The informational content of necessary truths[1]

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Necessary truths do not form a natural kind. The characterization of a content as necessarily true can obey different reasons, and depending on them the information codified can assume diverse connotations. Following the traditional classification, we will distinguish between *a priori necessary truths* and *a posteriori necessary truths*, and among the former we will distinguish between *propositional tautologies*, *analytic sentences* and *logical truths*. The latter two are, to our mind, the types that offer a more appealing contribution to the general theory of information. "Informational content", in turn, is not a univocal expression either. Simplifying a bit, an utterance can convey factual, linguistic, and inferential information.

Let's consider briefly all these types of necessary truths, starting out with those carrying less interest for the topic of informational content. A posteriori necessary truths are generally accepted since Kripke argued in their favour in his 1970 Princeton

Lectures. Kripke qualified the contents expressed by sentences such as "Water is H_2O" as a posteriori necessary truths because he understood them as identity propositions between rigid designators. Natural kind terms rigidly refer, according to this picture, to some stuffs in Earth. But, given that the source of their truth is neither meaning nor logical relations, they convey the same kind of information as that transmitted by contingent true sentences. There is nothing special about them concerning their informational status. As a posteriori truths, they are discovered at some point, and thus they supply new information.

A priori necessary truths of the analytic kind, such as "triangles have three sides", do not in principle widen the knowledge of a competent speaker. They seem to make semantic remarks whose content should be obvious to any proficient language user. Nevertheless, taking a broader perspective that incorporates into focus a complete speech act, analytic truths usually convey information pragmatically, *via* implicatures or enrichment. Sentences such as "war is war" or "women are women", although empty from the point of view of what is literally and strictly said, are apt to transmit an informative content that is heavily context-dependent.

Tautologies and logical truths are of a different kind. "Either it is raining or not" and "all men are mortal, and John is a man, therefore John is mortal" are, respectively, a propositional tautology and a quantified logical truth. According to the traditional picture, they lack factual informational content in the sense that they cannot serve to discriminate between the actual world and other possible worlds. If the option one takes regarding logical truths is that they represent necessary aspects of every possible state of affairs, then the information they transmit would be extralinguistic although not empirical. From a different take on logical truths, a view that we call "expressivism", the content logical truths convey is related to the conceptual links established within the

belief system of the agent that uses them, and not to the structure and nature of the world. It is characteristic of tautologies and logical truths that they include the occurrence of logical constants. According to expressivism, logical constants encode operations between concepts and propositional contents. They disclose conceptual links that can be seen as transitions between accepted contents and contents that follow from them. Such a view on logical constants is more naturally placed in an inferentialist framework as the one defended by Brandom (Brandom 1994). Nevertheless, it is also compatible with a more traditional, truth-conditional, account of content.

1. A Posteriori Necessary Truths

A posteriori necessary truths enter into the philosophical arena by the hand of Externalism, a proposal in Philosophy of Language that takes meanings out of the heads of speakers and places them either in the natural world or in the speaker's social community. Kripke (Kripke 1971, 1980) and Putnam (Putnam 1970, 1973, 1975) put the stress on the relations between words and the natural stuff in front of which they have acquired meaning through an act of initial baptism. The latter Wittgenstein (Wittgenstein 1956/2001) and, nowadays, Tyler Burge (Burge 1979, 1988, 1989) highlight the role played by the social community to which the speaker belongs.

Meaning externalism is ruled by the following principles:

[Ext. 1] Meanings are external to the individual (or at least meanings and concepts have aspects that are external to the individual)

[Ext. 2] Epistemology and metaphysics are independent approaches to contents

[Ext. 3] Speakers have to rely on experts to know the meaning of the terms they use. This is the Principle of Division of Linguistic Labour

Although Externalism is now the paradigmatic view on meaning, a few words will still be in order. Our words mean what our linguistic community takes them to mean, and thus the content of our utterances is not necessarily patent to us. When we utter a sentence, the proposition we express by means of it depends on the contents that are socially attached to the words used. Both, natural externalism and social externalism imply that the speaker is not necessarily aware of the content of his speech acts. Neither meanings nor contents are in the head, and thus no introspective act discloses contents to the language's user. According to Externalism, epistemology no longer goes parallel to semantics; the correct use of language no longer guarantees any especial access to meanings. The independence of epistemology and semantics opens the door for a whole range of combinations of semantic and epistemic categories. While within the traditional view, that considers meanings internal to the subject, all necessary truths are known a priori, for Externalism necessary truths can be known either a priori, and then we talk of analytic truths, or a posteriori. All true scientific claims are necessary truths known a posteriori. "Gold is the element with atomic number 79" and "Queen Elizabeth is the eldest daughter of King George and Queen Mary" are cases of necessary truths that are not a priori. Let's now explain in which sense they are necessary and in which sense they are a posteriori. Proper names and natural kind terms are, according to Kripke, rigid designators. The notion of rigid designator was introduced by Kripke to explain how we understand counterfactual discourse, if the meanings of terms were sets of descriptions that correspond to the features of the named objects or to the referred stuff, counterfactual discourse in which some of these features are suspended would be unintelligible. If being Alexander's tutor is part of what the name "Aristotle" means, we hardly could make sense of a conditional like "If Aristotle had not been Alexander's tutor, Alexander wouldn't have died young". For this reason, Kripke assumes, proper

names don't have descriptive meaning. They mean their referent; the same referent in every occasion of use, in every "possible world". A term of this kind is a rigid designator. Proper names are not the only terms with this property of referring to the same object in every possible world, most terms in language are also rigid: natural kind terms, common nouns, adjectives, adverbs…

Identity sentences between two rigid designators are, if true, necessarily true. "Hesperus is Phosphorus", but also "Water is H_2O", are identity statements between rigid designators, and express, if they are true, necessary truths. Identity sentences of this kind are not analytically true, their truth doesn't depend on the meanings of the terms involved in the traditional sense, and their informational content is not linguistic but factual. They are a posteriori, and hence informative. The necessity of identities like "Water is H_2O" is not conventional nor conceptual, it doesn't depend on the way we think of the world or on the meaning of the terms we use; their negations are thus conceivable, for although it might have been the case that water were not H_2O, once it is the case[2] and the terms have been introduced in our language with the referents they have, it is not possible that the referents of the two rigid designators designate different stuff.

From the point of view of the theory of information, an a posteriori necessary truth conveys information about the actual world; its necessity doesn't make its informational content to be of a special kind. These truths are necessary because (i) the way in which their terms have acquire meaning and (ii) the actual constitution of the surrounding reality. But neither (i) nor (ii) need to be known to the speaker, who even so can master his language at the user's level. The distance between the speaker's correct usage of language and the knowledge of the external conditions that provide

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[2] If our scientific theories are correct.

meaning and content to terms and concepts allows for necessity and a posteriori access to be independent. If we follow the traditional picture, and think of a posteriori propositions as extending our non-linguistic knowledge and of a priori propositions as only giving linguistic and logical information, then a posteriori necessary truths and a posteriori contingent truths are both informative about the world, and the feature of necessity doesn't add any special characteristic that allows to discriminate types of informational contents.

2. Tautologies, Contradictions, and Analytic Truths

Tautologies and contradictions are truth-functional combinations of atomic sentences and formulae that are necessarily true (or necessarily false) because of the meanings of the truth-functional connectives involved. "p or not p" and "if p, then p" are skeletons that give rise to true sentences when their propositional variables are substituted by declarative sentences, and "p and not p" always produces falsities after the substitution process. Analytic truths are sentences that can be recognized as true by anyone with language mastery. Tautologies and analytic sentences are similar kinds of truths, being their truth-value dependent on meaning, on the meanings of connectives the former, and on the meanings of their non-logical terms the latter. From the point of view of factual information, they are empty. This is the traditional picture that can be seen in Hobbes and Husserl, in Wittgenstein and Carnap. Hobbes, for instance, characterizes what we would now call "analytic falsities" as follows:

> "[M]en make a name of two Names, whose significations are contradictory
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> and inconsistent; as this name, an *incorporeal body*, or (which is all one)
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> an *incorporeal substance*, and a great number more. For whensover any

affirmation is false, the two names of which it is composed, put together and made one, signify nothing at all. For example is it be a false affirmation to say *a quadrangle is round*, the word *round quadrangle* signifies nothing; but is a mere sound" (Hobbes 1651/1952: 30).

Two centuries after Hobbes, Husserl (1900/1970) deals with analytic falsities in his *Logical Investigations*, and he too considers them empty combinations of words. Hobbes and Husserl are more interested in necessary falsities than in necessary truths, for the object of their enquiries is the analysis of nonsensical expressions, nevertheless what they say completely applies to necessary truths, like "a body is corporeal" or "a quadrangle is square".

The classical *Tractarian* view of tautologies and contradictions characterizes them as degenerated propositions that although don't say anything, they still show the limits of language and though. Wittgenstein consider that having a sense or, what amounts to the same, being *bipolar*, i. e., having the possibility of being either true or false, is a necessary condition for a proposition to be contentful.[3] Obviously, being tautologies true because of the definitions of the logical constants involved, and contradictions false for the same reason, they essentially are not-bipolar and thus, in the Wittgensteinian picture that has become paradigmatic in analytic philosophy, they are factually contentless. The term used by Wittgenstein to qualify them is "senseless" (*Sinnlos*). They are either compatible with all possible states of affairs, or, in the case of falsities, incompatible with all of them.

If we stopped here and bought the traditional picture as such, we should conclude that tautologies, contradictions and analytic truths don't posses informational

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[3] *Vid*., for instance, *Prototractatus* 2.11.14 and *Tractatus* 4.46 – 4.4.62

content, apart from the linguistic information contained in them. Nevertheless, it is a fact that speakers sometimes use apparently empty sentences relevantly. We say that war is war, that football is football or that if you are committed to do something, you are committed to do it, and intend to make a point with these sentences. The traditional picture doesn't have an explanation for these apparently empty uses, an explanation of them requires broadening the focus of our research to include not only the used sentences but also the complex situations in which they are uttered. It requires moving to pragmatics.

The distinction between what is strictly and explicitly said by the utterance of a sentence, and what it is pragmatically conveyed stems from Frege (1892)[4], and was developed by Grice (1967). Presently, the distinction has become central to the debate between different schools in philosophy of language, between Literalism and Contextualism for instance, and also in the debate about the relative borders that divide semantics and pragmatics. The Gricean view, inherited by literalists, considers that what is said by a speaker when she uses a particular sentence is closely related to the conventional meaning of the words uttered. Nevertheless, the information conveyed by the utterance doesn't stop at this point; by using a particular sentence in a particular situation speakers suggest further information that is drawn from the contextual features

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[4] In (1892: 168) Frege says: "Almost always, it seems, we connect with the main thought expressed by us subsidiary thoughts which, although not expressed, are associated with our words, in accordance with psychological laws, by the hearer. And since the subsidiary thought appears to be connected with our words on its own account, almost like the main thought itself, we want it also to be expressed. The sense of the sentence is thereby enriched, and it may well happen that we have more simple thoughts than clauses".

of the communicative exchange. This new information is inferred from what is literally said by flouting some maxims that specify what Grice calls the "Cooperative Principle". These maxims are classified into four categories: *quantity*, *quality*, *relation* and *manner*. Grice calls "conversational implicature" the propositional content pragmatically conveyed in a speech act by flouting a maxim. For example, when someone says (a),

   (a) Paul is meeting a woman this evening,

a conventionalized conversational implicature arises when the use of "a woman" triggers a pragmatic process. The generated implicature is that this woman is not Paul's wife, nor his mother or sister, nor even a close friend of his. This is so because, according the maxim of relevance, we wouldn't call the person Paul is meeting "a woman" if she was a member of his family or a close friend.

Applied to the issue of the informational content of tautologies, contradictions and analytic truths, the notion of implicature is highly relevant. The above mentioned kinds of necessary truth are, in this theoretical framework, informationally empty from the point of view of what it strictly and literally said. If a speaker offers an empty sentence of this kind as a relevant contribution to a communicative exchange, it is easy to defend that he is flouting the maxim of quantity ("Make your contribution to the conversation as informative as necessary"). In this case, contextual factors will help the hearer to derive the pragmatic content of the speaker's act.

Philosophers like Searle (Searle 1969), Recanati (Recanati 1993) or Bach (Bach 1979, 1987), and linguists like Carston (Carston 1988, 2002) and the Relevance theorists (Sperber and Wilson 1986) have put forward, from the contextualist files, the view that what is strictly and literally said by an utterance necessarily includes contextual factors not directly related to the linguistic components of the used sentences. For this picture, information that in a classical Gricean account would be

considered as belonging to the realm of what is pragmatically implicated but not literally said, are instead understood as part of the proposition expressed. Following Recanati, we call this latter view "truth-conditional pragmatics". An already classical example, due to Carston (Carston 1988), is (b)

(b) she gave him her key and he opened the door.

In a suitable context, what is said by using that sentence is that she gave him her key and *then* he opened the door *with that key*. In this case contextual information has enriched the sentence *via* a pragmatic process that differs from the pragmatic processes that trigger implicatures. This pragmatic process of enrichment adds new content to the proposition expressed by the sentence instead of generating a new propositional content besides the one that has been said. This is roughly the contextualist view.

Truth-conditional pragmatics rejects that sentences as such express propositions. An isolated sentence, truth-conditional pragmatists maintain, doesn't *say* anything. Saying something, expressing a proposition always requires an actual speech act, i. e., a sentence used in a context with a purpose. In this view, tautologies, contradictions and analytic truths can be informative through the contextual propositional components with which context enriches the sentential skeleton.

Thus, assuming the lessons of contemporary pragmatics in its several brands, the traditional contentlessness of tautologies, contradictions, and analytic truths needs revision. They seem to be informationally unfilled when the focus of analysis is too narrow, leaving out of attention the contextual features that provide the informative contents that permit to fill them. The Gricean notion of implicature or, alternatively, the contextualist notion of proposition pragmatically enriched illustrate the way in which a speaker can be informationally relevant even through the utilization of sentences that are, at face value, non-informative.

3. Logical Truths

A logical truth is a complex sentence or formula that is true under every interpretation of its non-logical terms. Logical truths are complex formulae with parts that are propositional functions, and also include quantifiers and truth-functional connectives. Unlike analytic truths, the truth of which depends on the meanings of their non-logical concepts, the truth-value of logical truths depends on the stable meanings of logical words. We have distinguished them from tautologies and contradictions, which are truth-functional, for they belong to quantification theory. The difference for our purposes is nevertheless one of degree.

The meaning of logical terms is subject to discrepancies. As Warmbrod claims in a recent paper, "there is as yet no settled consensus as to what makes a term a logical constant or even as to which terms should be recognized as having this status" (Warmbrod 1999: 503). The non-existence of a shared paradigm regarding how these terms work makes the question of the informational content of logical truths a difficult one. We will explore here two possibilities that, to our mind, are the two that have attracted more support. One is broadly Fregean and the other one mostly Wittgensteinian.

Frege has been generally interpreted[5] as defending that logical and mathematical truths represent very general features of the surrounding world. This view is patent in his polemic with Hilbert about axioms (Frege 1980). Let's call this view "Fregean

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[5] Particularly from 1892 onwards. *Begriffschrift* (1879), Frege's first published work, introduced an account of logical constants closer to Wittgenstein than to the mature Frege.

realism". The alternative view is the one present in Wittgenstein's *Tractatus* (Wittgenstein 1922): logical words are not names for anything. Let's call this view "Wittgensteinian expressivism"[6]. According to Fregean realism, there is no essential difference between the type of information conveyed by logical truths and that communicated by true empirical propositions; in both cases, there are facts external to language and to our use of it that are reflected in the sentences and that determine their contents; the information transmitted is thus that things are such-and-such, and they are true if, and only if, things are as the sentences at issue say they are. The truth of necessary truths is subsidiary on the existence of necessary facts, facts that belong to every possible world.

Wittgensteinian expressivism, on the contrary, draws a strict demarcation between logical words and run-of-the-mill concepts. The latter, but not the former, represent objects and properties of the world, while logical words indicate operations between propositions and concepts. The features that determine what a logical truth is stand on the side of language, of concepts, of thoughts. Logical truths exhibit relations between concepts and propositional contents. Complex propositions, those made out of atomic ones by means of logical words, do not reflect complex facts, for there is no complex fact in the *Tractarian* universe. What is then the informational content of logical truths, according to Wittgensteinian expressivism? Is it the substantive

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[6] "My fundamental idea", Wittgenstein said in 4.0312, "is that the 'logical constants' are not representatives." In Wittgenstein's view what there are are atomic facts and their components. Logical words are not components of facts. As Stenius says commenting on the *Tractatus*, " logical compounds are *not* pictures", Stenius (1960: 144). It would be possible to completely describe the world, any world, without using logical constants.

information that things are so-and-so? The answer is negative. Logical truths transmit the holding of some connections between the semantic contents of the atomic propositions that are part of them, i. e., they transmit intrasystemic, intralinguistic, information.

A further refinement of Wittgensteinian expressivism is inferential expressivism. Inferential expressivism understands the role played by logical words as that of making explicit inferential links between concepts, those inferential links that are implicit in our everyday inferential practices. The connections between concepts and conceptual contents stressed by Wittgensteinian expressivism are now characterized as inferential. Inferential expressivism has been put forward recently by Robert Brandom (Brandom 1994), who ascribes it back to Sellars, its proximal ancestor, and to Frege's *Begriffsschrift*, its distal referent.

Inferential expressivism about logical words should not be confused with inferentialism about concepts in general. There are currently two main paradigms in philosophy of language offering rival accounts of the meaning of run-of-the-mill concepts. One is truth-conditional semantics[7], the other inferential semantics[8]. The difference between them is that whereas truth-conditional semantics makes truth the basic notion in defining meaning, inferential semantics considers inference a more basic notion, from which the very notion of truth can be derived. Both truth-conditional semantics and inferential semantics are proposals about how ordinary concepts signify. The expressivist proposal about logical constants is *not* that they have inferential meaning, something that according to inferential semantics every concept has, but rather that the meaning of logical terms is exhibiting inferential links among propositions.

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[7] Davidson (Davidson 1984) is the main figure of truth-conditional semantics.

[8] (Brandom 1994: chapter 2), for a defence of inferential semantics.

Having inferential meaning is not a sufficient condition for a term to be a logical constant; it is necessary that its inferential meaning characterizes it as an inference marker. Gentzen-like accounts understand logical terms as possessing inferential meaning in the sense that their meanings can be completely conveyed by the rules that govern their introduction and elimination in a system. In this sense, a Gentzenian account doesn't offer a definition of logical worlds that distinguishes them from the rest of our everyday concepts. Being a logical constant is something else besides possessing inferential content: it is being a linguistic device to cast material inferences as *explicit* inferences. The inferential significance that makes some expressions logical words rests on their functional status, without which speakers could hardly use them to display inferences; a logical constant expresses a rule of inference in itself, and it doesn't suffice that its meaning can be presented as a set of rules.

A concept like WOMAN is inferentially connected with other concepts, like FEMALE, HUMAN BEING, VERTEBRATE, and many others. For this reason one cannot assent to (1), and reject (2),

(1) Victoria is a woman

(2) Victoria is a human being.

A sentence like (3)

(3) A woman is a human being

is a necessary truth of the analytic kind. It is true because of the meanings of WOMAN and HUMANG BEING. If you are inferentialist about content, you will maintain that these meanings support the correct material inferences in which these concepts are involved, an example of which is the transition from (1) to (2).

The rules that define conjunction, for instance, are much simpler that the rules that define womanhood. If only for this reason, inferentialism about conjunction seems to be more plausible than inferentialism about womanhood. But with the appropriate theory of meaning, the phenomenon is the same in both cases. The inferential rules for conjunction are (RC1), (RC2) and (RC3),

(RC1) A & B $\Rightarrow$ A

(RC2) A & B $\Rightarrow$ B

(RC3) A, B $\Rightarrow$ A & B

If we wanted to indicate explicitly the inferential movements that conjunction allows, we would have to say something like this: if you assume a proposition of the form A & B, you are also committed to A and to B. If you are committed to A and you are committed to B, then you are committed to A & B. Thus, although some inferences rest on the meaning of conjunction, conjunction is not used to display an ongoing inference. We use conditionals for this purpose, and so conditionals but not conjunctions are the logical constants at stake. With the concept WOMAN we have the same situation; there are some inferences that rest on its meaning, among others the inference from (1) to (2), as we have seen. If we wanted to display them explicitly, we would have to use an explicit conditional: "If (1), then (2)", for instance.

Inferential expressivism goes then a step further from ordinary inferentialism. If logical truths essentially include logical constants, understanding the informational content of logical truths requires comprehension of the contribution of logical constants to the content of the propositions in which they are involved. Language users bring logical words into play for some purpose, and the main purpose is, according to inferential expressivism, making inferential connections among concepts and

propositional concepts explicit; this is the pragmatic role of logical constants. Logical constants bring into the open the structure of an inference, and they permit present inferential transitions as explicit inferences. What is special about logical words is that their inferential significance makes them inference-*markers*.

In this expressivist picture, the informational content of logical truths is inferential. Logical truths display permissions to assume some contents once that others have being maintained. In negative cases, i.e., when negation is involved, they display relations of incompatibility between propositional contents.

4. Final remarks

What is then the informational content of necessary truths? As we have shown, this question does not have a simple answer. Necessary truths come into different brands; we have distinguished here between a posteriori necessary truths, analytic truths, and logical truths. And there also are different kinds of informational content: factual, linguistic and inferential content, possibly among others. Equipped with these distinctions and taking into account the current theories of meaning and content in contemporary philosophy of language and logic, there is a complex, and probably still incomplete, answer to the question above.

A posteriori necessary truths are statements about the structure of the world and its constituents. They are factually informative, and being a posteriori, extend our knowledge of the extralinguistic reality. They work as the rest of empirical truths. Analytic truths and falsities, in turn, give information about language, their truth-values are patent to everybody who masters the language in which they are expressed. Traditional truth-conditional semantics considers them factually empty. Strictly

speaking, they don't convey any extralinguistic information. Nevertheless, if the bearer of informational content is not the sentence but the whole speech act, then it is possible to understand them as pragmatically conveying factual information under the species of conversational implicatures. In a context where a speaker A asks (c),

(c) Don't you have mercy?

to a hearer B, an analytic truth like "war is war" as a response can be as informational as the use of any other non analytic sentence, since it triggers a pragmatic process that generates an informational content equivalent to the content of an answer like (d),

(d) No, I don't have mercy.

A more radical position, represented by truth-conditional pragmatics, is able to offer a different answer: although analytic sentences seem to be informationally empty, contextual factors contribute to enrich their contents, i.e., what is literally and strictly said by them, to the point of converting them into factually informative. The Gricean explanation is not incompatible with truth-conditional pragmatics, though. On the contrary, they can be seen as somewhat complementary. When it is doubtful that a pragmatic process of implicature is involved, truth-conditional pragmatics is able to offer an explanation of why some analytic sentences convey informational content. It does so by showing that what seems to be an analytic truth is not so once one takes into account the enriched content prompted by the utterance context.

Finally, logical truths express the most general aspects of the world, of every possible world, according to the view we have dubbed "Fregean realism". Fregean realism treats logical truths as similar to empirical truths, being the difference the degree of generality of the features of the world that they respectively represent. An alternative view on logical constants, which we have called "expressivism", either Wittgensteinian or inferential, marks an essential distinction between logical words and the rest of

language. Logical words are, according to expressivism, tools to display inferential links between concepts. On this view, the informational content of logical truths is internal to the conceptual system one possesses. In the inferentialist brand, the information logical truths transmit basically is either entailment relations or incompatibility relations among propositions.

Necessity doesn't make truths homogeneous for the purposes of the theory of information.

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