True Griceanism about scientific representation

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The Debate on Scientific Representation

The Model-View of Theories

Scientific theories were once conceived as set of statements about the world.

- Scientific representation is just one mode of linguistic representation
- The world-theory relation is a matter of *meaning*

It is now recognised that models are the main representational unit in science. Theories as organised collections of models.

- Scientific representation closer to pictural representation?
- World-theory relation = Similarity? Isomorphism?

The Model-World Relation

Similarity is not sufficient because representation is directional (irreflexive, asymetric)

Similarity is not necessary because misrepresentation is possible[1]

Importance of the user and their purposes[2]. Some aspects of the target matter, not others (idealisations).

Deflationary Accounts of Scientific Representation

Callender and Cohen[3]:

- We must separate the constitution question (what makes A a representation of B) from other questions (accuracy, ontology, demarcation).
- Constitution: mere stipulation by users is enough; nothing specific to science.
- Other questions: pragmatics (which vehicles are good for which purposes)

A Transposition of Grice's Philosophy of Language

- derivation of non-natural (linguistic) meaning from natural meaning ("dark clouds means that it will rain")
- reduction of linguistic meaning to mental representation

The deep questions are relegated to philosophy of mind.

Criticisms: Epistemic vs Symbolic Representation[4]

	Symbolic	**Epistemic**
Function	Pick an object or invoke a mental state	Tell us what an object is like, create a mental state
Structure	Can be simple	Symbols carefully arranged
Relation	Stipulated, conventional	Licensed*, responsive to empirical aims
Resemblence	Pragmatic	Constitutive

*Communal licensing: what a model represents depends on the history of its construction, reception and use.

Are Criticisms Well-founded?

Grice's derivation of non-natural meaning from natural meaning is not as simplistic as Callender and Cohen's.

⇒ Epistemic representation could derive from symbolic representation in a less trivial way.

Grice distinguishes utterance meaning and expression meaning. The latter is communal and not necessarily conventional.

⇒ There is room for communal licensing.

Grice's Actual Strategy

From Natural to Non-Natural Meaning

Narrative to derive non natural meaning from natural meaning.[5] Not a genetic or historical account: only exhibits conceptual links.

1. A groans non-voluntarily because A is in pain
2. A groans voluntarily (deception?)
3. B realizes that A groans voluntarily (undermines the conclusion that A is in pain)
4. A intends B to realize that she groans voluntarily
5. B assumes that it's a game of make-believe
6. B assumes that A is in pain because she groans voluntarily (why not a natural sign?)
7. No more connection to natural signs, more expressive freedom

Grice's Theory of Meaning

A specific utterance U means that p if, and only if, in performing it, the utterer intends:

1. that an audience will come to believe that p
2. that this audience will recognise intention (1), and
3. that the recognition in (2) will cause the belief in (1)

Expression Meaning

What is the meaning of words constituting utterances? What is the meaning of expressions (=combinations of words)?

- Social values: expression/word meaning=optimal use.
- Could rest on conventions, but not essential.

Expression meaning is explained in terms of utterance meaning. Utterance meaning is explained in terms of mental states.

Transposing the Strategy

More subtle than Callender and Cohen, but not an account of scientific representation. How shall we transpose?

- derive epistemic representation from symbolic representation
- distinguish contextual use and general status

From Symbolic to Epistemic Representation

The Narrative

1. A shows a turn left sign to B
2. A shows a succession of signs at every intersection for B to go from X to Y in the city
3. B tells where she wants to go and follows A's signs
4. A hands a sheet with a list of signs to B
5. A has a list of sheets for every possible route
6. There is redundancy. A synthesise the sheets in a single representation
    - extract a list of intersections (step in a sheet)
    - symbolise direction with angle (reversibility)
    - merge coinciding intersections
7. A displays the representation with instructions in a public place

The Account

A vehicle is an epistemic representation if and only if:

1. It induces complex sequences of mental states
2. The user assumes or pretends that particular purposes can be achieved reliably with (1)
3. (2) is true for a set of purposes within a range
4. Mental states in (1) are extracted using rules, taking purposes in (3) as inputs
5. The user can select purposes in (3) and apply rules in (4) autonomously

Back to the Constitution Question

What makes the map a representation of the city?

- Epistemic function: the map doesn't pick an object but creates mental states
- The target of representation is best characterised as a set of afforded purposes[6].
- This has instrumentalist flavours, but created states can be beliefs

Responds to some of the criticisms, but not all. Still a matter of stipulation?

From Contextual Use to Representational Status

Two objections

Dependence on the user: ex. a map of Mexico city used in New York city.

Restricted to concrete vehicles: model=abstract entity, cannot induce mental states.

Common answer: distinction between contextual use and general status, by analogy with utterance and expression meaning.

General Status as Optimal Use

A map of Mexico City can be *used as* (function as) a map of New York City. It is still a map of Mexico City… *even if not used at all!* $\rightarrow$ two senses of representation.
Gricean strategy: contextual use reduces to mental states, general status is a matter of optimal use

$\Rightarrow$ Not conventional, responsive to empirical aim
$\Rightarrow$ Communal licensing

Concrete and Abstract Vehicles

The harmonic oscillator is not a set of marks on paper… Scientific models are abstract entities. But many concrete vehicles can share the same function (induce the same mental states with equivalent rules).
What is licensed is the *shared symbolic structure*. Particularities (colour, etc.) are pragmatic features.
$\rightarrow$ Contextual use concerns concrete entities, general status concerns abstract entities.

Indexicality

Indexicals ("I", "here") acquire reference in context. Indexical terms and sentences have character: function from context to content.
Proposal: the relation between abstract representational status and concrete representational use can be formalised in terms of indexicality.
Abstract models have a *character*: the salient hydrogen atom in context, the origin of coordinate…

The Final Account

A concrete vehicle V is used by U with interpretational rules R as an epistemic representation for a set of possible purposes P if and only if:

1. V is capable of inducing complex sequences of mental states (intentions or beliefs) in U, which can be retrieved systematically by using R
2. U assumes or pretends that inducing these mental states with adapted rules is a reliable means of achieving any possible purpose within P

An abstract symbolic structure S is an epistemic representation for a set of indexical purposes $P*$ and indexical rules $R*$ within a community K if and only if it is considered appropriate or optimal for any member U of K, in any context C, to use a vehicle instantiating or describing S with rules $R*(C)$ as an epistemic representation for purposes $P*(C)$.

Are there Specificities in Science?

Reasons to doubt:

- Variety of vehicles (diagrams, equations, etc.) and scientific fields (economics, biology, physics)
- Vehicles used in science also used elsewhere

Theoretical framework? Not necessary. Could be a matter of optimality (licensed types of models).
Hypothetical reasoning? Permitted by this account.
→ The distinction between science and other epistemic activities is a matter of communal values (unification, scope, etc.)

Conclusion

Grice's strategy is applicable and gives a sensible account, in line with the literature (importance of users and purposes).
Two novelties:

- the target is a set of afforded purposes
- distinction between general status and contextual use

The latter is a blind spot of contemporary accounts. Scientific models do not always represent concrete entities. Could shed light on some controversies.
Could help establish links with other topics of philosophy of science: values and experience in theory choice, theoretical versus applied science, etc.

[1] Nelson Goodman. *Languages of Art.* Bobbs-Merrill, 1968; Mauricio Suárez. "Scientific representation: Against similarity and isomorphism". In: *International Studies in the Philosophy of Science* 17.3 (2003), pp. 225–244.

[2] Mauricio Suárez. "An inferential conception of scientific representation". In: *Philosophy of Science* 71.5 (2004), pp. 767–779; Bas van Fraassen. *Scientific Representation: Paradoxes of Perspective.* Vol. 70. Oxford University Press, 2008; Ronald Giere. "How models are used to represent reality". In: *Philosophy of Science* 71.5 (2004), pp. 742–752.

[3] Craig Callender and Jonathan Cohen. "There Is No Special Problem About Scientific Representation". In: *Theoria: Revista de Teoría, Historia y Fundamentos de la Ciencia* 21.1 (2006), pp. 67–85.

[4] Chuang Liu. "Re-inflating the Conception of Scientific Representation". In: *International Studies in the Philosophy of Science* 29.1 (Jan. 2, 2015), pp. 41–59; Brandon Boesch. "There Is a Special Problem of Scientific Representation". In: *Philosophy of Science* 84.5 (2017), pp. 970–981.

[5] Paul Grice. *Studies in the way of words.* Cambridge, Mass: Harvard University Press, 1989. 394 pp.

[6] Tarja Knuuttila and Mieke Boon. "How do models give us knowledge? The case of Carnot's ideal heat engine". In: *European Journal for Philosophy of Science* 1.3 (Oct. 2011), pp. 309–334.