14. Types of inference: entailment, presupposition, and implicature[1]

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This article is dedicated to Professor Nigel Vincent, my mentor at Cambridge, on the occasion of his sixty-fifth birthday.

Introduction

As one of the basic forms of reasoning, inference can in general be defined as a process of accepting a statement or proposition (called the conclusion) on the basis of the (possibly provisional) acceptance of one or more other statements or propositions (called the premises). Construed thus, it includes deduction, induction, and abduction. It also includes entailment,[2] presupposition, and implicature.

The aim of this article is to assess entailment, presupposition, and implicature – the three fundamental types of inference that are recognised in semantics and pragmatics (see e.g. Huang 2007, 2009g on the scope of pragmatics). Of the three categories of inference, entailment is essentially semantic in nature, though the notion of pragmatic entailment will be discussed. Presupposition straddles the semantics-pragmatics boundary, resulting in semantic and pragmatic presupposition. Finally, with regard to the two breeds of implicature, while conversational implicature is pragmatic in nature, conventional implicature can be categorised either as semantic or pragmatic, depending on how the distinction between semantics and pragmatics is drawn. Concepts parallel to conversational implicature such as explicature and impliciture will also be considered. Finally, a brief comparison among entailment, presupposition, conversational implicature, and conventional implicature in terms of four parameters: defeasibility, negation, conventionality and semantics versus pragmatics will be made.

1. Entailment

The term 'entailment' is derived from formal logic.[3] It refers to a semantic relation that can be defined in terms of truth in (1).

(1) Entailment
A proposition (or sentence expressing a proposition) *p* entails a proposition (or sentence expressing a proposition) *q* if and only if the truth of *p* guarantees the truth of *q*.

What (1) basically says is this: if *p* entails *q*, then *q* can be taken as following logically and inescapably from *p*. If *p* is true, then *q* is also true. By contrast, if *p* is false, nothing is said about the truth value of *q*. Defined thus, entailment represents a truth-functional relationship in the sense that its function is to predict the truth value of a proposition from what is known of the truth value of another. By way of illustration, let us consider (2). (I use '|–' to stand for 'entail'.)

(2) a. All of the university's professors are hard-working.
    b. |– Some of the university's professors are hard-working.

In (2), if the university in question has professors, then (2a) entails (2b), but not vice versa. The reason is that if it is true that all of the university's professors are hard-working, then there is no way to avoid the conclusion that it is also true that some of the university's professors are hard-working. Notice that entailment proceeds from our knowledge of language. It depends on the constituents of relevant sentences rather than context. Consequently, an entailment is not defeasible, that is, it cannot evaporate in any linguistic or non-linguistic context. This is why it must be seen as semantic in nature (see e.g. Huang 2007: 16–17).

However, on Fauconnier's (1975) and Israel's (2004) view, there is also pragmatic entailment. By pragmatic entailment is meant an inference that is on the one hand default, and on the other defeasible. Two examples are given in (3) and (4).

(3) a. John can run 100m in 9.9 seconds.
    b. |– John can run a slower 100m.
(4) a. John can't run 100m in 9.9 seconds.
    b. |– John can't run a faster 100m.

According to Fauconnier and Israel, the opposing, scalar inferences of (3b) and (4b) are pragmatic entailments. They are entailments because the inferences are default, i.e. automatically valid; they are pragmatic because the inferences can be defeated. But how the inferences can be cancelled seems to me to be unclear. One type of pragmatic entailment of this sort is scalar entailment stemming from what Levinson (2000) called a Hirschberg-scale – a contextually given *ad hoc* scale. The relation between the ordered elements in such a scale does not need to be that of semantic entailment. The scale can be based on any partially ordered contrast sets in a contextually salient way. Examples include destinations ordered in terms of their distance, autographs ordered in terms of their authors' famousness, and problems ordered in terms of their complexity (see e.g. Huang 2009d for further discussion).

Semantic entailment plays a prominent role in semantics and especially in formal semantics. It is explored to define many of the other fundamental semantic relations. For example, two sentences may be said to have a propositional equivalence, to be paraphrases of each other, or to be synonymous if and only if they have exactly the same set of entailments, as in (5). Next, two sentences may be con-

sidered to be contradictories if each entails the negation of the other so that whenever one is true the other must be false, as in (6). In a similar vein, a single sentence may be said to be a contradiction if it contains contradictory entailments, as in (7). While contradiction is a semantic relation in which one member of the pair must be true and the other false, contrariety is a semantic relation in which only one term may be true, though both terms may be simultaneously false. Consequently, two sentences S_1 and S_2 may be taken to have contrary propositions if and only if S_1 entails the negation of S_2 and the negation of S_2 does not entail S_1. This is exemplified in (8). Furthermore, semantic entailment is also used to define notions like analyticity and ambiguity.

(5) (Propositional equivalence)
   a. The little hut was hidden by the trees.
   b. The little hut was concealed by the trees.
(6) (Contradictory)
   a. No one likes dark tourism.
   b. At least someone likes dark tourism.
(7) (Contradiction)
   ?John isn't married, but his wife is a feminist.
(8) (Contrariety)
   a. This skirt is blue.
   b. This skirt is red.

In formal semantics, semantic entailment is employed to advance a theory of generalised quantifiers. In this theory, which is developed out of the work of Ladusaw (1979), the concept of directional entailingness (also called monotonicity) is invoked. Directional entailingness provides an account of patterns of semantic entailment between sets and subsets. Upward entailing or entailment (also called monotone increasing, usually represented as MON↑) involves entailment from a subset to a set. In other words, the direction of entailment is from more specific to less specific. By contrast, downward entailing or entailment (also called monotone decreasing, normally represented as MON↓) is concerned with entailment from a set to a subset. Another way of saying it is that the direction of downward entailment is from less specific to more specific. Now, contrast (9) and (10).

(9) a. Every woman is cooking.
   b. Every woman is roasting beef.
(10) a. No woman is cooking.
   b. No woman is roasting beef.

In (9), (9a) does not entail (9b), but (9b) does entail (9a). Consequently, the quantifier *every* triggers an upward entailment here.[4] By contrast, in (10) the reverse is true. Therefore, the quantifier *no* involves a downward entailment. The distinction between upward and downward entailment is applied particularly to the study of

negative polarity items (NPIs). It predicts correctly that NPIs like *any* and *ever* can be licensed in the scope of a downward entailment operator but not in that of an upward entailment one (see e.g. Saeed 2009). The contrast is shown in (11).

(11) a. ?Every woman is ever roasting beef.
b. No woman is ever roasting beef.

But there has also been evidence that downward entailment is neither necessary nor sufficient for the licensing of NPIs (e.g. Giannakidou 1998, Horn 2009, see also Atlas 2007).

More recently, Chierchia, Crain and their associates (e.g. Chierchia 2004, Crain and Pietroski 2002) have used the upward/downward entailment distinction to mount a challenge to what Horn (2006) dubbed a 'Golden Age Pure Pragmatics' or GAPP-style analysis of scalar implicatures. According to Chierchia, Crain, and their associates, while a standard upper bounding $Q_{\text{-scalar}}$ implicature, that is, an implicature from ' … *p* …' to ' … at most *p* …', does arise from positive Horn-scales, it is quite weak and even blocked in negative Horn-scales and other downward entailing environments. On the basis of this claim, Chierchia, Crain, and their associates argued that $Q_{\text{-scalar}}$ implicatures must be computed compositionally. Consequently, they fall under compositional semantics, hence part of grammar. But as pointed out by Levinson (2000) and Horn (2006, 2009), the alleged blockage of $Q_{\text{-scalar}}$ implicatures is due to the fact that a Horn-scale is reversed under negation and other downward entailing operators, as in (12a), and consequently, a different $Q_{\text{-scalar}}$ implicature is derived from the inverse scale, as in (12c) (see also Huang 2009b). (I use '+>' to signify 'conversationally implicate'.) If this is the case, then Chierchia and Crain's argument may not be maintained (see also Sauerland 2004, Russell 2006, and Geurts 2009 for various (neo)-Gricean analyses of $Q_{\text{-scalar}}$ implicature in downward entailment contexts).

(12) a. <not some, not many, not most, not all>
b. The earthquake didn't kill many of the villagers.
c. +> The earthquake killed some of the villagers.

There are, however, serious problems at the very heart of the (semantic) entailment based approach to meaning. One such problem, which is well-known, is concerned with the failure of a semantic entailment in a referentially opaque context. Consider first (13).

(13) a. Barack Obama is a popular politician.
b. The first African-American President of the United States of America is a popular politician.

At the time of writing (April, 2009), the proper name *Barack Obama* in (13a) and the definite description *the first African-American President of the United States of America* in (13b) have the same extension, i.e. they refer to the same person. Given

Leibniz's Law, which is a law of intersubstitutability *salva veritate* (Latin for 'with the truth unchanged'), it states that the substitution of expressions with the same extension does not affect the truth-conditions of the sentences. Consequently, if (13a) expresses a true proposition, then so does (13b). In other words, (13a) and (13b) are synonymous because they mutually entail each other. However, in a referentially opaque context, truth cannot be preserved when the co-referential expressions are substituted for each other. This is the case in (14).

(14) a. I want to dine with Barack Obama.
b. I want to dine with the first African-American President of the United States of America.

Here, (14a) and (14b) have different truth conditions. This is because the expression *the first African-American President of the United States of America* is given an intensional reading, that is, the reading that the speaker wants to dine with whoever happens to be the first African-American President of the United States of American and does not care and may not have known who that person is. The same can be said of (15).

(15) a. John believes that Barack Obama is a popular politician.
b. John believes that the first African-American President of the United States of America is a popular politician.

If John does not know or believe that Barack Obama is the first African-American President of the United States of America, then (15b) means that John has a belief about someone who is the first African-American President of the United States of America without knowing or caring about who the actual holder of the office is. Consequently, such a belief of John's is said to be *de dicto* – a belief about 'what is said'. The same is true of Frege's classical example, usually referred to as the Morning Star Paradox (see e.g. Cann 1993 for discussion about further problems of the (semantic) entailment based analysis). Verbs that create a referentially opaque context are commonly referred to as intensional verbs or verbs of propositional attitude. These include *believe*, *know*, *doubt*, *want*, *hope*, *fear*, *look*, *seem*, and *seek*. Other words that establish a referential opaque context include adjectives like *alleged*, prepositions like *about*, connectives like *because*, and modal words of various categories like *must, may*, *probably*, *obviously*, and *permissible*.

2. Presupposition

2.1. Defining presupposition

Presupposition is defined as a proposition or inference whose truth is taken for granted in the utterance of a sentence.[5] Its main function is to act as a precondition

of some sort for the appropriate use of that sentence. This background assumption will remain in force when the sentence that contains it is negated. The German mathematician and logician Gottlob Frege is generally recognised as the first scholar in modern times who (re)introduced the philosophical study of presupposition (see especially Frege 1892), though the notion of presupposition may go back at least as far as the mediaeval philosopher Petrus Hispanus (see e.g. Huang 2007).

Presupposition is usually engendered by the use of particular lexical items and/or linguistic constructions. Lexical items and linguistic constructions that give rise to presuppositions are called presupposition triggers. While presupposition has in general been regarded as 'a heterogeneous collection of quite distinct and different phenomena' (Levinson 1983: 217) since Karttunen (1973), a list of its representative examples may be given in (16) – (23) (see e.g. Levinson 1983, Atlas 2005, Huang 2007). (I use the symbol '>>' to stand for 'presuppose'. The positive and negative versions of the examples are separated by '/', and the lexical presupposition triggers are italicised.)

(16) Definite descriptions
The king of France is/isn't bald.
>> There is a king of France.

(17) Factive predicates
a. Epistemic or cognitive factives.
John *knows*/doesn't *know* that smoking is a dangerous pastime.
>> Smoking is a dangerous pastime.
b. Emotive factives
John *regrets*/doesn't *regret* that he has gone on the stage.
>> John has gone on the stage.

(18) Aspectual/change of state predicates
Mary has/hasn't *stopped* beating her boyfriend.
>> Mary has been beating her boyfriend.

(19) Iteratives
John *returned*/didn't *return* to Berlin.
>> John was in Berlin before.

(20) Implicative predicates
John *managed*/didn't *manag*e to give up binge drinking.
>> John tried to give up binge drinking.

(21) Temporal clauses
After she left school, Jane worked/didn't work as a secretary.
>> Jane left school.

(22) Cleft sentences
a. Cleft
It was/wasn't the porter who called a taxi for John.
>> Someone called a taxi for John.

b. Pseudo-cleft
What the porter called/didn't call was a taxi.
>> The porter called something.

(23) Counterfactual conditionals
If an ant was as big as a human being, it could/couldn't run five times faster than an Olympic sprinter.
>> An ant is not as big as a human being.

2.2. Properties of presupposition

Presuppositions exhibit two main properties: (i) constancy under negation, and (ii) defeasibility. In addition, certain cases of defeasibility give rise to what is known as the projection problem of presupposition.

2.2.1. Constancy under negation

By constancy under negation is meant that a presupposition generated by the use of a lexical item or a syntactic structure remains the same when the sentence containing that lexical item or syntactic structure is negated (e.g. Strawson 1952). Using constancy under negation as diagnostic, presuppositions can be more formally defined in (24).

(24) An utterance of a sentence *S* presupposes a proposition *p* if and only if
a. if *S* is true, then *p* is true;
b. if *S* is false, then *p* is (still) true.

What (24) basically says is this: for *S* to presuppose *p*, whenever *S* is true, *p* is also true, and whenever *S* is false, *p* is still true.

There are, however, problems with constancy under negation. On the one hand, constancy under negation may not be necessary. For example, there is a class of sentences which are hard, if not impossible to negate, yet they bear presuppositions, as in (25). On the other hand, constancy under negation may not be sufficient. This is illustrated by (26). Although (26) satisfies constancy under negation, the inference is standardly analysed as a felicity condition on performing the speech act of requesting (e.g. Levinson 1983). This is because if the window is open, there is no need for one to perform the speech act of requesting someone else, for example, to open it.

(25) Long live the king of France!
>> There is a king of France

(26) Do/don't open the window.
?>> The window is not open

2.2.2. *Defeasibility*

Presuppositions are deafeasible. They are cancelled if they are inconsistent with (i) background assumptions, (ii) conversational implicatures, and (iii) certain discourse contexts. Furthermore, they can also disappear in certain intrasentential contexts, some of which give rise to the projection problem of presupposition. Defeasibility has in general been taken as the second most important property of presupposition.

In the first place, presuppositions can disappear in the face of inconsistency with background assumptions or real-world knowledge. Contrast (27) and (28) (I use '~ >>' to stand for 'does not presuppose'.)

(27) John got an assistant professorship before he finished his Ph.D.
>> John finished his Ph.D.
(28) John died before he finished his Ph.D.
~ >> John finished his Ph.D.

While (27) presupposes that John finished his Ph.D. by virtue of the temporal clause, (28) does not carry that presupposition. This is because the putative presupposition conflicts with our real-world knowledge. Consequently, the unwanted presupposition vanishes.

Secondly, presuppositions can be cancelled by inconsistent conversational implicatures. By way of illustration, consider (29).

(29) If Susan has danced on the table, her mother will be unhappy that she has done so.
+> perhaps Susan has danced on the table, perhaps she hasn't
~ >> Susan has danced on the table

The use of the factive predicate *unhappy* in (29) should give rise to the potential presupposition that Susan has danced on the table. However, there is also a Q-clausal conversational implicature due to the use of the conditional in (29), namely, perhaps Susan has not danced on the table. In the face of the contradictory conversational implicature, the putative presupposition is defeated.

Thirdly, presuppositions are contextually cancellable, that is, they can evaporate if they run contrary to what the immediate discourse context tells us. Witness first (30), where the putative presupposition is defeated by the inconsistent proposition that has already been established in the immediate discourse background.

(30) There is no king of France. Therefore, the king of France isn't bald.
~ >> There is a king of France

In (30), the second sentence should presuppose that there is a king of France. The reason it does not is because such a putative presupposition is inconsistent with the preceding proposition that has already been established in the immediate discourse

background. As a result, the unwanted presupposition fails to survive. Next, presuppositions can be suspended by so-called reduction arguments – arguments that proceed by eliminating each of the possibilities – in a discourse. Finally, presuppositions can disappear in a discourse where evidence for their truth is being weighed and rejected.

In the fourth place, presuppositions can be blocked in certain intrasentential contexts, that is, they can be defeated by using other clauses in the same complex sentence to increment the local, intrasentential context. Three sub-cases are of particular interest. The first is that a presupposition of a sentence can be overtly denied in a co-ordinate clause without any apparent contradiction. This is exemplified in (31).

(31) John doesn't regret snoring atrociously because in fact he never did so!
~ >> John snored atrociously

Notice that in many cases, outright denial of presupposition is not possible with positive sentences.

(32)*John regrets snoring atrociously because in fact he never did so!

There is thus, at least in these cases, an asymmetry between negative and positive sentences with regard to defeasibility. This asymmetry has led to an entailment analysis for positive sentences, namely, the argument that what is allegedly presupposed in these sentences is actually what is entailed (e.g. Atlas 2005). Since semantic entailments cannot be overtly denied without producing semantic anomaly, the anomaly displayed in (32) is entirely expected. A second point to note is that the negation involved in overt denial of presupposition in (31) is generally taken as a metalinguistic negation (see e.g. Horn 2006). Next, a presupposition of a sentence can be explicitly suspended in an *if* clause that follows. Witness (33).

(33) Mary doesn't regret being a pet sitter, if she actually ever was one.
~ >> Mary was a pet sitter

Finally, presuppositions can disappear with certain verbs of saying such as *say*, *mention, tell*, *ask* and *announce,* and certain verbs of propositional attitude such as *believe*, *think*, *imagine*, *dream* and *want* (see e.g. Huang 2007: 72–73).

2.2.3. Theoretical issues and analyses

In general, there are three main theoretical issues in accounting for presupposition. The first and oldest one is concerned with presupposition failure. If a statement presupposes something which does not exist, what are the consequences for that statement? As already mentioned, a much quoted example of statements of this kind is the positive version of (16). Given that there is no king of France, the question boils down to this: what is the truth status of the sentence? Russell's (1905)

view was that since the sentence asserts both that there is a king of France and that he is bald, if the king of France does not exist, the sentence is false. This analysis was widely accepted and remained practically unchallenged for almost half a century. Then in 1950, Strawson published a seminal paper (Strawson 1950) in which he presented an alternative account. According to this analysis, Russell failed to distinguish sentences from the use of sentences. In using the sentence, a speaker does not assert but merely presupposes that there is a king of France. If there is no king of France, then there is a presupposition failure. Consequently, the sentence is neither true nor false: there is simply a truth-value gap. Strawson's account has led to the notion of semantic presupposition.

Secondly, there is the question of the origin of presupposition, namely, where presuppositions come from. The standard, though imperfect answer to this question is that presuppositions are engendered by certain lexical and structural triggers. Thirdly and finally, the most important issue is concerned with the projection problem of presupposition – a special case of the Fregean compositionality, namely, to state and explain the presuppositions of complex sentences (as 'wholes') in terms of the presuppositions of their component simple sentences (as 'parts'). The projection problem manifests itself in two opposite directions. On the one hand, the presuppositions of a component sentence may fail to be projected onto, and hence inherited by, the whole complex sentence. This is the case for e.g. (31) and (33). In addition, certain complex or compound sentences formed with *if … then* and *either … or* also belong to this category. On the other hand, the presuppositions of a component sentence may be preserved when that constituent sentence becomes part of a more complex sentence. This is what happens when the sentence containing a presupposition trigger is under negation, as in (16), when it is embedded in modal operators such as *it's possible that, it's likely that, ought to, may be* and *should*, and when it is embedded in the conditional and the disjunction formed with *if … then* and *either … or.*

Three formal semantic-pragmatic models are particularly influential in tackling the projection problem. The first is what I called the filtering-satisfaction (or Karttunen-Stalnaker) analysis in Huang (2007). The central idea of this approach is that a presupposition is not cancellable. Rather it has to be satisfied (i.e. entailed) in its local context, which is conceived mainly as a set of propositions. The local context is constructed in a dynamic way and developing online. This makes it possible for an unwanted presupposition to be filtered out during the derivation of a sentence in a bottom-up manner (see e.g. Karttunen 1973, Stalnaker 1974). Stalnaker's work has resulted in the development of the concept of pragmatic presupposition. Next, in contrast to the filtering-satisfaction analysis, underlying Gazdar's (1979) cancellation analysis is the crucial assumption that a presupposition is cancellable. On this theory, what a presupposition trigger engenders is merely a potential presupposition. A potential presupposition will become an actual one, unless it is defeated. With respect to the projection problem, what the cancellation analysis pre-

dicts is that each and every presupposition of the embedded clause will become an actual presupposition of the complex sentence, unless it is nullified by certain linguistic and non-linguistic factors. Finally, in an attempt to combine the strengths of both the filtering-satisfaction and cancellation theories, Heim (1983) developed a particular version of the filtering-satisfaction model, couched in her dynamic semantic theory of context change. In Huang (2007), I dubbed this model the accommodation analysis. Central to this approach is Heim's belief that the meaning of an expression, including the presupposition of a sentence, is its context change potential. The context change potential of a sentence is the intersection of any context set in a common ground together with the proposition expressed by the sentence. By common ground is meant 'a background of beliefs or assumptions which are shared by the speaker and his audience and which are recognised by them to be so shared' (Stalnaker 1974). Accommodation, then, provides a mechanism to increment the discourse context set with new, non-controversial assumptions.

Of these analyses, Karttunen's and Gazdar's are representatives of the two-component model view of presupposition, according to which, sentences including those containing presuppositions have two types of content: semantic content and presuppositional content. The latter is pragmatic in character. By contrast, Stalnaker and Heim take the one-component model view, operating within the general framework of a theory of pragmatic presupposition. On this account, presuppositions are treated as conditions on whether a sentence can be admitted into a context (see e.g. Portner 2005).

3. Implicature

The concept of implicature (both conversational and conventional) has its origin in the work of H. P. Grice, though some proto-Gricean ideas can be traced back at least to the first century B.C. rhetorician Dionysius and the fourth century rhetoricians Servius and Donatus (e.g. de Jonge 2001). The ideas were later reiterated by the nineteenth century English philosophers John Stuart Mill and Augustus De Morgan (e.g. Horn 2006).

3.1. Conversational implicature

A conversational implicature is any meaning implied or expressed by, and inferred or understood from, the utterance of a sentence which is meant without being part of what is strictly said[6] (e.g. Huang 2009a, b, f). It is derived via Grice's (1975, 1989) cooperative principle and its attendant maxims of conversation. For example, when one utters the sentence in (34a), he or she (*ceteris paribus*) conversationally implicates (34b).

(34) a. Some of the tourists are admiring the view.
b. +> Not many/most/all of the tourists are admiring the view

Conversational implicatures are characterised by a number of distinctive properties (Grice 1975, 1989, Levinson 2000, Huang 2007: 32–35, 2009a, b). In the first place, there is the property of defeasibility – conversational implicatures can simply vanish in certain linguistic or non-linguistic contexts. How? They are cancelled if they are inconsistent with (i) semantic entailments, (ii) background or ontological assumptions, (iii) contexts, or (iv) priority conversational implicatures. As an illustrating example, consider (35) and (36). (The symbol '~ +>' is used to stand for 'do not conversationally implicate'.)

(35) John and Mary bought a villa in Auckland.
+> John and Mary bought a villa in Auckland together
(36) The Americans and the Russians tested an atom bomb in 1962.
~ +> The Americans and the Russians tested an atom bomb in 1962 together

The utterance in (36) has the potential mirror maxim, 'togetherness' conversational implicature, as indicated in (35). However, this potential conversational implicature runs contrary to our background or ontological assumptions. Given our knowledge about history, it was impossible for the USA and the USSR to test an atom bomb together in 1962. Consequently, the potential 'togetherness' conversational implicature is defeated by inconsistent real-world knowledge. Notice that defeasibility is a necessary but not a sufficient condition for conversational implicature (Horn 2007).

A second property exhibited by conversational implicatures is non-detachability – any linguistic expression with the same semantic content tends to carry the same conversational implicature. (A principled exception is those conversational implicatures that arise via the maxim of Manner.) This is because conversational implicatures are attached to the semantic content, rather than the linguistic form, of what is said. Therefore, they cannot be detached from an utterance simply by replacing the relevant linguistic expressions with their synonyms. This is illustrated in (37), which indicates that the use of any linguistic expression that is synonymous with *almost* will give rise to the same conversational implicature.

(37) Gordon almost/nearly lost /came close to losing his job.
+> Gordon did not (quite) lose his job

Thirdly, we have the property of calculability – conversational implicatures can transparently be derived via the cooperative principle and its component maxims. A fourth property is non-conventionality – conversational implicatures, though dependent on the saying of what is coded, are non-coded in nature. In other words, they rely on the saying of what is said but they are not part of what is said. A fifth

property is reinforceability – conversational implicatures can be made explicit without producing too much of a sense of redundancy. This is because conversational implicatures are not part of the conventional import of an utterance. For instance, the conversational implicature in (34) is made explicit in (38). But (38) is not judged to be semantically redundant.

(38) Some, but not many/most/all, of the tourists are admiring the view.

The sixth property of conversational implicatures is universality – conversational implicatures tend to be universal, because they are motivated rather than arbitrary. For example, if a language has 'all' and 'some', the use of the semantically weaker 'some' will universally carry the conversational implicature 'not all'. In Huang (2007: 35), data are drawn from Modern Standard Arabic, Catalan, Chinese, Modern Greek, Kashmiri and Malagasy to illustrate this point. Finally, there is the property of indeterminacy – some conversational implicatures may be indeterminate. They can be taken as conveying an open-ended range of implicaures relating to matters in hand. Suppose one says (39). He or she may generate a range of indeterminate conversational implicatures.

(39) Our new professor is a machine.
+> Our new professor is cold, or/and
+> Our new professor is efficient, or/and
+> Our new professor is a workaholic, or/and
+> …

A conversational implicature can be engendered in two distinct ways. On the one hand, it can arise from strictly observing the maxims of conversation. In Huang (2007: 27), I called conversational implicatures thus induced conversational implicatures$_{O}$. This is the case for e.g. (34), (35) and (37) above. On the other hand, a conversational implicature can be generated by way of a speaker's ostentatiously flouting the maxims. In Huang (2007: 29), I dubbed conversational implicatures thus engendered conversational implicatures$_{F}$. This is the case with the generation of the conversational implicature in (39), which deliberately exploits Grice's maxim of Quality. There is thus the first Gricean dichotomy between conversational implicature$_{O}$ and conversational implicature$_{F}$. Grice's achievement here was to have provided a unified analysis of both types.

A second Gricean dichotomy, independent of the first, is between those conversational implicatures which arise without requiring any particular contextual conditions and those which do require such conditions. Grice called the first kind generalised conversational implicatures (GCIs) and the second kind particularised conversational implicatures (PCIs). By way of illustration, consider the two conversational implicatures in Mary's utterance in (40).

(40) John: How did yesterday's guest lecture go?
Mary: Some of the faculty left before it ended.
+> (a) Not many/most/all of the faculty left before the lecture ended
+> (b) The lecture didn't go well

The conversational implicature in (40a) has a very general currency. Any utterance of the form 'Some x are Y' will have the default interpretation 'Not many/most/all x are Y'. This interpretation will go through without needing any particular context, hence (40a) is a GCI. By contrast, the conversational implicature in (40b) depends crucially on context of some kind. Mary's reply points to a possible connection, namely, if some of the faculty left a lecture before it ended, the lecture may not have gone well. Without such a specific connection, we will not have the relevant conversational implicature, thus (40b) is a PCI. The theoretical importance of this Gricean dichotomy has recently been subject to heated debates. Hirschberg (1991), Welker (1994) and Carston (2002), for example, doubted whether such a distinction can be maintained. On the other hand, Levinson (2000) put forward a rigorous defence of it.

Since its inception, Grice's classical theory of conversational implicature has revolutionised pragmatic theorising, nourishing numerous neo- and post-Gricean variants and reformulations. Horn developed a bipartite model calling it Manichaean pragmatics. In this account, there are two genera of conversational implicatures: namely Q[uantity]- and R[elation]-implicatures (see e.g. Horn 2009). Arguing for a clear separation between pragmatic principles governing an utterance's surface form and pragmatic principles governing its informational content, Levinson (2000) proposed that the original Gricean program (the maxim of Quality apart) be reduced to a tripartite model with three genera of conversational implicatures: what he dubbed the Q-, I[nformativeness]- and M[anner] implicatures. Q-implicatures can then be divided into three species: what I termed (i) $Q_{\text{-scalar}}$, (ii) $Q_{\text{-clausal}}$ and (iii) $Q_{\text{-alternate}}$ implicatures in Huang (2007: 42–44). Furthermore, within $Q_{\text{-alternate}}$ implicatures, we have two subtypes: $Q_{\text{-ordered alternate}}$ and $Q_{\text{-unordered alternate}}$ implicatures such as <*bake, boil, grill, steam, stir-fry*>. Notice that $Q_{\text{-ordered alternate}}$ implicatures can arise either from a non-entailment scale which is given by the lexicon without requiring any specific context (e.g. <*succeed, try*>) or from what Levinson (2000) called a Hirschberg-scale or what Horn (2007, 2009) dubbed a rank order, following in part work by Lehrer (1974). As already mentioned above, a Hirschberg-scale is essentially a nonce scale, that is, a contextually given *ad hoc* scale. Such a scale can be based on any partially ordered contrast sets in a contextually salient way. Examples include <*divorce, separate*>, <*Barack Obama's autograph, Hillary Clinton's autograph*>, and <*full professor, associate professor, assistant professor*> (see e.g. Huang 2009d for further discussion). On the other hand, in relevance theory (Sperber and Wilson 1995), the majority of classical and neo-Gricean GCIs is refashioned as an explicature – a proposition that is an infer-

ential development of one of the linguistically given incomplete conceptual representations or logical forms of the sentence uttered (but see e.g. Burton-Roberts 2007 for the comment that 'development' in the definition is not defined in relevance theory). Explicature corresponds roughly to the intuitive notion of what is said, though the Gricean notion of what is said is abandoned in relevance theory. Conversational implicatures in the relevance-theoretic sense, called r-implicatures in Huang (2007: 195), are largely PCIs in the classical and neo-Gricean sense. In a similar vein, Recanati (2004), a radical contextualist in the current divide between contextualism and (semantic) minimalism in the philosophy of language, reduced some cases of conversational implicature to what he called the 'pragmatically enriched said'. Also, Bach (2004) argued that certain aspects of speaker meaning are neither part of what is said nor of what is conversationally implicated. Consequently, he proposed a third category of communicative content, intermediate between what is said and what is conversationally implicated, and dubbed the vehicle of such a content 'conversational impliciture', because it is what is implicit in what is said. In other words, on Bach's view, some cases of conversational implicature in the classical and neo-Gricean sense are in fact (conversational) implicitures (see also Bach 2006, Huang 2009e and Garret and Harnish 2007).

At this point, it is useful to discuss some of the current debates on conversational implicature. In the first place, the treatment of cardinals as scalar expressions engendering Q-scalar implicatures is highly controversial (see e.g. Carston 2002, Bultinick 2005, Hurewitz et al. 2006, Horn 2009 for arguments against, and Levinson 2000 for arguments for the scalar analysis). Secondly, there is the issue of the epistemic strength of Q-scalar implicatures. It is concerned with the question of what it is a speaker Q-scalar implicates against. Two neo-Gricean pragmatic positions can be identified here: the weak epistemic one represented by e.g. Hirschberg (1991), Sauerland (2004), Geurts (2009), and Horn (2009), and the strong epistemic one advocated by e.g. Gazdar (1979) and Levinson (2000: 77–79). In the third place, a heated debate has been going on for the last two decades or so, focusing on the nature of Gricean and neo-Gricean GCIs in general and Q-scalar implicatures in particular. One view is that GCIs in general and Q-scalar implicatures in particular convey default meanings, *sans* a conscious inferential process and irrespective of a particular context (e.g. see Levinson 2000 for strong defaultism and Horn 2009 for weak defaultism). Another, relevance-theoretic position is that they are essentially inferred contextually (e.g. Sperber and Wilson 1995). In addition, a more recent, third view holds that the derivation of Q-scalar implicatures relies heavily on structural factors (cf. Section 2 above and Chierchia 2004). Furthermore, all the three views have recently been subject to studies in experimental pragmatics. While much of the relevance-theoretically oriented experimental work favours the contextual inference approach (e.g. Noveck and Sperber 2007, Noveck and Reboul 2008), there is also evidence in support of the default inference theory (e.g. Grodner et al. 2007) and the structural inference view (e.g. Panizza and Chier-

chia 2008). Next, in recent years, there has also been an intense debate on (i) whether or not pragmatically enriched or inferred content can enter or 'intrude' upon the conventional, truth-conditional content of what is said, and (ii) if the answer to (i) is positive, then what the pragmatic intrusion under consideration is. Concerning the first question, a dividing line can generally be drawn between pragmaticists like Levinson (2000), Recanati (2004) and relevance theorists (Sperber and Wilson 1995, Carston 2002), who argue for pragmatic intrusion (but see e.g. Horn 2009 for reservations), and semanticists like Cappelen and Lepore (2005) and King and Stanley (2005), who argue against it. Next, regarding the second question, two current positions can roughly be identified. The first is that pragmatic intrusion is of a special kind, which differs from conversational implicature. Within this camp, three lines of argument are of particular interest. According to Sperber and Wilson (1995), the pragmatic content is an explicature. Secondly, there is the position taken by Recanati (2004) that it is a pragmatically enriched part of what is said. A third argument is due to Bach (2004), who took the view that the pragmatic inference under consideration is his impliciture. On the other hand, the second position is represented by Levinson (2000). Within the neo-Gricean framework, Levinson argued that these so-called explicatures/pragmatically enriched said/implicitures are in fact the same beast as conversational implicatures. See also my neo-Gricean and revised neo-Gricean analyses of anaphora in e.g. Huang (1991, 2000a, b, 2004, 2007 and 2009b), which in effect argue that the presemantic, pragmatic inference involved in the interpretation of anaphora is a conversational implicature.

Finally, it is worth mentioning that there have been various attempts to integrate the classical and neo-Gricean pragmatic theories of conversational implicature with other current linguistic theories. These linguistic theories include decision theory (Merin 1999), bidirectional optimality theory (Blutner 2004) and game theory (Benz et al. 2006).

3.2. Conventional implicature

We turn next to the second category of implicature postulated by Grice, namely, conventional implicature. (In fact, Frege's 1892, 1918–1919 analysis of the *Andeutung* relation is a direct precursor of Grice's concept of conventional implicature. See e.g. Bach 1999, Feng 2006, Horn 2007). An *Andeutung* or conventional implicature is a non-truth-conditional meaning which is not derivable from general considerations of cooperation and rationality, but arises solely from the conventional features attached to particular lexical items and/or linguistic constructions involved. A few standard examples are given in (41)-(43). (I use '+>>' to stand for 'conventionally implicate'.)

(41) *p* therefore *q* +>> *q* follows from *p*
Lihua is a Chinese; she, therefore, knows how to use chopsticks.
(42) *p* but *q* +>> *p* contrasts with *q*
John is poor but he is honest.
(43) Even *p* +>> contrary to expectation
Even a child can scoff all the small bananas.

In (41), the conventional implicature triggered by the use of *therefore* is that being a Chinese provides some good reason for knowing how to use chopsticks. In (42), there is a conventional implicature of contrast between the proposition contained in *p* and that contained in *q*. Finally in (43), *even*, being epistemic in nature, conventionally implicates some sort of unexpectedness, surprise or unlikeliness (Farncescotti 1995). Other representative lexical items that are considered to engender conventional implicatures in English include *actually*, *also*, *anyway*, *barely*, *besides*, *however*, *manage to*, *moreover*, *on the other hand*, *only*, *still*, *so*, *though*, *too* and *yet*.

What, then, are the essential properties of conventional implicature? From a traditional point of view, conventional implicatures are considered to have the following properties (Grice 1989, Levinson 1983, Huang 2007, 2009c). Firstly, conventional implicatures are not derived from Grice's cooperative principle and its component maxims, but are attached by convention to particular lexical items and/or linguistic constructions. They are therefore an arbitrary part of meaning, and must be learned *ad hoc*. Secondly, conventional implicatures are not calculable via any natural procedure, but are rather given by convention, thus they must be stipulated. Thirdly, conventional implicatures are not defeasible, that is, they cannot be cancelled. Fourthly, conventional implicatures are detachable, because they depend on the particular lexical expressions and/or linguistic constructions used. Finally, conventional implicatures do not tend to be universal.

It should be pointed out that unlike the concept of conversational implicature, the notion of conventional implicature is not taken to be very coherent. Even Grice himself (1989: 46) warned that 'the nature of conventional implicature needs to be examined before any free use of it, for explanatory purposes, can be indulged in'. Horn (2004: 6) has gone a step further by claiming that 'the role played by conventional implicature within the general theory of meaning is increasingly shaky'. Since its inception, conventional implicature has been subject to numerous attempts to reduce it to semantic entailment, conversational implicature, and presupposition (Levinson 1983), and more recently, to part of what is said (Bach 1999), part of tacit performatives (Rieber 1997), vehicles for performing second-order speech acts (Bach 1999), and procedural meaning in relevance theory (Blakemore 2004).

But recently, Potts (2005) has made a brave attempt to resurrect the concept of conventional implicature. He 'retain[ed] Grice's brand name but alter[ed] the product' (Horn 2007) by focusing on expressives like epithets, attributive adjectives

and honorifics and supplements like non-restrictive relatives, parentheticals and appositives rather than lexical items such as *but*, *therefore* and *even*. He isolated four essential properties of conventional implicature. The first of these properties is conventionality – conventional implicatures are part of the conventional meaning of the expressions involved. The second property is commitment – conventional implicatures are commitments, and thus engenders entailments. The third property is speaker orientation – the commitments are made by the speaker of an utterance. The final property is independence – conventional implicatures are logically and compositionally independent of what is said (see also von Heusinger and Turner 2006). Taking the view that conventional implicature is semantic in nature, Potts developed a logic of the notion by modelling it with a type-driven multi-dimensional semantic translation language (see Feng 2006, Horn 2007 for criticisms of this analysis). Feng (2006) presented another development of Grice's notion of conventional implicature. The properties extracted by him for conventional implicature are (i) non-truth-conditionality, (ii) speaker orientation, (iii) infallibility, (iv) occurrency, (v) dependency, and (vi) context-sensitivity. He further argued that properties (i) – (iv) are intimately associated with subjectivity. Finally, contrary to Potts's view, Feng maintained that conventional implicature has both a semantic and pragmatic character. This is why a conventional implicature is so named by Grice. '[I]t is so named because it involves both linguistic and contextual information. It is conventional because it is associated with the conventional linguistic meaning of a certain expression … It is implicated rather than said because its full content requires contextual information, and does not affect the truth conditions of the utterance' (Feng 2006: 184). This view is also echoed in Horn (2007: 50), who said that '[conventional implicature] is semantic insofar as it involves an aspect of the conventional meaning of a given expression rather than being computable from general principles of rational behavior or communicative competence, but it is pragmatic insofar as it involves considerations of appropriateness rather than truth of the sentence in which it appears.' Whether belonging to semantics or balancing on the edge between semantics and pragmatics, Potts's, Feng's and Horn's recent works have shown that the Fregeo-Gricean concept of conventional implicature is, after all, not that incoherent.

4. A brief comparison

In this final section, I shall make a brief comparison among semantic entailment, presupposition, conversational implicature and conventional implicature. I shall compare them in terms of four parameters: (i) defeasiblility, (ii) negation, (iii) conventionality, and (iv) semantics versus pragmatics.

First, defeasibility. While semantic entailment and conventional implicature are not defeasible, most cases of presupposition and all cases of conversational im-

plicature are defeasible. In the study of inference, a hierarchy is set up to rank various types of inference as defeasible, nonmonotonic, default, probabilistic, and plausibilistic, with defeasible inference at the top. An inference is defeasible when it has the possibility of error. Looked at in this way, nonmontonic inference is a major type of defeasible inference. It is currently reasonable but its reasonability can be cancelled upon the admittance of new information into common ground. Default inference is then a particular kind of nonmonotonic inference. It is characterised by what computer scientists and artificial intelligence (AI) workers call 'negation as failure'. An example might be that from the 'failure' of the airport departures board to list a late-night flight to London Heathrow, one may infer that such a flight has been cancelled. In this sense, both presupposition and conversational implicature are a case of presumptive reasoning like default inference. Probabilistic inference is stronger than plausibilistic inference (see e.g. Woods 2009). Next, we turn to negation. While presupposition can survive negation, entailment cannot. As for conversational and conventional implicatures, their behaviour under negation is rather complex and needs to be further studied. Finally, let us consider the question of conventionality and the related question of where in the linguistic terrain the four types of inference are situated. Clearly, semantic entailment is the most conventional and falls in the province of semantics. Presupposition is less conventional than conventional implicature but more conventional than conversational implicature. Therefore, it straddles the boundary between semantics and pragmatics, but more on the side of pragmatics. Of the three types of implicature, although GCIs are more conventional than PCIs, both types are the pursuit of pragmatics. Finally, conventional implicature, which is more conventional than both GCIs and PCIs, can be considered either as semantic or pragmatic, depending on how the boundary between semantics and pragmatics is placed. If semantics is taken to be concerned with those aspects of meaning that affect truth conditions, then the investigation of conventional implicature falls on the pragmatic side of the divide rather than on the semantic side, since, as noted above, it does not make any contribution to truth conditions. On the other hand, if pragmatics is conceived of as dealing with those inferences that are non-conventional, hence cancellable, then conventional implicature falls within the province of semantics but outside that of pragmatics, since it cannot be defeated.

Notes

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2. On Saeed's (2009) view, entailment is not an inference. However, Cummings (2005: 83–84) argued convincingly that such a view is too narrow.
3. The phrase '*p* entails *q*' appeared first in Moore (1922). The term 'entailment', according to the second edition of the *Oxford English Dictionary*, was first used by L. S. Stebbing in 1933, who wrote: 'Professor Moore's analysis of the distinction between material implication and entailment makes it possible'.
4. Notice that whereas *every* is upward entailing with respect to its right, VP argument, as in (9), it is downward entailing in its left, NP argument (e.g. Saeed 2009). For example, *Every woman is cooking* unilaterally entails *Every old woman is cooking*. In terms of monotone increasing/decreasing, the former is called right monotone increasing, and the latter is labelled left monotone decreasing.
5 The term 'presupposition' seems to be introduced into English by Strawson (1952).
6. Note that Saul (2002) was of the view that Grice's main goal is to develop a theory of speaker-meaning. Following Saul and biting the bullet, Horn (2009) now holds that conversational implicature is a component of speaker-meaning rather than a pragmatic inference. By contrast, Levinson (2000), Atlas (2005) and many others are still treating conversational implicature as a pragmatic inference. My definition is applicable to both sides.

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