist about the entities that nature does and does not contain and about the ways in which those entities behave. That information provides a map whose details are elucidated by mature scientific research. And since nature is too complex and vague to be explored at random, that map is as essential as observation and experiment to science's continuing development. Through the theories they embody, paradigms prove
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Alphabetic list

- Actor-network theory
- ANT
- classical paradigm
- classical positivism
- constructivism
- critical rationalism
- critical realism
- critical theory
- Cyber Semiotics
- cybernetic information theory
- dialectical realism
- discourse analysis
- early critical theory
- Grounded Theory
- Habermas critical theory
- hermeneutics
- late critical theory
- logical positivism
- Luhmann’s systems theory
The nature of the characteristics in the ROCK Ontology

The combination of characteristics: PURPOSE, ONTOLOGY, EPISTEMOLOGY etc. is not allowed according to the basic principles of terminological ontologies.

3.1.1.3 Actor-network theory

PURPOSE: to examine varied translations in heterogeneous networks and their generation
ONTOLOGY: constructivist realism
EPISTEMOLOGY: idiographic mapping of actants in networks by ethnological procedures
TRUTH CONCEPT: pragmatic.
A relation between humans, institutions and statements

3.1.1.4 Systems theory

PURPOSE: to generate a hierarchical and general theory of systematization that is true of all structures from an organic micro-cosmos to social macro-cosmos
ONTOLOGY: 3rd person structural realism
EPISTEMOLOGY: objective knowledge can be found by understanding systemic structures, and detect their effects on organisms, human consciousness, and social processes
TRUTH CONCEPT: correspondence theory of truth

3.1.1.5 Cybernetic information theory

PURPOSE: to explore regulatory systems, their structures, constraints, and possibilities
ONTOLOGY: complex realist ontology
EPISTEMOLOGY: objectivist, which in 2nd order cybernetics includes a cybernetic (self)observer
TRUTH CONCEPT: emergence
Basic principles of Terminological Ontologies

Polyhierarchy: allows a combination of characteristics, inherited from the superordinate concepts. The combination of characteristics distinguishes the concept from other concepts.
The ROCK Ontology with non-lexicalized concepts

Solution in the ROCK Ontology: introduce non-lexicalized concepts in order to obtain polyhierarchy

Polyhierarchy: allows a combination of feature specifications
Simplified diagram with non-lexicalized concepts

The extra layer of non-lexicalized concepts should not be presented to the students, but may be useful for experts in order to clarify and define concepts.
Perspectives: competing ontology structures

Competing ontology structures built according to different perceptions of the teachers:

• A given student would then be free to choose the relevant view represented by his/her teacher when consulting the knowledge base.
Perspectives: Ontology app
To conclude

Vi hope that we have provided the students with a visual overview of a complicated field and that we can offer them an easily navigatable app, where they can look up further information about the paradigms, when they have to choose the ones that are relevant for the research task they have to solve.