



# An introduction to biological essentialism

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# An ambiguous term

- Meaning of “essence” - what-it-is-to-be
- Originally tied to substance-form ontology of Aristotle
- Prescientific theory of knowledge based on defining ordinary terms (Man is a rational animal)
- Separate from other features or properties (accidents)
- Invariance of tokens of a type

# The Received View in biology

- Before Darwin, biological kinds were essentialist
- Darwin introduced “population thinking”
- The Modern Synthesis showed that species were polytypic (or “polymorphic”)
- Hence, biological essentialism is false

# The history of the Received View

- Plato fingered by Simpson and Mayr
- Aristotle by A. J. Cain in 1958 (Cain was a student of Mayr's)
- Popper's opposition to "essentialism" dates to his *Open Society* (1945), also fingers Plato as the culprit
- David Hull in 1965 publishes "The effects of essentialism on taxonomy: two thousand years of stasis" from a graduate seminar with Popper
- Mayr's revision fingered Aristotle.

# A Revisionist History

- No essentialism of biological species until ***after*** Darwin
- Type  $\neq$  Essence
- Aristotle did not establish essentialism **in biology**
- Idealists before Darwin not anti-transmutation
- Species were always defined by the *generative production of form* (The “Generative Conception of Species”)

# Four kinds of essentialisms

- Cognitive essentialism
- Sociological essentialism
- Semantic or formal essentialism
- Material or causal essentialism

# Cognitive essentialism

- Piaget, Carey, Keil, Atran and Gelman
- Focuses on a native inference of something common to all tokens of a type
- Atran claims that species in folk taxonomy have cognitive essences
- Problem: No straight mapping to biological kinds (Why the Cassowary is not a Bird)

# Sociological essentialism

- Human nature as essence
- Racial essences
- Ethnic essences
- Gender essences
- Problem: Human diversity fails to track the “standard” essential kinds (e.g., races or gender) and contributes to racism and sexism.



# Semantic or formal essentialism

- Essence of terms, words or natural kinds
- Traditional version: necessary and sufficient conditions for inclusion in a kind term (Putnam and Kripke)
- More recent versions:
  - Family resemblance predicates
  - Homeostatic property clusters (Boyd)
  - Population structure kinds (Ereshefsky and Matthen)
  - Vague kinds

# Semantic essentialism 2

- Problems:
  - Ordinary kind terms fail to track scientific kinds (elms and lilies)
  - Appears to not match scientific practice
  - Does not do what it is thought to do under the Received View (diagnosis and definition)

# Material or causal essentialism

- Traditional: microstructural constitution
- Some aspects of the type are causally effective in making tokens instances of the type
- The distinction between formal and material essence is old – goes back at least to Aquinas



# Aquinas on the material/formal distinction

These [*species infimae* or *specialissimae*] are called individuals, in so far as they are not further divisible formally. Individuals however are called particulars in so far as they are not further divisible neither materially nor formally.

In lib. X *Met. Lect* 10, 21-23

- Aquinas distinguishes the material from the formal. Later writers continue this.

# Aristotle's biology

- Did not tend to use the logic of division of the *Categories* or *Metaphysics*
- He and Theophrastus (his student and founder of botany) used “*genos*” (genus) and “*eidos*” (species) interchangeably in biology
- This was the case until the 16thC (Fuchs in botany and Gesner in zoology)
- So the words *genus* and *species* had no special biological meaning until then

# Logic and biology

- Always held to be distinct
- Cain, Mayr, Simpson, Hull and others misled by reading logical ideas as referring to biology
- But the **logicians** knew they were distinct. In 1826, Whatley explicitly said as much in his *Elements of Logic*, a widely used text

# Whatley on species essences

... if anyone utters such a proposition as ... “Argus was a mastiff,” to what head of Predicables would such a Predicate be referred? Surely our logical principles would lead us to answer, that it is the *Species*; since it could hardly be called an Accident, and is manifestly no other Predicable. And yet every Naturalist would at once pronounce that Mastiff, is no distinct Species, but is only a *variety* of the Species Dog. ...

# Whatley's 1826 Solution

... the solution of the difficulty is to be found in the peculiar technical sense ... of the word “Species” when applied to *organized Beings*: in which case it is always applied (when we are speaking strictly, as naturalists) to individuals as are supposed to be *descended from a common stock*, or which *might* have so descended; viz. which resemble one another (to use M. Cuvier’s expression) as much as those of the same stock do. ...

[*The fact of two organisms being the same species*] being one which can seldom be *directly* known, the consequence is, that the *marks* by which any Species of Animal or Plant is known, are not the very *Differentia* which *constitutes* that Species.



# Origins of (biological) essentialism

- Arises in the period *after* Darwin (1870s–1920s)
- Largely in Germany and France
- Contemporary with the rise of neo-scholasticism after Vatican I, and the later neo-Thomist movement of the early 20thC
- Often directed against Haeckel and his Monism
- Usually Catholic (but not the official RCC position)
- A conjecture: Mayr was an undergraduate in Germany during the height of the neo-Thomist revival (1922–28): a connection?

# The phylogenetic perspective

- Species as individuals thesis (SAI)
- Historical individuals with proper names
- Clades versus grades/natural kinds versus natural (evolutionary) groups
- Basal groups are constructs if they fail to include descendents
- Hence species are not natural kinds



# Could there be a biological essence for some kinds?

- If a population has a completely shared trait that
  - Causes or contributes causally to the population being what it is
  - Is modally necessary to being that kindthen yes.
- But most “kinds” will not be essentially defined (species will, typically, not be essential kinds)

# Relational biological essences

- Essences might be relations:
  - Genealogical relations (interbreeding)
  - Historical relations (shared ancestry)
  - Similarity relations (phenetics)
- Which relations matter, and which don't?

# Summary

- *Essence* in biology is an ambiguous term
- Usually means invariance of properties of tokens of a type
- **Not** the “default” view before Darwin
- Comes in *formal* and *material* varieties, or in modern terms, *semantic* and *causal* varieties
- Semantic essentialism is harmless. Causal essentialism is contrary to biological facts (it is argued by “population thinkers”)

