On the Analogy between Cognitive Representation and Truth

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ABSTRACT: In this paper we claim that the notion of cognitive representation (and scientific representation in particular) is irreducibly plural. By means of an analogy with the minimalist conception of truth, we show that this pluralism is compatible with a generally deflationary attitude towards representation. We then explore the extent and nature of representational pluralism by discussing the positive and negative analogies between the inferential conception of representation advocated by one of us and the minimalist conception of truth.

Key words: representation, inferential conception, truth, minimalism.

1. The Inferential Conception of Scientific Representation

In a scientific representation some source A —typically a model, a graph, an equation— is used to represent some target B —typically a system, entity or phenomenon. The inferential conception of scientific representation (Suárez 2004) rejects the view that scientific representation is a relation between A and B that answers solely to the properties of A and B. Instead representation in science is conceived as an intentional activity, which cannot be reduced to any objective relation between the objects that stand as sources and targets of the representation, and is best characterised by two 'surface' features: its intentional or representational force and its inferential capacity.

The inferential conception takes it that agents' pragmatic purposes are essential in two different ways to the nature of the kind of cognitive representations one finds in science: i) as initial fixers of the representational *force* that points from A to B when A represents B, and ii) as defining the level of information, skill and competence required for an appropriate use of the representation, which in turn determines the *inferential capacities* of the source —i.e. it determines the inferences about B that can legitimately be carried out on the basis of reasoning about A. The representational force of a model within a practice, for instance, is typically initially fixed by stipulation and thereafter maintained by convention; the model's inferential capacities are institutionally preserved through the practices of model-building in science. Both are essential ingredients of representation, though admittedly they do not cut deep: it is built into the notion of a cognitive representation that sources are representationally directed towards their targets; and similarly, that they allow or permit the carrying out of infer-

ences regarding these targets. These two features may then be considered among the most basic platitudes regarding cognitive or informative representation.[1]

The inferential conception was explicitly linked from the start to 'a deflationary or minimalist attitude and strategy towards the concept of scientific representation in analogy to deflationary or minimalist conceptions of truth' (Suárez 2004, 770). We take it that a generally deflationary attitude towards any concept entails, roughly, an attempt at turning its platitudes into the defining conditions for the concept. It consequently involves the withdrawal of any further attempt at a 'deeper' or more substantive definition of the concept. This is precisely what the inferential conception invites us to do regarding the notion of representation as employed in science. Without prejudging the possibility of further platitudes, the inferential conception turns the two platitudes mentioned above into necessary conditions on representation, as follows (Suárez 2004, 773):

> [inf]: A represents B only if (i) the representational force of A points towards B, and (ii) A allows competent and informed agents to draw specific inferences regarding B.

[inf] is not intended to capture one unique concept but a plurality of concepts of representation, since it leaves open a number of different possibilities for a completion into further necessary conditions or even necessary *and* sufficient conditions. Thus suppose that a further platitude x is found in the use of the notion of representation, which we might hope will complete the analytical definition of the concept. This can always be added to the set of necessary conditions established by [inf] in the following fashion:

> [plural inf]: A represents B if and only if (i) the representational force of A points towards B, (ii) A allows competent and informed agents to draw specific inferences regarding B, and (iii) x.

First, note that the logical relationship between [inf] and [plural inf] is that the former is entailed, but does not entail, the latter. In proposing [plural inf] we are extending the original proposal into a more general schema which we characterise as *irreducibly* plural in the following sense. We assume that there are different members of [plural inf] with conditions x, y, z, etc, all of them legitimately defining a distinct concept of representation. Hence representation is a word that refers to several distinct concepts that share some but not all of its structure. This move turns the original proposal [inf] into a partial specification of the inferential conception of representation, which more precisely corresponds to the whole family of members of [plural inf]. We find it an advantage of the inferential conception that it allows for the possibility of maximal plurality —but it is clear to us that it then becomes imperative to try to locate

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[1] Cognitive representations differ from mere stipulations or denotations, since they allow us to infer information about the intrinsic properties of targets that we would not be able to infer from any other arbitrary representation. Throughout we take scientific representation to be a subspecies of cognitive representation in general, and aim at characterising this most general notion. See Suárez 2004, Section 3, for a discussion.

the core conditions in virtue of which all these concepts fall under the same term. That is the job that the original proposal [inf] was designed to fulfil: identifying the two conditions that are conceptually necessary ('platitudinous') for any instance of scientific representation.

There is a particularly simple member of [plural inf] that achieves the logical closure of [inf] (and hence a full analytical definition of the concept):

> [closed inf]: *A* represents *B* if and only if (i) the representational force of *A* points towards *B* and (ii) *A* allows competent and informed agents to draw specific inferences regarding *B*.

We are not suggesting to replace the original [inf] with [closed inf], since we consider [closed inf] only one case in a large family of interesting possibilities generated by [plural inf]. We are however, particularly keen to explore the features of this member, in particular with respect to the analogy with truth previously pointed out, since it might be considered the most *conservative* completion of the inferential conception and it restores the integrity of the concept of representation wholesale.[2]

Since we are thus providing a full analytical definition of the concept, it can now be questioned to what extent [closed inf] constitutes a deflationary or minimalist conception of representation. The main purpose of this paper is to defend the claim that it does. In other words we aim to show that even the simplest, or more conservative, member of [plural inf] satisfies the desiderata that we originally set for a generally deflationary attitude to representation.

We will defend this claim by developing the analogy with Crispin Wright's minimalist conception of truth. This should not be taken to entail support for any specific conception of truth, whether substantive or deflationary; in particular, it should not be taken as endorsement of Wright's 'inflationary' argument against Horwich's position (Wright 1992, Chapter 1; 2003, 337ff.). We do not need in this paper to defend any position on truth, since the issue is tangential to the discussion about cognitive representation.[3]

2. Minimalism and Deflationism about Truth

According to Wright, deflationism and minimalism share the contention that the conceptual analysis of truth must make essential reference to a couple of basic platitudes

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[2] In other words, in this paper we make our commitment explicit to [plural inf], as a general schema of the inferential conception of representation. But we are not thereby committing ourselves to this particular version in lieu of the general schema [plural inf]. What we advocate instead is more philosophical research into various possible completions of this general schema and their relative virtues, as well as their domains of application.

[3] For arguments sharply distinguishing truth and representation see Giere 1999 and forthcoming; Suárez 2003; Bailer-Jones 2003.

or a priori principles, 'a suitably generalised form of one (or both) of the following two schemata' (Wright 2003, 332): [4]

Equivalence Schema for propositions (ES):   *It is true that P iff P*

Disquotational Scheme for sentences (DS):   *'P' is true iff P*

The deflationist argues further that there is nothing substantial left to say about truth, both in its conceptual analysis and in its application: the traditional metaphysical disputes about the nature of truth (in particular whether truth is reducible to correspondence, coherence, justification, etc), are in fact about nothing substantial.

The minimalist view, by contrast, while accepting the essential role that (ES) and (DS) play in the analysis of the abstract concept of truth, takes it that there are further properties of propositions, or sentences, that realise or instantiate concretely this concept of truth. However, according to the minimalist these properties are not the same in all cases, and might well vary from domain to domain of discourse. Hence minimalism combines the advantages of deflationism with respect to the concept of truth with those of pluralism regarding its application in practice: 'Minimalism thus incorporates a potential pluralism about truth, in the specific sense that what property serves as truth may vary from discourse to discourse' (Wright 2003, 334).

It would be a mistake however to identify the crucial distinction between minimalism and deflationism with an exclusive emphasis upon the abstract *concept* as opposed to the concrete *property* of truth. In other words it would be wrong to characterise this disagreement as one about whether truth is an abstract concept. The minimalist accepts that in *every* concrete instantiation or realisation of the truth concept some further properties will obtain; in other words, that there is no pure, or unmediated, application of the abstract concept. Conversely the deflationist can argue that in every application of the concept, an additional property is instantiated, namely the trivial property of *falling under* the truth concept.[5] Hence both can accept that every legitimate ascription of the truth predicate involves both the application of an abstract truth concept and its instantiation via a concrete property of propositions, or sentences.

Instead the essential distinction between these two positions is at the point of application: for the deflationist the property that instantiates the truth concept is the same in each and every application of the concept —and in no case a substantive property. For the minimalist by contrast, the properties instantiating truth are many and diverse, co-varying with the different domains of discourse. In terminology suited to this paper we could say that according to the minimalist truth has many 'means' of

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[4] In this paper we follow Wright's terminology —though it is not universally accepted.

[5] See for instance Horwich 1998, 141-4. Horwich distinguishes different sorts of properties, and argues that any one justifiably applied to the truth concept will likely not be substantive —so deflationism is not in danger.

application, while according to the deflationist it only ever has one 'means' —i.e. falling under the extension of the truth-concept.

3. *The Analogy between Representation and Truth*

Let us now return to the completion of the inferential conception ([closed inf]) that we are proposing to explore in this paper. First of all it must be stressed that the point of departure of this conception and the minimalist or deflationist theories of truth is exactly the same: taking some platitudes as the conditions which constitute the analytic definition of the abstract concept the theory is dealing with.

We begin by emphasising the distinction between the *means* and the *constituents* of representation (see Suárez 2003 for this distinction, as well as the arguments mentioned below). The constituents of representation are the necessary and sufficient conditions that define the concept, while the means of representation are the relations between A and B (i.e.: relational properties of A and B), actually employed by scientists in order to infer consequences about B on the basis of reasoning about A. Among the most widely used means are similarity (understood as the sharing of properties between A and B), and isomorphism (between the structures exemplified by A and B). The latter is typical in the domain of the mathematical sciences, while the former accounts for cases of iconic representation in the less quantitative sciences. An important part of the background to the inferential conception is the set of arguments that show that none of the typical representational means, such as similarity and isomorphism, are in fact constituents of representation. This consequently shows that the platitudes about representation ('representational force' and 'inferential capacities') cannot be reduced to any of the typical representational means, thus vindicating the deflationist attitude that motivates the inferential conception.

Nevertheless a weaker relation *does* hold, namely: all representational means (such as isomorphism and similarity) are concrete instantiations, or realisations, of one of the basic platitudes that constitute representation, namely ii) inferential capacities. For suppose that similarity obtains between A and B. Then A and B have some properties $\{a_1, a_2, \ldots, a_n\}$ in common. It follows that anyone sufficiently competent and informed about the representation of B by A can infer on the basis of A that $\{a_1, a_2, \ldots, a_n\}$ are instantiated in B. Similarly, suppose that A and B exemplify isomorphic structures $A' = <D, P^n_j >$ and $B' = <E, T^n_j >$; where D, E are the domains of objects in each structure and P^n_j and T^n_j are the n-place relations defined in the structure. A' and B' are isomorphic if and only if there is a one-to-one and onto mapping $f: D \rightarrow E$, such that for any n-tuple $(x_1, \ldots, x_n) \in D: P^n_j [x_1, \ldots, x_n]$ if and only if $T^n_j [f(x_1), \ldots, f(x_n)]$. It follows that a competent agent informed about the isomorphism can in principle infer that B' possesses $T^n_j [f(x_1), \ldots, f(x_n)]$ from the observation that A' possesses $P^n_j [x_1, \ldots, x_n]$.

Hence every obtaining of similarity or isomorphism between the source and the target of a representation is ipso facto an instantiation of part of the abstract concept

of representation. And since similarity and isomorphism are distinct relations between *A* and *B*, appropriate as means of representation in different domains, it follows that the realisations of scientific representation, like those of truth according to minimalism, are irreducibly plural.

But it remains to be seen if, along the lines of the analogy with minimalism, it is also the case that the constituents of representation can only be applied via some more concrete means —such as isomorphism and similarity. In other words we may ask if it is possible that [closed inf] applies on its own, *without* simultaneously instantiating some further property, or properties, of *A* and *B*. Note how very doubtful this sounds. Since part (ii) of [closed inf] states that it must be possible for a competent and informed agent to infer some conclusions regarding *B* (i.e. its properties), on the basis of a consideration of *A*'s properties, there must be some operative rule of inference (whether or not actively employed by the particular agent) between *A*'s and *B*'s properties, but such rule would precisely qualify as a concrete means of representation. Hence, according to [closed inf] there can be no application of representation without the simultaneous instantiation of a particular set of properties of *A* and *B*, and their relation.

A similar argument applies to part (i) of [closed inf]. This part states that the representational force of the source must point towards the target of the representation; it must be noted that [closed inf] leaves open the question of which particular conditions must be met in every concrete instance of representation in order to fix and preserve the representational force of the source. This allows these conditions to vary from one domain of representation to another. So, part (i) of [closed inf] expresses a generic condition which can only be instantiated if further conditions are met —and these further conditions will vary from context to context. But here the analogy with the minimalist theory is even stronger since a different analysis of the representational force will apply to each whole domain of representation (scientific, artistic, etc) in the same way as according to Wright every property that instantiates the abstract concept of truth applies throughout a whole domain of discourse.

This is the core of the positive analogy between the inferential conception of representation in the simplest, or most conservative version [closed inf], and the minimalist conception of truth. In both cases an abstract concept is applied via a variety of concrete properties of the objects characteristically falling under the concept (propositions or sentences in the case of truth, sources and targets in the case of representation), but *which* concrete properties co-varies with the domains of application. The view similarly combines deflationism regarding the abstract concept with pluralism regarding the concrete property that serves to instantiate it.

We would like to point out in addition that the analogy brings out a particularly welcome feature of the inferential conception in the context of the present-day debates on the nature of scientific representation. Wright employs minimalism to explain away the metaphysical debates concerning different theories of truth (as correspondence, coherence, justification, etc). On the minimalist view these theories no longer characterise the concept of truth but its properties instead. It is then possible to show

that the different theories correspond to different sets of truth-instantiating properties in different domains, so every theory can feel vindicated in its own domain of discourse (and no theory is vindicated as a universal account of the concept of truth). Similarly the inferential conception explains away the quarrels between different theories of representation; for each theory now describes a different means of representation, appropriate in different domains (i.e. isomorphism being appropriate in the case of the most mathematical dynamical descriptions of nature, similarity appropriate for the less quantitative sciences). So these theories aim to characterise the means of representation in particular domains of scientific modelling; they do not characterise — nor should they be understood as trying to characterise— the constituents of representation. A long-standing dispute in the field is thereby resolved.

4. *The Limits of the Analogy*

The analogy between representation and minimalist truth is a good heuristic tool to explore the properties of the inferential conception, but it is not a perfect analogy. In this final section we point out two sources of negative analogy between the inferential conception and minimalism about truth. One of them lies precisely at the heart of what minimalism and deflationism share in common. Although minimalism and deflationism disagree about the plurality of 'means' of application, and specifically about whether there is only one or many, the deflationist and the minimalist agree on the other hand that there is only one concept of truth. What is debated is how to characterise this concept, and whether it has one or multiple realisations in terms of distinct properties, but the fact that there is only one such concept is not under discussion. The differences might be captured by means of the following diagram:

	MINIMALISM	DEFLATIONISM
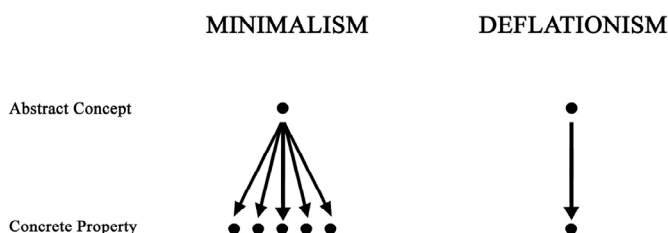
Hence minimalism allows for a plurality of concrete properties, but sticks to one abstract concept. Here the analogy with the inferential conception in general breaks down since [plural inf] allows (but not entails) that there might be a plurality of abstract concepts of representation: [closed inf] is just one of them. In other words the inferential conception of representation adheres to the following diagram:

INFERENTIAL CONCEPTION
OF REPRESENTATION
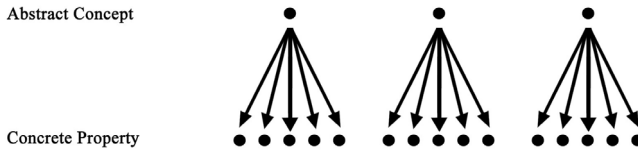
The inferential conception is in this regard better conceived as a research programme for the development of alternative, and potentially competitive, notions of representation. In each domain of scientific discourse there might be different platitudes that need to be added to define the concept of representation appropriate for that domain. This patently finds no analogue in the minimalist conception of truth.

A second negative analogy we would like to mention between minimalist truth and the inferential conception concerns the possibility of turning these concepts into second-order properties. Such a move has already been developed with respect to minimalism. Michael Lynch (2001) for instance has developed what he calls alethic functionalism; essentially this is the claim that truth is a second order property of propositions, or sentences, namely, the property of having a first-order property that plays the truth-role. This accommodates the minimalist insight nicely, since it allows us to account for the plurality of concrete 'truth' properties in different domains: coherence for juridical science, for instance, correspondence for ordinary factual discourse about macroscopic objects perhaps, etc. What these properties share according to the functionalist is not so much their instantiating the same abstract concept of truth, but their playing the truth-role in their domain (a role characterised at the very least by the fulfilment of the platitudes). The generic property of playing the truth-role is thus realised by different properties of propositions, or sentences, in different domains; however, according to the functionalist, truth is precisely this 2nd order property.

The move to a 2nd order property theory of truth is of course controversial and in fact changes considerably the nature of the minimalist project. It is not obvious that an analogous functionalist theory for representation would satisfy our conditions for a deflationary attitude. But the analogy with the inferential conception breaks down at this stage anyway, since the latter cannot be considered a 2nd order property of source-target pairs. For consider what this would entail —roughly that there are particular properties of chosen source-target pairs that play the representation-role in each domain, and that it is the generic 2nd order property of playing that role (a role characterised at least by the platitudes about representation) that constitutes 'representation'. The inferential capacities of the source (part (ii) of [closed inf]) could indeed be taken to describe a representation-role across each of the domains (fulfilled by a different means of representation in each domain as we have seen). However the problem is

that part (i) states that the representational force must flow from the source towards the target, and this is not per se a property of the objects that function as source or target, nor is it therefore a relation between them. So there is no room here to exploit the idea of a 2nd order property of 1st order properties of the objects related, and the functionalist theory seems to lack an analogue in the inferential conception.

5. Conclusions

We have explored the positive and negative analogy between the inferential conception of cognitive representation (which we propose to formally represent by [plural inf] in general) and the minimalist conception of truth defended by Crispin Wright. The analogy is introduced for heuristic purposes, in order to display the kind of pluralism that we take cognitive representation to possess. We do not wish to establish any deeper theoretical link between representation and truth, and we have already declared our neutrality regarding the nature of truth.

The point of the positive analogy is to strengthen and to clarify the distinction between the means and the constituents of representation. The latter are given by the platitudes of representation and define the abstract concept, while the former correspond to the set of concrete properties (such as isomorphism, similarity, homology, etc) that instantiate the abstract concept —each property being the characteristic form of instantiation in its corresponding domain. While the point of the negative analogy is, first, to show that the inferential conception admits a plurality (in fact a whole family) of abstract concepts of representation —in contrast to minimalism which takes truth to be a univocal concept. Second, the attempts to reformulate minimalism as a functionalist 2nd order property of truth would seem to lack any possible analogue in the case of the inferential conception of representation.

To conclude we see this analogy as heuristic reinforcement of the view that the abstract constituents of representation are instantiated, or realised, partly through the concrete means of representation. In turn this vindicates the claim that the kinds of cognitive representation characteristic of science are abstract relations that obtain in practice through isomorphism, similarity, homology, and so on —but which should not be identified with any of them.

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