

INFERENCEAL ACCOUNT OF REPRESENTATION

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Aim: How to best characterize scientific representation?

Importance

Ubiquity of representations in science: "Bohr's Atom", "Lotka–Volterra equations", "heat-maps",

In model based philosophy of science, the question surrounding representation are arguably *the* questions of fundamental importance: when does a model represent a target, how do we learn about the target from the model, can a target have different mutually inconsistent models, and so on.

Unifying framework for many problems in philosophy of science. For e.g. demarcation.

Whether this is re-inventing the wheel is an interesting question.

Questions

via Frigg and Nguyen (2021):

- If and how are scientific representations different from other kinds of representations?
- What are the necessary and sufficient conditions for R to represent T ?
- How to identify adequate representations?
- What are the kind of objects that serve as representations?

"Scientific Representation." *Stanford Encyclopedia of Philosophy.*"

Desiderata

- Surrogate Reasoning
- Possibility of Misrepresentation

Distinguish misrepresentation from non-representation.

- Targetless Models.
- Directionality

The Inferential Tradition

DDI account: Models *denote* their targets; are such that users can perform *demonstrations* on them; and *interpret* the results of such demonstrations in terms of the target.

Richard I.G. Hughes (1997) "Models and Representation." *Philosophy of Science*, 64: 325–336. © (2010) *The Theoretical Practises of Physics: Philosophical Essays*. Oxford: Oxford University Press.

Suarez's Account

"The aim of a substantive theory of representation is to lay down the general conditions that disparate models must meet to carry out a representational function: It does not need to stipulate the conditions for accurate, true, or complete representation."

Gem!

(INF) A source represents a target only if (i) the *representational force* of the source points towards the target, and (ii) the source allows a competent and informed agent *to draw specific inferences* regarding the target.

Places due emphasis on the intentionality of the representation-user.

Gem!

Representational Force: "the [relational and contextual] capacity of a source to lead a competent and informed user to a consideration of the target." Can vary according to the usage. Suarez takes it as a brute notion. I will raise a worry about this at the end.

Important consequence: "No object or system may be said to possess representational force in the absence of any such uses."

Features of (INF)

Unlike DDI, (INF) does not require that inferences actually be carried out.

This seems to be in tension with the deflationary and minimalist spirit.

"The inferential conception that I defend does not require the actual carrying out of any of the relevant inferences."

Works well with fictional targets like unicorns.

(INF) is a local account. It "abandon[s] the aim of a substantive theory to seek universal necessary and sufficient conditions that are met in each and every concrete real instance of scientific representation."

Objectivity of Scientific Representation

I want to talk a bit more about Suarez's use of objectivity in distinguishing scientific (and as we will see aesthetic) representations from mere stipulation.

Hence, the second requirement of (INF) is motivated as a demarcation criterion. That we can make inferences using scientific representations is what distinguishes them from mere stipulations.

"It requires A to have the internal structure that allows informed agents to correctly draw inferences about B."

This still seems a bit too thin to me. There is, I think, a matter of fact as to why the London tube map makes me reliably make correct inferences about trains. There is, I think, a matter of fact as to why I can infer the qualities of Innocent X from looking at Velazquez's painting. But what is the internal structure that warrants me the same epistemic privileges in the case of representation?

A global answer is out of the question given Suarez's account. But what can qualify as a local answer? I don't know!

Perspectival

"... the reference to the presence of agents and the purposes of inquiry is essential. First, the establishing and maintaining of representational force in (i) requires some agent's intended uses to be in place; and these will be driven by pragmatic considerations. Second, the type and level of competence and information required in (ii) for an agent to draw inferences regarding B on the basis of reasoning about A is a pragmatic skill that depends on the aim and context of the particular inquiry."

I am sympathetic to this approach. And Suarez's account satisfies lots of desiderata and answers most of the questions I noted above. But I think that it fails on the most important question: when is a source a good representation of the target?

Suarez: By "objective" in this context, and throughout the paper, I mean informative regarding the target of the representation. But if truth, isomorphism, and similarity cannot be used to capture the objectivity that distinguishes scientific representation, what can? I suggest that we explicitly turn to the second surface feature of scientific representation, that is, its capacity to allow surrogate reasoning.

Suarez writes: "The quantum-state diffusion equation has the resources to allow a competent and informed user to draw inferences concerning the state of a quantum particle subject to a localization procedure. These are not inferences that a competent agent could derive on the basis of any odd equation: they are specific to the chosen source and target pair." But what are the resources of the equation that facilitate this? That's the interesting question.

Coal!

