On Weak Truthmaking

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Abstract. Informally speaking, a truthmaker is something in reality *in virtue of* which sentences of a language can be made true. This fundamental philosophical notion plays a central role in applied ontology. In particular, a recent non-orthodox formulation of this notion proposed by the philosopher Josh Parsons, which we labelled *weak truthamking*, has been shown to be extremely useful in addressing a number of classical problems in the area of Conceptual Modeling. In this paper, after revisiting the classical notion of truthmaking, we conduct an in depth analysis of Parsons' account of weak truthmaking. By doing that, we expose some difficulties in his original formulation. As the main contribution of this paper, we propose solutions to address these issues which are then integrated in a new precise interpretation of truthmaking that is harmonizable with commonsense as well as with existing four-category foundational ontologies.

Keywords. Strong and Weak Truthmaking, Ontological Analysis

1. Introduction

Suppose the sentences 'John is in love with Mary', or 'this Rose is Red' are *true* in a given situation. If this is the case, it is because they accurately represent something about the world. In other words, if a sentence is true, it is because there is something *in reality* (e.g., the existence of certain things bearing certain properties) that makes them true. The philosophical literature terms a *truthmaker* of a sentence this entity *in virtue of* which the sentence is true, i.e., *truthmaking* is a relation that binds the sentences of a language with pieces of reality.

The literature about truthmakers is very rich [Mac19, Arm04, Mol07], and this notion plays a fundamental role in ontological analysis. Indeed, we may regard ontological analysis as the activity that, at its core, consists of searching for the *truthmakers* of the sentences that concern a certain domain of interest [GG16]. In the latest years, based on the analysis of truthmakers of relational sentences, some of us have revisited a number of problems in the representation of relations [GG15], proposed a revised ontology of relation types [Fon19], and isolated a number of *modeling patterns* for their proper representation [Gua18]. In this work, we relied on a non-standard notion of truthmaking proposed by the philosopher Josh Parsons [Par99, Par05], which we term *weak truthmaking*.

In this paper, we revisit the notion of truthmaking and conduct a in depth analysis of weak truthmaking. We expose some difficulties in Parsons' original formulation of the

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latter and propose some solutions to address them. In particular, we advance a new precise interpretation of weak truthmaking that is harmonizable with foundational ontologies that countenance the existence of *individual qualities*, such as DOLCE [MBG^{+}03] and UFO [Gui05].

The remainder of this paper is organised as follows: in Section 2, we elaborate on the standard philosophical notion of truthmaking; in Section 3, we revisit Parsons' nonstandard albeit insightful idea of weak truthmaking. We expose some of its difficulties, and propose our new interpretation of this notion; in section 4, we present some final considerations of the paper.

2. Truthmaking

As previously mentioned, the truthmaker of a sentence is an entity *in virtue of* which the sentence is true. The truthmakers debate is specifically about providing a meaningful grasping of the expression *in virtue of*. According to the mainstream theories, the truthmaker of a sentence is something the *existence* of which at a world w is necessary, sufficient, or both, for the truth of that sentence at w. For the purpose of this paper, we shall only present the definition of the entailment principle (T): [Big88, Arm04]:

(T) x is a truthmaker of ϕ at w iff for every w', the existence of x at w' entails the truth of ϕ at w'.

Note that we phrased the principle (T) in modal terms and we are defining truthmaking with respect to a world w. In fact, there are in principle two readings of this principle: *i)* the relation of truthmaking must be invariant across worlds, i.e., if t is a truthmaker of ϕ at w, then it is for every w, *ii)* the truthmaker is relative to a word, i.e. t may be a truthmaker of ϕ at w but not, say, at w'. Here, we shall assume that the truthmaker is the same in every possible world.

A couple of points are worth noticing. First, this definition of truthmaking has been severely criticised on the ground of its logical consequences, if a few quite natural principles are assumed [Res96]. One of such principles is the so-called *truthmaker maximalism*, according to which *every* true sentence must have a truthmaker. If this principle is assumed, then arbitrarily complex sentences need to have their own truthmakers, and, if not carefully constrained, principle (T) leads to a devastating conclusion from the ontological point of view, namely that every true sentence has the same set of truthmakers (*truthmaker monism*). In this paper, we cannot face this delicate issue and we restrict ourselves to discussing truthmakers of atomic predicative sentences, without claiming for truthmaker maximalism. Perhaps, as Parsons suggests, "the best we can demand is that every contingent truth either has a truthmaker, or is a conjunction, disjunction, negation, or some other more complicated Boolean function of propositions that would have truthmakers were they true." [Par05, p. 169].

A second problem is that principle (T) overgenerates, in the sense that it allows for truthmakers that intuitively should not be considered as such [Mac19]. For example, it follows from (T) that if t is a truthmaker of ϕ and ϕ is true at w if and only if ψ is true in w, then t is a truthmaker of ψ as well. Thus, two logically equivalent sentences have the same truthmakers. This consequence may be convincing, only if we assume a sufficiently large number of possible worlds that is capable of separating the meaning

of the required propositions. However, this move only *implicitly* distinguishes between the relevant truthmakers of the sentences at issue. We prefer to explicitly assume a further condition on truthmaking, which is traditionally labelled the *relevance assumption*: "what makes something true must in some sense be what it is 'about' "([Mac19]).

(R) *x* is a truthmaker of ϕ at *w* only if *t* is relevant to ϕ at *w*

As it is well known, it is very difficult to capture relevance formally. In Section 4 we shall discuss a simple strategy that allows us to take relevance somehow into account.

Note finally that, since principle (T) is formulated in terms of the *existence* of a certain entity, the truthmaking relation is intertwined with our ontological assumptions, since only the things endorsed by our ontology can be considered as truthmakers. For instance, if we say that a certain mass quality is the truthmaker of the sentence '*a* has mass', then of course we commit to the existence of qualities.

3. Weak truthmaking

In 1999, Josh Parsons proposed an interesting non-orthodox approach to truthmaking [Par99, Par05] that denies the so-called *truthmaker essentialism*, i.e., the idea (implicit in principle (T)) that a truthmaker is *essentially* such that it makes a certain proposition true. We labelled this approach *weak truthmaking*[2] [GG16], in contrast with *strong truthmaking*, which relies on principle (T). Parsons describes it as follows, proposing two criteria that for him are equivalent[3]:

(i) for every true sentence, there is some thing such that the sentence cannot become false without a qualitative change, a non-Cambridge change, in that thing. That thing, whatever it is, is the sentence's truthmaker.

(ii) [Or,] the truthmaker for a sentence is that thing that is intrinsically such that the sentence is true. [Par99, 328] (*sentence numbers added*)

So, according to Parsons' intuitions, it is not the mere existence of the truthmaker that entails the truth of the sentence, it is rather *the way* the truthmaker intrinsically is. In his view, truthmaking depends not so much on *whether* something exists, but on *how* something is in itself (either contingently or necessarily), independently on anything else. In this sense, weak truthmaking appears to be more informative than strong truthmaking, as it manifests the intrinsic way an entity *grounds* the truth of a proposition.

Note also that, since a weak truthmaker may be *contingently* such that the sentence is true, the so-called *truthmaker essentialism* implied by (T) is rejected: the same rose may be the (weak) truthmaker of 'This rose is bright red' in a world, and of 'This rose is dark red' in another, so such rose is not *essentially* that proposition's truthmaker.

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[2]Friedrike Moltmann speaks of strong and weak truthmaking in a different sense, to distinguish a truthmaker theory that admits truthmaker maximalism from one that does not [Mol13, p. 90]

[3]Note that the two sentences below, which we have numbered in order to discuss them, are actually contiguous to each other in the original text.

3.1. Being intrinsically such that

Let us now try to understand Parsons's proposal more in detail. Criterion (ii) is for him the central one [Par05], which may be formulated as follows[4]:

> (WT) t is a weak truthmaker for proposition that ϕ iff t is intrinsically such that ϕ.

A crucial point in this definition is the notion of being *intrinsically such that ϕ*. Parson adopts Lewis' definition of intrinsicality in terms of *duplicates* [Par05]. That is, for him a property *P holds intrinsically* for x if and only if *P* holds for every duplicate of x. Being a duplicate of x and having the same intrinsic properties of x are therefore interdefinable notions, thus it is a matter of choice whether one prefers to start with a definition of duplicates or to start by defining intrinsic properties. A supposedly equivalent (and perhaps more informative) way of defining intrinsicality is in terms of *loneliness* (being the only contingent object in the world), or *accompaniment* (presupposing the existence of other contingent beings): a property *P* holds intrinsically for x iff "having or lacking the property is independent of accompaniment or loniless" [LL98]. In the light of this, the tentative definition we shall adopt is as follows:

> (INT) A property *holds intrinsically* for x iff it holds independently of the presence or the absence of anything[5] wholly distinct from x, where *x is wholly distinct from y* means that x is not identical to y nor to any of its proper parts.

Consider now properties of the form *being such that ϕ*. These are known as 'vacuous' (a.k.a. 'propositional') properties since they do not convey much information about their argument: x is such that ϕ just in case x exists and ϕ holds. As Lewis noted, such properties may hold intrinsically for some entities and extrinsically for others[6]. For instance (Parsons' example), *being such that Socrates is snub-nosed* holds intrinsically for Socrates and not for Plato, since in the latter case it requires the presence of something else (Socrates) wholly distinct from Plato. Therefore, according to (WT), the (weak) truthmaker of 'Socrates is snub-nosed' is just Socrates, and not Plato, because only the former is intrinsically such that the proposition holds.

Let us now go back to the (alleged) alternative way of expressing the same intuitions, conveyed by criterion (i) in the above quotation. What are the things such that the sentence 'Socrates is snub-nosed' "cannot become false without a qualitative change, a non-Cambridge change", in that things? For sure, Socrates itself is one of such things. But what about his nose? Of course, a suitable qualitative change in *that* thing, too, would falsify the sentence. So, Socrates' nose seems to be a perfect weak truthmaker of 'Socrates

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[4]We report here Rami's re-formulation of Parson's definition [Ram09, p. 23]. As Rami explains, "Parsons himself gives the following formulation: x makes p true iff x is intrinsically such that p. But this formulation is incorrect, because 'p' must be regarded as a nominal variable relative to its first occurrence and as a sentential variable relative to its second occurrence". Here and in the following, we shall use ϕ as a sentential variable, and p as a nominal variable standing for the proposition that ϕ. So, 'intrinsically such that ϕ' is equivalent to 'intrinsically such that p is true', and 'ϕ holds' is equivalent to 'p is true'.

[5]The cited definition refers to the presence or the absence of any *contingent* entity wholly distinct from x, but for our purposes we prefer to adopt a stricter notion of intrinsicality, allowing us to consider John's property of *liking the number 7* as holding extrinsically just because John and the number 7 are wholly distinct from each other. Philosophers are still debating these definitions.

[6]Such properties are called therefore *conditionally intrinsic*. A property is *intrinsic* iff it holds intrinsically for all its instances.

is snub-nosed' according to (i). Indeed, it would be the *minimal weak truthmaker*, assuming that a truthmaker is non-minimal iff it has another truthmaker as a proper part. Such minimal truthmaker would definitely carry an important role in explaing *why* the proposition holds, grounding therefore its meaning: Socrates is snub-nosed because of the way his *nose* is (and not, say, his legs). Unfortunately, however, Socrates' nose does not satisfy criterion (ii), since 'Socrates'nose is such that Socrates is snub-nosed' implies the existence of something (Socrates) wholly distinct from Socrates' nose[7], so the nose is not a weak truthmaker of our proposition.

Similarly, assuming that a certain rose, Rosie, has an individual color quality q (as in the DOLCE or UFO ontologies) that is located in the 'red' region, and has therefore the property of being a *Red Color*, according to criterion (ii) such quality would not count as a (minimal) weak truthmaker of 'Rosie is red' (*contra* criterion (i)), because it is not *intrinsically* such that the proposition is true. The reason is that *being such that Rosie is Red* would imply the existence of Rosie, which is wholly distinct from q[8].

So, there is a problem for Parsons: criterion (ii), which he believes as equivalent to (and more basic than) (i), turns out to be too restrictive in the kinds of truthmakers it allows for, excluding parts and individual qualities from being (minimal) weak truthmakers and limiting therefore the explanation power of the weak truthmaking approach. We shall call this the *restrictiveness problem*.

3.2. Addressing the restrictiveness problem

We think there is a solution to the restrictiveness problem, which relies on understanding the scope of the 'intrinsically' modifier in the expression "*x* is intrinsically such that ϕ". There are indeed two scopes, which recall the *de dicto* vs. *de re* reading of modalities:

1. intrinsically *x* is such that ϕ (*de dicto*): The property of *being such that ϕ* holds intrinsically for *x*. This means that all duplicates of *x* are such that ϕ holds, i.e., ϕ holds in each world where there is a duplicate of *x*. This is Parson's interpretation.
2. *x* is intrinsically such that ϕ (*de re*): ϕ holds in virtue of the way *x* intrinsically is (i.e., in virtue of a property that holds intrinsically for *x*).

Let *x* be Rosie's color, which is actually red. According to (1), it is not the case that intrinsically *x* is such that Rosie is red, since *x* may have a duplicate in a world where Rosie is not red. According to (2), *x* is intrinsically such that Rosie is red, since Rosie is red in virtue of the property *being a red color* that holds intrinsically for x[9]. So, reading (2) of *intrinsically such that* would allow us to reconcile the two criteria (i) and (ii).

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[7]Keep in mind that *wholly distinct from* is not symmetric. In terms of duplicates, we may arrive to the same conclusion by observing that an exact copy of Socrates' nose (attached to a different face or even isolated) may exist in a world where Socrates is not snub-nosed.

[8]In terms of duplicates, we may say that *being such that Rosie is Red* does not hold intrinsically for q since an exactly resembling quality (a duplicate) may exist in a world where the rose is not red.

[9]The fact that a certain quality has intrinsically its own value seems self-evident to us, but requires some care in understanding the tentative definition of intrinsicality we have suggested, i.e., (INT). One may observe that, since q is existentially dependent on Rosie, *RedColor(q)* implies the existence of something, Rosie, which is wholly distinct from q. Therefore, *RedColor* should not be considered as an intrinsic property of q. To avoid this, we may amend (INT) to clarify that an intrinsic property should be *definitionally* independent on the presence or absence of anything wholly distinct from its argument. This discussion is delicate, and we are not pursuing it further here.

In the light of the above discussion, we may attempt to re-formulate weak truthmaking as follows:

(WT1a) t is a weak truthmaker for the proposition that ϕ if and only if t is (intrinsically such) that ϕ.

Or, equivalently, using just nominal variables[10]:

(WT1b) For every object x and every proposition p, x is a truthmaker of p iff there exists a property P such that P holds intrinsically for x iff p is true.

Note that, although the notion of *holding intrinsically* is defined in terms of possible worlds, no quantification on worlds appears explicitly in the above definition, allowing something to be a weak truthmaker of p just in the actual world. For instance, consider the sentence 'Socratie is snub-nosed', where Socratie is a particular statue of Socrates. Suppose that Socratie's nose ($Nose_1$) is actually snub, satisfying therefore the above definition in the actual world w_0. Consider now the world w_1, where $Nose_1$ has been replaced by a duplicate ($Nose_2$). In such world, the truthmaker would be $Nose_2$, and not $Nose_1$.

In conclusion, the above refined definition not only goes towards a reconciliation of interpretations (i) and (ii), capturing Parsons' powerful intuition of truthmakers that depend on *how* something is and not on *whether* something exists, but it also allows us to fully exploit such intuition, including *parts* and *qualities* (and, in general, *modes*) of things as weak truthmakers accounting for the properties of such things: Socrates' nose accounts for the fact that he is snub-nosed, the rose's color accounts for the fact that it is red, and the love John has for Mary accounts for the fact that he is in love with her

3.3. The relevance problem

There is however a further, subtle problem in Parsons' account that also affects our refined definition. According to Parsons, the truthmaking relation is an internal relation in Russell's sense, i.e., it is derivable from the intrinsic properties of its relata. This has as a consequence that, if t is a truthmaker of ϕ in the world w, everything that is duplicate of t in w is also truthmaker of ϕ. Parsons seems to be happy with this:

"According to the truthmaker principle, as I've stated it, the truth of a sentence supervenes on the qualitative nature of its truthmaker. That nature is precisely what duplicates duplicate, so a duplicate of a truthmaker will do as well for truthmaking purposes as the original." [Par99, p. 8]

For us, this is unacceptable, and indeed, again, contradicts the intuition behind criterion (i). Suppose there are two exactly resembling roses, $Rose_1$ and $Rose_2$, that are both red. According to Parsons, $Rose_2$, besides $Rose_1$, is *also* a truthmaker of '$Rose_1$ is red'. But of course it is not true that '$Rose_1$ is red' cannot become false without a qualitative change of $Rose_2$, so this contradicts (i), running indeed against commonsense.

In conclusion, criterion (ii) is not enough accurate, since any duplicate of a truthmaker is also a truthmaker of the same proposition, so we have 'irrelevant' truthmakers.

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[10]Note that this version does not suffer of the problems discussed by Rami [Ram09, p. 23-24] concerning the impossibility of expressing Parsons' definition using just nominal variables.

This is an instance of the general *relevance problem*, which also affects strong truthmaking.

The strategy that we shall adopt to address this problem consists in a restriction of WT1b in the light of the following general principle, which in our view should be assumed for both strong and weak truthmaking:

> (CC) If a proposition p has arguments $x_1, ..., x_n$, every truthmaker of p should be *causally connected*[11] to at least one argument of p, where *x is causally connected to y* means that:
>
> > x is existentially dependent on y (including the case where $x = y$), OR
> > x is *internal* to y, i.e., it is either inhering in y, proper part of y, or participant to y.

So, going back to the previous example, we can exclude $Rose_2$ from being a weak truthmaker of '$Rose_1$ is red' since it is not causally connected to $Rose_1$.

There is however a last problem concerning relevance: not only a truthmaker should be causally connected to the arguments of the proposition, but we also need to make sure that it is actually relevant to the *meaning* of such proposition. Consider for instance the case of an electron, e, whose charge and mass qualities, c_e and m_e, have necessarily certain values, v_{ce} and v_{me}. The two propositions 'e has charge v_{ce}' and $p2 =$'e has mass m_{ce}' are logically equivalent, and so it turns out that *both c_e and m_e are weak truthmakers* for each of them, with no possibility to distinguish what accounts for what.

To avoid this, let us first assume that each proposition can be represented as a generic relation r holding for a list of one or more arguments. We impose that the intrinsic property P that, according to (WT1b), characterizes a relevant truthmaker candidate should be constrained by the meaning of r. If r is a primitive, then the relevant intrinsic property should be r itself[12]. Otherwise, if r is definable, that is, it is *definitionally dependent* [Fin95] on other properties or relations, the relevant intrinsic property should be either such that r depends on it, or, in turn, definable in terms of properties or relations that occur in the definition of r. We shall use the predicate $about(r, p)$ to say that the property p is relevant for the meaning of r (note that the first argument stands for a relation of arbitrary arity, while the second one stands for a property). So, the property *being a charge of value v_{ce}*, which holds intrinsically for c_e, is about the relation *has charge* and not about *has mass*, since it is definable in terms of properties and relations that occur in the definition of *has charge*. Similarly, *being a red color* (holding for a color quality) is about *being red*, since *being red* is definable in terms of having a color quality that has the value 'red', and *being a red quality* is in turn definable as being a quality that has the value 'red'.

The relation *about* is in fact a way to associate a meaning to a predicate, by specifying which properties are pertinent for its truth conditions. In this sense, it plays a role similar to a meaning postulate in the Carnapian sense, which specifies a constraint that holds in virtue of the meaning of the symbols involved, and is therefore stable across possible worlds (e.g. a bachelor is an unmarried male).[13]

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[11]We are aware that this term may be not totally appropriate, but it will do for the scope of this article.

[12]This means that primitive extrinsic properties have no weak truthmaker.

[13]A similar move to associate predicative sentences with the pertinent ontological entities that are their truthmakers is discussed in [MBP18]. A formalisation of the relevant implication for this purposes is provided in [MP15].

We can then finally formulate a definition of truthmaking that takes into account our considerations regarding intrinsically, restrictiveness and relevance (in terms of *causal connectedness* and *aboutness*):

(WT1c) For every object x and every proposition p equivalent to a relation r holding for arguments $x_1,...,x_n$, x is a truth-maker of p iff:

1. x is causally connected to at least one argument of r
2. there exists a property P such that r is about P, and P holds intrinsically for x iff p is true.

4. Conclusions

In this paper, we elaborate on the innovative and non-standard philosophical notion of weak truthmaking proposed by Josh Parsons. We do this, firstly, by contrasting it with the standard account on (strong) truthmaking in the philosophical literature. We then conduct an in depth analysis of this notion and expose some difficulties in its original formulation. In particular, we demonstrate that Parsons' reliance on David Lewis' notion of *intrinsically* is in contrast with his own intuitions, and that this renders his original formulation, on one hand, too *restrictive* w.r.t. the kinds of truthmakers it allows for; and, on the other hand, not *accurate* enough, since any duplicate of a truthmaker is also a truthmaker of the same proposition (an instance of a general problem of *relevance*, which also affects strong truthmaking). Finally, we propose a new precise understanding of truthmaking that not only addresses these issues but that is also in line with the onto-logical views of modern foundational theories such as DOLCE and UFO. In particular, we address: (i) the *restrictiveness* of his approach through a new scope analysis of the modifier 'intrinsically'. This is done by employing the *de re/de dicto* distincion in philo-sophical logic; (ii) the issue of *accuracy*, by accounting for the *relevance* of properties in contributing to the meaning of sentences. This, in turn, is done by employing the no-tions of *aboutness* (which connects a sentence with relevant properties in the domain) and *causal connectedness* (which connects these properties with particulars occurring in a sentence at hand).

In our view, weak truthmaking should not be regarded as an alternative to strong truthmaking, but these two theories should be seen as complementing each other. Indeed, in a previous publication [Gua18], we have shown how different *truthmaking patterns* combining the two theories can be of practical utility in concrete conceptual modelling scenarios. While in such previous work we where relying on an informal understanding of the truthmaking notions, as future work, we shall present a formalization of these notions based on the account proposed here. In particular, we then intend to use this formal theory of weak and strong truthmaking to advance the formalization of UFO's theory of relations preliminarily addressed in [Fon19].

Of course, many problems related to the notion of truthmaking are still there, in-cluding the problem of non-atomic sentences, which affect both strong and weak truth-making. We intend to address these problems in a future companion of this article.

References

[Arm04] David Malet Armstrong. *Truth and truthmakers*. Cambridge University Press, 2004.

[Big88] John Bigelow. *The reality of numbers: A physicalist's philosophy of mathematics*. Oxford University Press, 1988.

[Fin95] Kit Fine. Ontological dependence. In *Proceedings of the Aristotelian society*, volume 95, pages 269–290. JSTOR, 1995.

[Fon19] Fonseca, C. M, Porello, D., Guizzardi, G., Almeida, J. P., Guarino, N. Relations in Ontology-Driven Conceptual Modeling. In *Proc.38th ER*, 2019.

[GG15] Nicola Guarino and Giancarlo Guizzardi. "We need to discuss the Relationship": Revisiting Relationships as Modeling Constructs. In *Proc.27th CAiSE*, 2015.

[GG16] Nicola Guarino and Giancarlo Guizzardi. Relationships and Events: Towards a General Theory of Reification and Truthmaking. In *Proc.15th AI*IA*, 2016.

[Gua18] Guarino, N. et al. Reification and Truthmaking Patterns. In *Proc.37th ER*, 2018.

[Gui05] Giancarlo Guizzardi. *Ontological Foundations for Structural Conceptual Models*. Telematica Instituut / CTIT, 2005.

[LL98] Rae Langton and David Lewis. Defining intrinsic. *Philosophy and phenomenological research*, 58(2):333–345, 1998.

[Mac19] Fraser MacBride. Truthmakers. In Edward N. Zalta, editor, *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, spring 2019 edition, 2019.

[MBG⁺03] Claudio Masolo, Stefano Borgo, Aldo Gangemi, Nicola Guarino, and Alessandro Oltramari. Wonderweb deliverable d18. Technical report, CNR, 2003.

[MBP18] Claudio Masolo, Alessander Botti Benevides, and Daniele Porello. The interplay between models and observations. *Applied Ontology*, 13(1):41–71, 2018.

[Mol07] Frederik Moltmann. Events, tropes and truthmaking. *Philosophical Studies*, 2007.

[Mol13] Friederike Moltmann. *Abstract objects and the semantics of natural language*. OUP Oxford, 2013.

[MP15] Claudio Masolo and Daniele Porello. A cognitive view of relevant implication. In *Proceedings of the 3rd International Workshop on Artificial Intelligence and Cognition, Turin, Italy, September 28-29, 2015.*, pages 40–53, 2015.

[Par99] Josh Parsons. There is no 'truthmaker' argument against nominalism. *Australasian Journal of Philosophy*, 77(3):325–334, 1999.

[Par05] Josh Parsons. Truthmakers, the past, and the future. In Helen Beebee and Julian Dodd, editors, *Truthmakers: The Contemporary Debate*. Clarendon Press, 2005.

[Ram09] Adolf Rami. Introduction: Truth and truthmaking. In E J Lowe and Adolf Rami, editors, *Truth and Truthmaking*. Acumen, 2009.

[Res96] Greg Restall. Truthmakers, entailment and necessity. 1996.