Minds and Machines, 17: 3, pp. 331-344, 2007.
The original article is available at www.springerlink.com.
DOI: 10.1007/s11023-007-9072-4
http://www.springerlink.com/content/0506124412516828/?p=c0b9b86122294cca8108fddfcbf9042f&pi=5

The Metaphilosophy of Information*

SEBASTIAN SEQUOIAH-GRAYSON†

†Faculty of Philosophy and IEG, Computing Laboratory, The University of Oxford, Great Britain
Address for correspondence: Balliol College, OX1 3BJ, Oxford, UK;
sebastian.sequoiah-grayson@philosophy.ox.ac.uk

ABSTRACT: This article mounts a defence of Floridi's theory of strongly semantic information against recent independent objections from Fetzer and Dodig-Crnkovic. It is argued that Fetzer and Dodig-Crnkovic's objections result from an adherence to a redundant practice of analysis. This leads them to fail to accept an informational pluralism, as stipulated by what will be referred to as Shannon's Principle, and the non-reductionist stance. It is demonstrated that Fetzer and Dodig-Crnkovic fail to acknowledge that Floridi's theory of strongly semantic information captures one of our deepest and most compelling intuitions regarding informativeness as a basic notion. This modal intuition will be referred to as the contingency requirement on informativeness. It will be demonstrated that its clarification validates the theory of strongly semantic information as a novel, and non *ad-hoc* solution to the Bar-Hillel-Carnap semantic paradox.

Keywords: Floridi, Carnap, Bar-Hillel, information, informativeness, analysis, Bar-Hillel-Carnap semantic paradox, classical semantic information, strongly semantic information, Shannon's Principle, non-reductionist stance, contingency requirement on informativeness.

* My deepest gratitude is extended to Luciano Floridi, Patrick Allo, Antony Eagle, and an anonymous referee at *Minds and Machines* for many extremely helpful comments on a previous version of this paper. Any errors that remain are entirely my own.

1. Introduction

The philosophy of information is a new area (See Floridi, 2003a). Like all things new to the world it needs to be raised well, with proper guidance, in order that it not get led astray by the world's less attractive practices. Specifically of course, the philosophy of information requires guidance in order that it not be led astray by some of philosophy's less attractive practices. The purpose of this article is to provide the philosophy of information with an inoculation of sorts. The practice it is to be inoculated against is one that has, unfortunately, permeated much of modern philosophy. Its form is as follows: we begin some ubiquitous pre-theoretical notion and then begin to rigidify it. This much is positive, and the function of analysis. It becomes negative when, despite having clearly demarcated the various notions that operate under the pre-theoretical notion (as ubiquitous pre-theoretical terms are usually umbrella-like) we *then* continue to argue about which of these demarcated notions is most deserving of the original pre-theoretical title. Of course such debates are not usually carried out on quite these terms. Instead of claiming that the demarcated notion N_1 (as opposed to N_2) is most deserving of the title T (where in this context T is mentioned, not used), additional ontological gravitas is invoked by claiming that notion T *is* N_1 (where in this context T is used, not mentioned). This is disingenuous however. When philosophers ask, "What is T?" (where T is used) what we often *really* mean is "which N_i should we pick out with T?" (where T is mentioned). By way of examples, consider *knowledge*, *truth*, *consciousness*, *content*, *concept*, *meaning*, *proposition*, *semantic*, *logical*, and *free will* to name just a few.[1]

The difference here goes deeper than a mere hiding of mentioning in use's clothing (which would be cause for concern enough). It amounts to a hiding of the normative in the clothing of the descriptive. Why does this occur? The tempting explanation, and quite likely the correct one, is that being explicit about this practice runs the risk of making philosophy look rather limp. It amounts to understanding the task of philosophy as being to instruct the folk on the proper meaning of certain words. Philosophers of an ordinary-language-philosophy tendency will be happy to assert this, and do. Philosophers, they say, are the experts when it comes to deciding on the meaning of certain words, and due deference should be paid to experts in general. We defer to the authority of mechanics when they say that the shrieking noise occurring at ignition is because the tread has worn from our flywheel and that we need a new one, because instructing us on correct car maintenance is a mechanic's job. Similarly, so it goes, the folk should defer to the authority of philosophers when in comes to the meaning of certain words, because instructing the folk on correct word meaning is *our* job.

---

[1] This list it not meant to be anything like exhaustive, but merely indicative.

However, even if there *is* something more to correct word meaning over and above convention,[2] some of us might think that the task of philosophy is something a little more robust, namely, separating the True from the False. With specific reference to extending the positive function of analysis, some of us might think that philosophy's task is to accurately distinguish amongst the collection of concepts at work under the rubric in question (*knowledge*, *truth*….). Once this distinction is made, and made accurately, then philosophy's work in the area of analysis is done. Typically, sustained reflection upon a particular pre-theoretical notion (or even some theoretical ones) will reveal hitherto unrecognised notions that are then specified by stipulative definitions. Whether or not such a stipulative definition is a valid one or not is a function of whether the notion to which the definition is intended to apply is useful or merely arbitrary. If the stipulative definition *is* a good one, then entering into an extended debate about whether a particular term *T* should be used to denote it is next to useless.

This article is concerned generally with this set of issues with respect to the notion(s) falling under the term 'information', and specifically with the validity of Floridi's (2003b) *theory of strongly semantic information* (**TSSI**). The originator of information theory, Claude Shannon, had the following (what we might refer to as *Shannon's Premonition*) to say about the general issue:

> *Shannon's Premonition*
>
> The word 'information' has been given different meanings by various writers in the general field of information theory. It is likely that at least a number of these will prove to be useful in certain applications to deserve further study and permanent recognition. It is hardly to be expected that a single concept of information would satisfactorily account for the numerous possible applications of the general field (1950, p.80).

Taking Shannon's Premonition into account, establishing the validity of Floridi's **TSSI** turns on establishing whether **TSSI** is useful and non-arbitrary. If this can be done, the detractors of **TSSI** who argue about whether or not it "is" information will be seen to be largely occupied with an irrelevancy. This article demonstrates that this is in fact the present state of affairs.

---

[2] And there's probably not. To be sure, it is possible to misuse a word, but such misuse is a result of deviation from convention. In cases where convention is at odds with canonical stipulated use (such as an old edition of the OED for example) then the meaning of the word has changed (as the meaning of words is want to do). In cases where convention is at odds with a current edition of the OED, the edition requires updating. In cases where general convention is at odds with a specialized minority convention, then we are dealing with homonyms, which may or may not be accurately tracked in some lexical cannon or other, depending on its intended domain. If the use falls within the intended domain of the lexical cannon, yet the entry does not track the convention, then, to reiterate, the entry requires updating. If you think of philosophy in pragmatic as opposed to semantic terms, then think of all of this in terms of correct word *usage* as opposed to correct word *meaning*.

The major criticisms of **TSSI**, Fetzer (2004) and Dodig-Crnkovic (2005) have either a) failed to take Shannon's Premonition into account, or b) despite taking Shannon's Premonition into account, failed to adhere to it.

The first task is to establish that **TSSI** *is* useful and non-arbitrary. Floridi constructs **TSSI** in order to avoid a paradox generated by Bar-Hillel and Carnap's (1952) theory of *classical semantic information* (**CSI**).[3] He calls this paradox *the Bar-Hillel-Carnap semantic paradox* (**BCP**), which is, simply put, that inconsistent formulas yield a maximal individuation and measure of semantic information (see §2). The fact that **TSSI** successfully avoids **BCP** (and it is a fact, as it does) is insufficient to establish that it is a useful and non-arbitrary notion. This is because a theory may avoid particular unwanted results by ruling them out with stipulative axioms. Such an *ad-hoc* approach is awkward and unsatisfying. It is demonstrated (see §3) that Floridi's **TSSI** provides a *novel* solution to **BCP** by capturing one of our deepest and most compelling modal intuitions regarding *informativeness* as a basic notion. It is this fact (and not simply it's solution to **BCP**) that validates **TSSI**. That the modal intuitions underlying **TSSI** have been missed by Fetzer and Dodig-Crnkovic is an indication of how much bother the philosophy of information will get itself into if Shannon's Premonition is not kept firmly in mind. Before these modal intuitions can be made explicit, we will explicate **CSI** just far enough to reveal its underlying modal structure, and to render **BCP** transparent.

2. The Modal Structure of the Theory of Classical Semantic Information and the Bar-Hillel-Carnap Semantic Paradox

CSI (Bar-Hillel and Carnap, *op. cit.*) is *semantic information* precisely because it is concerned with the information contained in the content *of* a sentence, as opposed to the surprise value of receiving a message (which is the subject matter of Shannon and Weaver's (1948) *mathematical theory of communication* (**MTC**)). **CSI** encapsulates content in virtue of it being built upon the classical modal space that Carnap (1955, 1956) used to define his notion of *intension* and which is commonly used to explicate metaphysical necessity.[4] The

[3] Floridi refers to **CSI** as the *theory of weakly semantic information* (**TWSI**).

[4] Bar-Hillel and Carnap built **CSI** around a monadic predicate language. The number of possible worlds is calculated accordingly. Where there are n individual constants (standing for n individuals) and m primitive monadic predicates, the number of atomic sentences will be nm, the number of possible worlds 2^{nm}, and the number of "Q-predicators" 2^m (Q-predicators are individuations of possible types of objects given a conjunction of predicates whereby each primitive predicate occurs either negated or un-negated (but not both)). A full sentence of a Q-predicator is a Q-sentence where a predicate is attached to a term. Hence a possible world is a conjunction of n Q sentences as each Q-sentence describes a possibly existing individual. Since this article deals with nothing more fine-grained than the propositional calculus, these details will be ignored.

intension of a declarative sentence is taken to be the set of possible worlds that make the sentence true (equivalently, those worlds included by the sentence).[5] The notion of an intension is co-definable with Bar-Hillel and Carnap's notion of *semantic information* as comprised by **CSI**. Semantic information is also referred to as *content* and denoted by 'Cont'. The content of a declarative sentence is taken to be the set of possible worlds that make the sentence false (equivalently, those worlds excluded by the sentence). Letting W be the set of all possible worlds, and X be the set of possible worlds identified with the intension of a declarative sentence s, and Y be the set of possible worlds identified with the content of s, we have (2.1):

(2.1) $W \setminus X = Y$ iff $W \setminus Y = X$

Hence X and Y will always be mutually exclusive and jointly exhaustive on W (i.e., they are a partition on W). Explicitly, the content of s will be identical to the set of possible worlds included by the negation of s. This is just to say that content of s is identified with the set of possible worlds included by $\neg s$. Where $X \subseteq W$ we have (2.2):[6]

(2.2) $\text{Cont}(s) =_{df} \{x \in W: x \vDash \neg s\}$

For any logically true sentence $\top$, $\neg \top$ will exclude every possible world. Via (2.2) we have (2.3):

(2.3) $\text{Cont}(\top) = \varnothing$

Similarly, for any inconsistent (contradictory) sentence $\bot$, $\neg \bot$ will include every possible world. Via (2.2) we have the first instance of **BCP** (2.4):

(2.4) $\text{Cont}(\bot) = W$

CSI is concerned not only with the individuation of semantic information (Cont) but also with its *measure*. The guiding intuition is that the informativeness of a sentence s is inversely proportionate to the probability of the state of affairs it describes being the case. **CSI** involves

[5] We speak of the intension associated with a sentence as opposed to the intension associated with a *proposition* because, on the possible worlds understanding of propositions, a proposition *just is* an intension.

[6] We require '$\subseteq$' instead of the stronger '$\subset$' here because of the possibility that $\vDash \neg s$, in which case $X = W$.

two distinct methods for obtaining measures of semantic information, a *content measure* (cont) and an *information measure* (inf).

Beginning with cont. Bar-Hillel and Carnap denote the logical (*a priori*) probability of a sentence *s* by *m*(*s*), where *m* designates 'measure' (*op. cit.*, 302). *m* is acquired via an *a priori* probability distribution onto the set of all possible worlds. The distributed values sum to 1. For simplicities sake, we may assume that the distribution pattern is equiprobable. **CSI** defines the cont of a sentence *s* as the measure of the complement of *s*, (2.5):

(2.5) $\text{cont}(s) =_{df} 1 - m(s)$

A logically true sentence $\top$ is true in every possible world, hence (2.6):

(2.6) $m(\top) = 1$

A logically true sentence will return a minimal content measure. From (2.5) and (2.6) we have (2.7):

(2.7) $\text{cont}(\top) = 1 - 1 = 0$

An inconsistent sentence $\bot$ will be false in every possible world, hence (2.8):

(2.8) $m(\bot) = 0$

An inconsistent sentence will return a maximal content measure. From (2.5) and (2.8) we have the second instance of **BCP** (2.9):

(2.9) $\text{cont}(\bot) = 1 - 0 = 1$

Bar-Hillel and Carnap introduced the notion of an *information measure* (inf) to capture additivity on *inductive independence*. Two sentences are said to be inductively independent when the conditional probability of each sentence given the other is identical to its initial probability. Additivity on inductive independence fails for cont. For any two arbitrary sentences *s* and *s′*, we cannot guarantee that $\text{cont}(s \wedge s') = \text{cont}(s) + \text{cont}(s')$ because it may be the case that *m*(*s*) and *m*(*s*)′ have worlds in common. *s* and *s′* may have shared *content*. For additivity to hold on cont, it is *content independence* (not inductive independence) that is required.

The definition of inf may proceed via either cont (2.10) or *m* (2.11):

$$\text{(2.10)} \qquad \inf(s) =_{df} \log_2 \frac{1}{1 - \text{cont}(s)}$$

$$\text{(2.11)} \qquad \inf(s) =_{df} \log_2 \frac{1}{m(s)} = -\log_2 m(s)$$

(2.10) and (2.11) are equivalent, hence we consider only (2.10). Similarly to cont, any logically true sentence $\top$ will return a minimal information measure. From (2.10) and (2.7) we have (2.12):

$$\text{(2.12)} \qquad \inf(\top) = \log_2 \frac{1}{1-0} = \log_2 \frac{1}{1} = \log_2 1 = 0$$

Again similarly to cont, an inconsistent sentence $\bot$ will return a maximal information measure. From (2.10) and (2.9) we have the third instance of **BCP** (2.13):

$$\text{(2.13)} \qquad \inf(\bot) = \log_2 \frac{1}{1-1} = \log_2 \frac{1}{0} = \log_2 0 = \infty$$

With respect to inconsistent sentences returning a maximal value, that is, with respect to **BCP**, Bar-Hillel and Carnap comment that:

> It might perhaps, at first, seem strange that a self-contradictory sentence, hence one which no ideal receiver would accept, is regarded as carrying with it the most inclusive information. It should, however, be emphasized that semantic information is here not meant as implying truth. A false sentence which happens to say too much is thereby highly informative in our sense. Whether the information it carries is true or false, scientifically valuable or not, does not concern us. A self-contradictory sentence asserts too much; it is too informative to be true (*ibid*, 229).

It is the desire for a theory of semantic information that avoids the result that some sentences may be "too informative to be true" that motivates Floridi's construction of **TSSI**.

3. Floridi's Theory of Strongly Semantic Information and our Modal Intuitions regarding Informativeness

We note immediately that Floridi does not intend **TSSI** to be a theory of an *Ur*-concept with respect to theories of information. He rejects the feasibility of a *reductionist program* for a *unified theory of information* (**UTI**) outright:

> Reductionist strategies are unlikely to succeed. Several surveys have shown no consensus or even convergence on a single, unified definition of information (see for example Brahman (1989), Losee (1997), Machlup (1983), NATO (1974, 1975, 1983, Schrader (1984), Wellisch (1972), Wersig and Neveling (1975)). This is hardly surprising. Information is such a powerful and flexible concept and such a complex phenomenon that, as an explicandum, it can be associated with several explanations, depending on the level of abstraction adopted and *the cluster of requirements and desiderata orientating a theory* (2004, 2, emphasis added).

He quotes *Shannon's Premonition* (*ibid*) to reinforce the point. Floridi also rejects any *antireductionist program* as "an impasse rather than a solution" (*ibid*). The antireductionist program actively defends the irreducibilty of *prima facie* distinct information types to *any* connected concepts. By contrast, Floridi adopts what he calls a *non-reductionist* stance, whereby conceptual connections between *prima facie* distinct information types are pursued in a non-hierarchical manner that eschews the pursuit of any informational *Ur*-concept.

As the emphasised passage from the quotation above makes clear, Floridi takes an explanation of the explicandum to turn on the particular requirements and desiderata behind the theory purported to offer the explanation. In the present case, the theory in question is **TSSI**, and the requirement and desiderata placed on it is that it provides a solution to **BCP**. It was argued toward the end of §1 that, in order for a theory to be validated, the manner in which it satisfies the requirements placed on it must be novel, and non-*ad-hoc*. It was claimed that Floridi's **TSSI** provides a *novel* solution to **BCP** by capturing some of our deepest and most compelling modal intuitions regarding *informativeness* as a basic notion. It is this fact, it was claimed (and not simply it's solution to **BCP**) that validates **TSSI**.

In the remainder of this section, we trace out just enough of **TSSI** (which is mathematically quite complex) required to make this fact explicit. The first simplification will be that talk of infons σ (Devlin, 1991, Barwise and Perry, 1983) will be replaced by talk of sentences *s*. Very loosely speaking, an infon may be described as a discrete item of information, "irrespective of [its] semiotic code and physical implementation" (Floridi, *op. cit.*, 4). Sentences are particular infon-types, as are utterances, gestures, signs etc. Floridi formulates a *discrepancy function* ϑ whose domain is the set of declarative sentences and

range is the set of real numbers [–1.0, +1.0]. Intuitively, the less accurately the sentence describes the situation it putatively reports (THERE ARE THREE CATS ON THE MAT etc.) the greater its discrepancy. True sentences will return a value from the range [0, +1.0] and false sentences will return a value from the range [0, –1.0]. 0 is the value returned for non, or zero-discrepancy. Importantly, inconsistent sentences will be maximally *inaccurate*, whilst logically true (or tautologous in the looser sense) sentences will be maximally *vacuous*:

(3.1) $\bot = -1.0$

(3.2) $\top = +1.0$

Floridi also formulates an *informativeness function* ι whose domain is the set of declarative sentences *s* and range is the set of real numbers [0, 1]. 0 demarcates zero informativeness, and 1 demarcates maximal informativeness. Importantly for our purposes, we note the following three necessary conditions on **TSSI**:

(3.3) $(\vartheta(s) = 0) \rightarrow (\iota(s) = 1)$

(3.4) $(\vartheta(s) = (+1 \vee -1)) \rightarrow (\iota(s) = 0)$

(3.5) $((0 < \vartheta(s) < +1) \vee (0 > \vartheta(s) > -1)) \rightarrow (0 < \iota(s) < 1)$

Via (3.4) and (3.1), we get (3.6):

(3.6) $\iota(\bot) = 0$

Via (3.4) and (3.2), we get (3.7):

(3.7) $\iota(\top) = 0$

We shouldn't mistake (3.6) and (3.7) for Floridi's solution to **BCP** via **TSSI** (the details of which we are leaving aside). They are instead well-motivated capturings of a strong modal intuition regarding informativeness upon which **TSSI** is constructed and **BCP** is avoided. The modal intuition captured at the heart of **TSSI** is what we might call *the contingency requirement on informativeness* (**CRI**):

The Contingency Requirement on Informativeness

A declarative sentence s is informative $\leftrightarrow$ s individuates at least some but not all w_i from W (where $w_i \in W$).

CRI is clearly an idealized notion. Realistic agents will, and do, find sentences that pick out all possible worlds to be informative. Any set of premises $P_1,\ldots, P_n$ and conclusion C such that $P_1,\ldots, P_n \vdash C$ may be turned into a logically true sentence with the form $P_1 \wedge,\ldots, \wedge P_n \rightarrow C$. Such deductions (and transformed sentences) are informative for agents precisely because we are not logically omniscient.[7] It is this failure of logical omniscience that **CRI** (via (3.7) and by it, **TSSI**) idealises over. That a similar idealisation occurs in **CSI** is indicated by (2.7) and (2.12). [8]

Despite this idealisation, **CRI** remains a convincing modal intuition. For a declarative sentence s to be informative, in some useful sense of the term, it must stake out a claim as to which world, out of the entire modal space, is in fact the actual world. This sense of informativeness is that which takes informativeness to be an attempt to locate our world within the space of all possible worlds. Neither inconsistent nor tautologous sentences achieve this. This is because there is no way that our world might be such that a contradiction is true, and no way that our world might be such that a tautology is false.[9] No matter how many contradictions or tautologies we are exposed to, we remain lost in modal space. Informativeness, on this reading, necessarily entails an attempt to find our way home, so to speak, to the actual world. This notion of informativeness is that which is captured by **TSSI**, and ensures that the definitions contained therein are novel and non-arbitrary. It is this fact that validates **TSSI** as a useful theory of information. With all this on board, we turn now to the analysis of Fetzer and Dodig-Crnkovic's objections to **TSSI**.

---

[7] For a critical evaluation of Jaakko Hintikka's approach to the issue, see Sequoiah-Grayson (2007). For a development of a metasemantic approach to logical hyperintensionality explicitly related to issues surrounding the problem of logical omniscience, see Sequoiah-Grayson (2008).

[8] For the outline of a theory of information faithful to Shannon's Premonition that is designed to overcome this very idealisation, see Sequoiah-Grayson (2006).

[9] Barring a dialethic paraconsistentism that is. The need for weak substructural logics with respect to capturing fine-grained real-world phenomena may always be satisfied via a less radical non-dialethic paraconsistentism. One infamous example of such phenomena is the information yield of deductive inferences for resource-bounded non-idealised natural agents. See Sequoiah-Grayson (2006) for further details.

4. Fetzer and Dodig-Crnkovic's Objections to the Theory of Strongly Semantic Information

Fetzer (*ibid*) raises a series of objections to **TSSI**. Several of these result from Fetzer's failing to take Shannon's Premonition and Floridi's non-reductionist stance into account, whilst others are the result of independent confusions. Fetzer's first substantive objection involves a mistaken assumption regarding the assignment of truth-values to sentences falling within the scope of logical modalities, as well as the conflation of ontological issues with epistemic ones.

Fetzer (*ibid*, 224-5) claims that we are often presented with truth-apt sentences despite not being in a position to ascertain their truth-value. This much is uncontroversial. The test case is the English sentence:

s*: There is life elsewhere in the universe.

According to Fetzer, **CSI** would count s* as information, wheras **TSSI** might or might not, since it would count to be so only if it is true (and we don't know whether or not it is). Suppose we understand s* to be understood as an open claim encountered by the agent(s) considering its truth-value (and it seems from the way that Fetzer presents things that we should). In this case, s* comes embedded, implicitly, inside the scope of a modal operator. At the very least it comes embedded within the scope of the logical possibility operator $\langle \mathrm{L} \rangle$. For any declarative sentence *s*, and where [L] denotes logical necessity $\langle \mathrm{L} \rangle s$ *iff* $\neg [\mathrm{L}] \neg s$. That is, it is true that $\langle \mathrm{L} \rangle s$ just in case *s* is not a contradiction. s* is no contradiction, hence it is *true* that $\langle \mathrm{L} \rangle$s*. This is just to say that $\langle \mathrm{L} \rangle$s* *does* explicitly count as information in the sense of **TSSI** (contra Fetzer's objection).

There is another, stronger response to Fetzer on this point that holds irrespectively of whether he intended s* to fall within the scope of $\langle \mathrm{L} \rangle$. This turns on his conflation of ontological with epistemic issues. Fetzer writes, "A problem that remains, therefore, is how we know whether a meaningful datum happens to be information [in the **TSSI** sense], insofar as that presupposes that we happen to know that it is true" (*ibid*, 225). Fetzer makes this point elsewhere: "It follows that, on Floridi's account, a sentence that is information can have a negation that is not, where no one knows which is information and which is not! This result must be at least as paradoxical as any it would resolve" (*ibid*, 226).

Floridi situates his **TSSI** within the class of *declarative, objective*, and *semantic* (**DOS**) *information* types (2005). The relevant **DOS** criterion is *objectivity*. An instance of **DOS** information remains information even if there are no agents who have accessed it as such.

DOS information's status as information is independent of epistemic access. It is "agent independent". Although it is true to an extent that "a problem that remains, therefore, is how we know whether a meaningful datum happens to be information, in the **TSSI** sense, insofar as that presupposes that we happen to know that it is true", this problem is simply that which all rational, non-omniscient agents face: How do we know whether a particular claim is true? A claim's actually *being* true (or not) is not a function of our knowing whether it is one way or another. Similarly, a claim's being information in the **TSSI** sense is not a function of our knowing that it is, one way or another. There is nothing "paradoxical" in this at all, unless one *also* holds that a claim's truth-value being independent of our *knowing* its truth-value is also paradoxical. To say that **TSSI** might or might not count s* as information since it would count to be so only if it is true (and we don't know whether or not it is) is misleading. s* has already been assigned an informational status by **TSSI**, it's just that we do not yet know what it is on account of our limited epistemic access to the universe.

Fetzer's failure to note Shannon's Premonition and the non-reductionist stance is responsible for several confused claims. He writes that "Even were [**TSSI**] to be adopted, there would still remain the need for a weaker concept that corresponds to [**CSI**]" (*op. cit.* 225). This, clearly, is a claim that Floridi assents to. Hence it cannot form part of an objection to **TSSI**. Fetzer's failure to note Shannon's Premonition and the non-reductionist stance goes beyond Floridi's construction of **TSSI** and extends to Bar-Hillel and Carnap's (*op. cit.*) construction of **CSI**. Fetzer writes that "Floridi joins Carnap and Bar-Hillel in rejecting…the thesis that tautologies are information" (*op. cit.*). The claim that Bar-Hillel and Carnap reject the thesis that tautologies are information is simply false. Bar-Hillel and Carnap write:

> This, [the results of **CSI** (2.7) and (2.12) explicated in §2 above) however, is by no means to be understood as implying that there is no good sense of 'amount of information', in which the amount of information in these sentences [tautologies] will not be zero at all, and for some people, might even be rather high. To avoid ambiguities, we shall use the adjective 'semantic' to differentiate both the presystematic sense of 'information' in which we are interested at the moment and their systematic explicata from other senses (such as "amount of psychological information for the person P") and their explicata (*op. cit.*, 223).

In line with Shannon's Premonition and the non-reductionist stance, Bar-Hillel and Carnap intend **CSI** to be one information type among many. By way of an explicit example, they allow that there be, but do not develop, a sensible notion of *psychological information* (**PI**), such that tautologies count as information (see Sequoiah-Grayson, (2006)). Fetzer further exemplifies his failure to comprehend the methodological perspective guiding **CSI** and **TSSI**

when he writes "These considerations appear to establish beyond a reasonable doubt that an account of information that embraces a truth-condition cannot possibly be correct" (*op. cit.*, 226). Fetzer goes on to suggest two accounts of information distinct from **CSI** and **TSSI**, the *semiotic conception of information* (**SCI**) and the *pragmatic conception of information* (**PCI**) respectively (*ibid*). He understands **SCI** and **PCI** (as well as, obviously, **CSI** and **TSSI**) to be competing "alternatives" (*ibid*) for *the* definition of information. It is left to the reader to ascertain whether **SCI** or **PCI** are valid information types on account of their being useful, non-arbitrary notions.

Quite apart from considerations tuning on the truth conditions for modally embedded sentences and conflations between ontology and epistemology, it is clear that the failure to note Shannon's Premonition and the non-reductionist stance is leading Fetzer astray. One might justifiably believe, at this stage, that due attention to Shannon's Premonition would be sufficient to remove the motivation for such misplaced objections. Dodig-Crnkovic (*op. cit.*) demonstrates that this is not the case. In §2.1, Dodig-Crnkovic explicitly notes, and states, Shannon's Premonition. Moreover, with respect to **CSI** and **TSSI**, she states that, "both approaches will prove to have legitimacy under specific circumstances" (*ibid*, §2.3). So it appears as if Dodig-Crnkovic has got the metaphilosophy of information right; Shannon's Premonition is on board, and explications of the pre-theoretical notion of information are to be judged on their usefulness. However, in the very same sentence partially quoted above, Dodig-Crnkovic goes on to write "I will try to illuminate why the general definition of information does not [correspond to **TSSI**]". What "general definition" is this supposed to be exactly? The *point* of Shannon's Premonition is that searching for such a general definition is work for Sisyphus.[10] In her conclusion (*ibid*, §4), Dodig-Crnkovic writes that her "paper argues that meaningful data need not necessarily be true to constitute information". As should be clear at this stage, Floridi has not claimed that meaningful data need be necessarily true to constitute information, only that meaningful data need necessarily be true to constitute *strongly semantic information*.

The parity with Fetzer's arguments run deeper still, as Dodig-Crnkovic's argument against **TSSI** also conflates the very same ontological and epistemic issue. Her argument focuses on verisimilitude. The guiding idea is that scientific inquiry strictly speaking, works with approximations to truth as opposed to truth *simpliciter*. Since this means that strictly speaking, the majority of our scientific theories are likely false, a *reductio* is attempted against **TSSI** on account of it purportedly failing to assign informational status to the majority of scientific theories. Surely, the *reductio* runs, we *do* want to assign informational status to

[10] If Dodig-Crnkovic means *well-formed meaningful data* by 'the general definition of information', as does Floridi, then this is also confusing. It is confusing because Floridi does not take *well-formed meaningful data* to correspond to **TSSI** either.

the majority of our scientific theories, despite their failing to achieve truth *simpliciter*. In §3, Dodig-Crnkovic writes, "When do we expect to be able to label some information as "true"? Is it possible for a theory, a model, or a simulation to be "true"?".

There are three rejoinders to make here: Firstly, concerns about when we can expect to label some information (or in keeping with **TSSI**, data) true, are epistemic concerns. They do not affect the ontological status (in the **TSSI** sense of the term) of our scientific theories. This point is identical to the one made above regarding Fetzer's analogous criticism. Secondly, a formal theory of semantic information that takes verisimilitude into account has not yet been achieved by anyone, for the simple reason that constructing a formal theory of approximate truth has proved notoriously difficult. So although it is both true that **TSSI** does not take into account the complexities involved in verisimilitude, and that it is desirable that we posses a theory of semantic information that does, this can hardly count as a criticism of Floridi's construction. Thirdly, Floridi is not claiming that the majority of our scientific theories, on account of their (let us assume) being only approximately true, fail to count as information, only (to reiterate the point) that they do not constitute *strongly semantic information*.

4. Conclusion

Fetzer and Dodig-Crnkovic's objections to **TSSI** have several things in common. Not only do they both confuse epistemic concerns with robustly ontological ones, they both fail to adhere to the positive program of analysis. Doing so requires conceding that the validity of a stipulative definition turns on whether the notion to which the definition is intended to apply is useful or merely arbitrary. It also requires conceding that if the stipulative definition *is* a good one, then entering into an extended debate about whether a particular term *T* should be used to denote it is next to useless. Making the relevant concessions is not sufficient however. As Dodig-Crnkovic demonstrates, it is possible to pay lip-service to such standards (specifically, to Shannon's Premonition and the non-reductionist stance) whilst still failing to follow them.

In summary, neither Fetzer nor Dodig-Crnkovic acknowledge Floridi's motivating philosophical insight. To be sure, Floridi does not state it explicitly, yet it is situated just beneath the surface, and it is immediately apparent from a cursory appraisal of the formal apparatus upon which **TSSI** is constructed. **TSSI** provides us with a novel solution to **BCP** by capturing one of our deepest and most compelling modal intuitions regarding *informativeness* as a basic notion. This fact is made explicit by (3.6) and (3.7) in §3 above, and the modal intuition captured is that which we have called **CRI**. **CRI** states that a declarative sentence *s* is informative *iff s* individuates at least some but not all w_i from W (where $w_i \in W$). This is just to say that for a declarative sentence *s* to be informative, in some useful sense of the term,

then it must stake out a claim as to which world out of the entire modal space is in fact the actual world. Neither inconsistent nor tautologous sentences assist us in locating our world within the space of all possible worlds. No matter how saturated our exposure to such sentences, we remain lost in modal space. The reading of informativeness captured by **TSSI** is that which understands informativeness to necessarily entail an attempt to find our way home, to the actual world. It is this fact, via Shannon's Principle and the non-reductionist stance that validates **TSSI** as a novel and non *ad-hoc* solution to **BCP**, and hence validates it as a useful and non-redundant theory of information.

Bibliography

Bar-Hillel, Y., and Carnap, R. (1952): An Outline of a Theory of Semantic Information, rep. in Bar-Hillel, (1964) pp. 221-74.

Barwise J. and Perry, J. (1983): *Situations and Attitudes*, reprinted by CSLI, 1999.

Braman, S. (1989): Defining Information, *Telecommunications Policy*, 13, 233-242.

Carnap, R. (1956): *Meaning and Necessity*: *A Study in Semantics and Modal Logic*, Chicago: The University of Chicago Press.

Carnap, R. (1955): Meaning and Synonymy in Natural Languages, *Philosophical Studies*.

Devlin, K. (1991): *Logic and Information*, New York, Cambridge University Press

Dodig-Crnkovic, G. (2005): System Modelling and Information Semantics, in J. Bubenkojr *et. al.* (eds.): *Proceedings of the Fifth Conference for the Promotion of Research in IT*, New Universities and University Colleges in Sweden, Studentlitteratur, Lund, 2005.

Fetzer, J. H. (2004): Information: Does it Have To Be True, *Minds and Machines*, 14, 223-229.

Floridi, L. (2003a): What is the Philosophy of Information, *Metaphilosophy*, 33, 123-145, reprinted in T. W. Bynam & J. H. Moore (eds.): *Cyberphilosophy:The Intersection of Philosophy and Computing*, Oxford, New York, Blackwell, 2003.

Floridi, L. (2003b): Outline of a theory of Strongly Semantic Information, *Minds and Machines*, 14, 197-222.

Floridi, L. (2004): Information, in L. Floridi (ed.): *The Blackwell Guide to the Philosophy of Computing and Information*, Blackwell Publishing, 40-62.

Floridi, L. (2005): Is Semantic Information Meaningful Data, *Philosophy and Phenomenological Research*, 70, 351-370.

Loose, R. M. (1997): A Discipline Independent Definition of Information, *Journal of the American Society for Information Science*, 48, 254-269.

Machlup, F. (1983): Semantic Quirks in the Study of Information, in F. Machlup & U. **Mansfield (eds.):** *The Study of Information: Interdisciplinary Messeges*, 641-671, New York: John Wiley, 1983.

NATO (1974): Advanced Study Institute in Information Science, Champion, 1972, A. Debbons (ed.) *Information Science:Search for Identity*, New York, Marcel Decker.

NATO (1975): Advanced Study Institute in Information Science, Champion, 1972, A. Debbons & W. J. Cameron (eds.) *Perspectives on Information Science*, Leiden, Noorrdhoff.

NATO (1983): Advanced Study Institute in Information Science, Crete, (1978), A. Debbons & A. G. Larson (eds.): *Information Science in Action: Systems Design*, Boston, Martinus Nijhoff).

Sequoiah-Grayson, S. (2006): Information Flow and Impossible Situations, *Logique et Analyse*, 49, Special Issue on Logic and the Philosophy of Information.

Sequoiah-Grayson, S. (2007): The Scandal of Deduction: Hintikka on the Information yield of Deductive Inferences, *forthcoming* in *Journal of Philosophical Logic*.

Sequoiah-Grayson, S. (2008): Metasemantic Information and the Scandal of Deduction, *forthcoming* in *The Logica Yearbook 2007*, Proceedings of Logica 2007: 21st annual symposia, The Institute of Philosophy, Academy of Sciences, Hejnice Monastery, 18 – 22 June 2007, Filosofia, Prague, 2008.

Shannon, C. E. and Weaver, W. (1948): *The Mathematical Theory of Communication*, reprinted with a forward by R. E. Blahut & B. Hajek, Urbana and Chicago, University of Illinois Press, 1998.

Shannon, C. E. (1950): The Lattice Theory of Information, reprinted in N. J.A. Sloane & A. D. Wyner (eds.): *Collected Papers*, Los Alamos, Ca: IEEE Computer Society Press, 1993.