Metaphysics and the Philosophy of Biology

ANZ Philosophy of Biology, 23/6/2023

Caleb Hazelwood & Charles H. Pence

UCLouvain
Institut supérieur de philosophie (ISP)

Outline

1. A contested relationship
2. The primacy of practice? On holobionts
3. A more difficult case: Levels of organization
4. Toward general criteria

The take-home: We need to consider when the philosophy of biology should (and shouldn't) appeal to metaphysical arguments.

A Contested Relationship

If we take a step back and think about it in general, the relationship between the philosophy of biology and the metaphysics of science is **pretty weird.**

Yay, metaphysics! boo, practice

Philosophy of Science

September, 1978

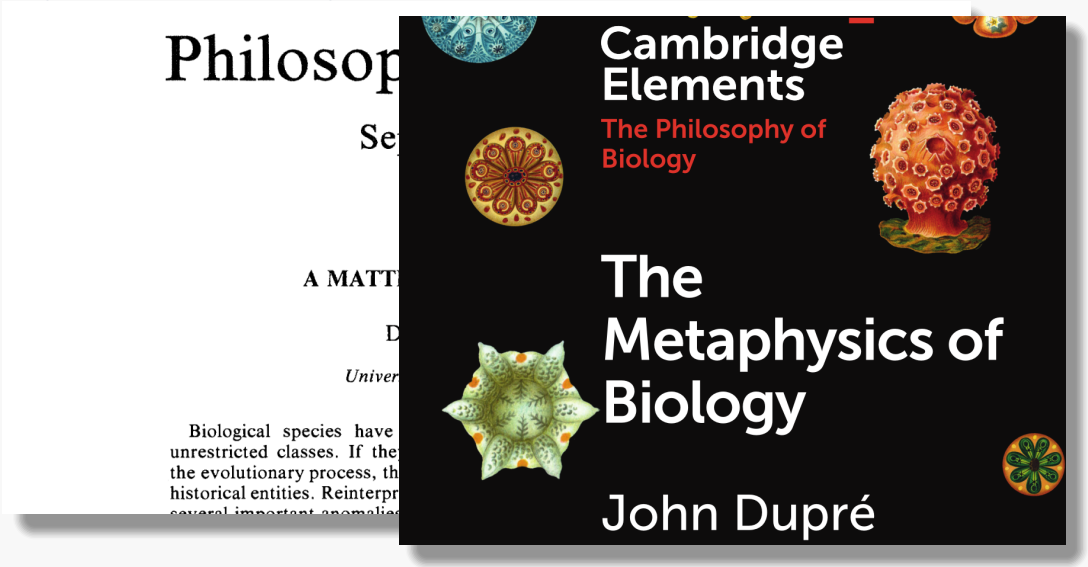
A MATTER OF INDIVIDUALITY*

DAVID L. HULL†

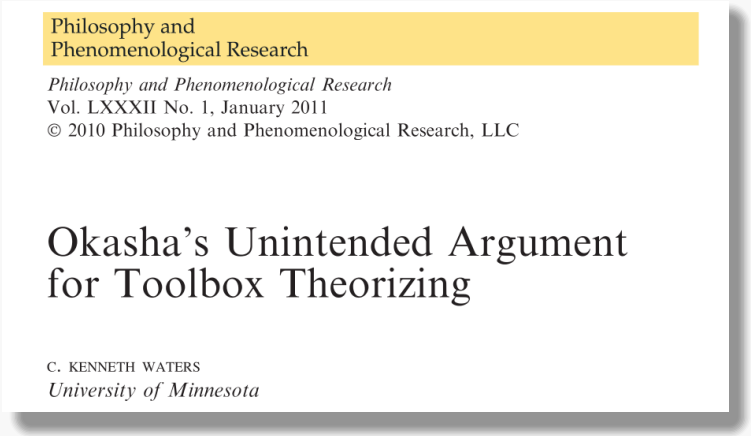
University of Wisconsin-Milwaukee

Biological species have been treated traditionally as spatiotemporally unrestricted classes. If they are to perform the function which they do in the evolutionary process, they must be spatiotemporally localized individuals, historical entities. Reinterpreting biological species as historical entities solves several important anomalies in biology, in philosophy of biology, and within

Yay, metaphysics! boo, practice



Yay, practice! boo, metaphysics



Philosophy and
Phenomenological Research

Philosophy and Phenomenological Research
Vol. LXXXII No. 1, January 2011

Okasha's Unintended Argument for Toolbox Theorizing

C. KENNETH WATERS
University of Minnesota

Yay, practice! boo, metaphysics

Philosophy and Phenomenological Research

Philosophy and Phenomenological Research
Vol. LXXXII No. 1, January 2011

Okasha's Unintende
for Toolbox Theori

C. KENNETH WATERS
University of Minnesota

Journal of the History of Biology (2008) 41:339–367
DOI 10.1007/s10739-007-9145-5

Distinguishing Drift and Selection Empirically: "The Great Snail Debate" of the 1950s

ROBERTA L. MILLSTEIN
Department of Philosophy
University of California, Davis
One Shields Avenue
Davis, CA 95616
USA
E-mail: RLMillstein@UCDavis.edu

The Primacy of Practice Thesis

(POP) When suitably applied and fully elaborated, biological practice should be able to resolve any questions that we might otherwise have taken to be metaphysical.

What differentiates cases where the literature adheres to (POP) and cases where it does not?

What differentiates cases where the literature adheres to (POP) and cases where it does not?

Our claim: **Not much.** Perhaps, even, just founder effects and engagement with the state of the art.

Our suggestion: We need something that resembles **theorizing** about (POP). **Under what conditions should we expect it to hold?**

Our suggestion: We need something that resembles **theorizing** about (POP). **Under what conditions should we expect it to hold?**

Our proposal: Here are a few **case studies** to help us look at the question, which we'll evaluate by looking at a kind of **underdetermination** of apparently-metaphysical questions by biological practice.

Holobionts and (POP): A Success Story

Holobionts

The term **holobiont** refers to a plant or animal host and its associated microbiome

In humans, microbes are necessary for proper development of immune, digestive, and circulatory systems

Even wilder intuition-challenging examples abound: aphids, Hawaiian bobtail squid, termites, ruminants, etc.

Holobionts

Holobionts and their blurred boundaries have prompted researchers to ask: what, from a biological perspective, is an individual **really?**

There are, of course, several ways to cash out what we mean by "a biological perspective"…

Holobionts

- Physiological criteria such as **immunological policing** mechanisms (Pradeu 2010)
- Perhaps the most disputed way of treating holobionts has been to characterize them as **evolutionary individuals**

  Evolutionary individuality, too, must be further specified: replicators and interactors (Hull 1980), "manifestors of adaptation" (Gould and Lloyd 1999), "Darwinian individuals" (Godfrey-Smith 2009)

Holobionts

These concepts come apart in interesting ways

Example: Hawaiian bobtail squid + *Vibrio fischeri* are **interactors** and **manifestors of adaptation** (the entire holobiont bears the trait of bioluminescence) but they are not **replicators** or **Darwinian individuals** (bacteria are transmitted horizontally, not vertically, so the holobionts don't form parent-offspring lineages)

This ambiguity leads some to say that holobionts **are** evolutionary individuals (e.g., Veigl et al. 2022) whereas others say they are **not** (e.g., Bourrat and Griffiths 2018)

Holobionts

So, who is right? Are holobionts evolutionary individuals or aren't they? …the answer depends on practice!

If practitioners are interested in, for example, **phylosymbiosis,** then evolutionary individuals will be distinguished by the presence of parent-offspring lineages

If practitioners are, instead, interested in **trait frequencies,** then evolutionary individuals will be distinguished by whether they instantiate the holobiont-level trait

Holobionts

In this case, (**POP**) clearly does the heavy lifting: specify how you are operationalizing the concept and then determine the boundaries of the evolutionary individuals

There is no **uniquely correct** characterization of "evolutionary individuals": once the concept is appropriately specified, the classifications fall out of practice

Holobionts

Sometimes this will mean relying on practical conventions. In cases where there is both horizontal and vertical transmission, then a threshold of heritability will need to be stipulated

This will be determined on the epistemic aims of practitioners. What degree of heritability are they interested in?

In short: **practice unambiguously advocates for pluralism about evolutionary individuals**

We can follow (**POP**) with a clear conscience.

A More Difficult Case: Levels

Levels of Organization

DiFrisco (2017): A theory of levels needs to propose a collection of **classes** that is **causally adequate** – it properly captures the ways in which much of the "causal action" is level-segregated – and is **consistent** – a single, unified criterion picks out all of the levels

Levels of Organization

- Classic, "global" levels of nested composition: Oppenheim and Putnam (1958)
- Spatial scales of causal interaction: Potochnik and McGill (2012)
- Temporal scales of causal interaction: DiFrisco (2017)
- Epistemic patterns of foregrounding and backgrounding: Hochstein (2022)
- Eliminativism about levels entirely: Thalos (2013)
- and many more…

DiFrisco's Example

Consider the growth of a tree, as a higher-level process, and the processes of photosynthesis occurring in the tree's leaves, at the lower level. Photosynthesis will be very sensitive to **short-term** changes in light levels, etc.; tree growth will "dampen" those fluctuations and respond only to something like **long-run** average photosynthesis.

DiFrisco's Example

- Fits (unsurprisingly) well in DiFrisco's theory of levels: chemical interactions largely segregated to short time-scales and hence low-level; tree growth largely segregated to longer time-scales and hence high-level
- But also can be explained by composition: photosynthesis occurs in organelles which are parts of cells, the growth rates of which cause tree growth
- Or by Hochstein's theory of epistemic resources: one will foreground or background different explanatory resources in constructing explanations of photosynthesis versus explanations of tree growth

DiFrisco's Example

More generally, how could practice studying photosynthesis resolve the question of which **general theory** of levels is correct? DiFrisco's adequacy criteria of causal adequacy and consistency don't seem to respond to even the most charitably general reconstruction of the study of tree growth.

In short: **practical examples seem not to speak to the suitability of theories of levels in general**

(**POP**) seems like a bad rule of thumb; we need input from elsewhere, too.

Toward General Criteria

Underdetermination

Many of these cases seem to have suffered from a kind of **underdetermination of metaphysical questions** by biological practice

Underdetermination

This is helpful as a way to diagnose a kind of common currency between the examples that we've described here. But it just pushes the problem back a level: how can we know **when underdetermination threatens a debate?**

An Intuition

This kind of underdetermination seems to arise when, in some sense, given the current landscape of a philosophical debate, adding further cases from practice **doesn't change the landscape.**

How can we cash out this sense of "not providing us with new information?"

A Proposal

Underdetermination of a question by practice, and hence the failure of (POP), seems likely to occur when **practical cases can be seamlessly translated between different underlying philosophical views.**

A quick example: causation in natural selection

Other Cases?

- species: classes or individuals?
- natural selection: causal or epiphenomenal?
- genes: ontology?
- extended synthesis: commensurable?
- function: selected effect or causal role?

The common thread: groups differing over the role of practice without always recognizing that they're doing so.

The Nuclear Option

A possible objection: But the **only good questions** in philosophy of biology are ones where (POP) holds. You should just ignore the rest!

Our response: This is a perfectly reasonable **personal preference.** But it's not an argument that questions for which (POP) fails to hold are somehow illegitimate.

Questions?

charles@charlespence.net
caleb.hazelwood@duke.edu
https://pencelab.be · https://calebhazelwood.com