

Philosophy of Science

Lecture 10: Natural Kinds Special Topic: Dispositions

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Introduction

A metaphysical and an epistemological question

- Two questions arise vis-à-vis scientific classification schemes:

(1) Are some classes – henceforth *kinds* – natural?

(2) Can science discover them?

NB: Otherwise put, does science carve nature at the joints?

- Natural kinds are contrasted with non-natural (a.k.a. artificial) kinds. Here are some alleged examples:

Artificial Kinds

Books

Attic contents

Peruvian hats

Natural Kinds

Elements

Molecules

Species

Theorising about Natural Kinds

Naturalism

- There are roughly two kinds of answers to the foregoing questions. Let us consider each in turn.

(1) Naturalism: Some kinds are natural and these are identified by our best scientific theories.

NB: This view goes back at least to Empedocles who first posited that there are four kinds of things.

- If naturalists are right, we need criteria that allow us to identify such kinds from artificial ones. More on this below.
- **Prominent advocates:** Ellis and Quine.

Conventionalism

(2) Conventionalism: On this view, there are no pre-existing divisions in nature. Kinds are purely a matter of convention.

NB: Sometimes this is also known as ‘constructivism’.

“Conventionalists... deny that any of our classifications, including those of science, are naturally privileged forms of classification. The classifications of botanists do not carve nature at its joints any more than the classifications of cooks” (Bird and Tobin 2017: p. 3).

- **Prominent advocates:** Duhem (allegedly), Poincaré (allegedly), Woolgar and Latour.

Many ways to divide a pie: A toy example

- One motivation for conventionalism is that some schemes of classification seem to be genuinely conflicting.

Which of the following are fruits (vs. vegetables)?

rhubarbs, tomatoes & peppers

Two competing classifications:

Culinary: rhubarbs

Biological: tomatoes & peppers



- **Counter:** The answer is obvious in this case (biological).

Natural kinds: Some criteria

- On the assumption that natural kinds exist, we need criteria that allow us to identify such kinds from artificial ones.
- Tokens of the same kind, it has been suggested, should satisfy one or more of the following:
 - (1) *Share properties*, e.g. electrons are negatively charged.
 - (2) *Behave in similar ways*; in so doing, they should support inductive inferences, e.g. wolves hunt in packs.
 - (3) *Feature in laws of nature*, e.g. objects with mass resist acceleration.
 - (4) *Be hierarchical in nature*, e.g. lions and tigers are different species but belong to the genus *Felis*.

Essentialism

- The most common type of approach to naturalism is essentialism (compare: anti-essentialism or pluralism).
- Essentialists argue that the source of similarities between tokens of the same natural kind are certain properties.
- We can call these 'essential properties' or 'essential structures' for short.
- Objects are members of the same natural kind *if and only if* their essential properties coincide.
- **Prominent advocates:** Aristotle, Putnam and Ellis.

Natural Kinds in Biology

Classification issues within science

- Unlike chemical kinds, biological kinds like *species* don't have fixed natures. That's because their genetic code evolves.
- Even so, species are not merely arbitrary classes of things. That is, the concept species seems to pick out a natural kind.
- The trouble is that even within biology there are several conflicting classification schemes.
- Species can be discriminated on the basis of:
 - * phenetic: morphological traits, e.g. Linnaeus 1735.
 - * phylogenetics: unique (ancestry + traits), e.g. Cracraft 1983.
 - * biological species concept: interbreeding, e.g. Mayr 1969.

Phenetic problem: Sexual dimorphism



Hypolimnys misippus
male



Hypolimnys misippus
female

Phenetic/Phylogenetic problem: Polymorphism



Theridion grallator



Sonora semiannulata

Phenetic problem: Mimicry (and polymorphism)



Danaidae

Papilio dardanus

Asexual reproduction

A. inornatus



A. tigris

Aspidoscelis neomexicanus

Special Topic: Dispositions

What are dispositions?

- Dispositions or capacities are properties that get ‘activated’, i.e. manifest themselves, under certain conditions.

Example: Fragility, solubility, malleability, etc.

- What’s interesting about such properties is that they may be possessed by objects even if they are never manifested.
- That is, the defining characteristic of dispositions is *possible* behaviour.
- As such, dispositions tend to be eschewed by empiricist philosophers who opt for light metaphysics.

The simple conditional analysis

- The conditions under which dispositional properties get manifested are sometimes known as 'stimulus conditions'.
- Simple Conditional Analysis (SCA):

An object is disposed to manifest M under conditions C IFF if it were the case that C , then M would be the case.

Example: A glass is disposed to manifest breaking when it is violently struck with a heavy object.

Prominent advocates: Ryle (1949) and Goodman (1954).

Dispositions, laws and kinds

- In recent years, dispositions have been intimately tied to laws of nature and natural kinds.
- Cartwright (1999), for example, argues that (statements of) laws of nature express relations between capacities.
- Similarly, laws of nature have been proposed to hold a close relation with natural kinds, see, for example, Ellis (2002).
- A law of nature relates only natural kinds and natural kinds are identified by their presence in laws of nature.

The End