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# Experimental pragmatics

## Testing for implicatures

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Grice proposed to investigate ‘the total signification of the utterance’. One persistent criticism of Grice’s taxonomy of signification is that he missed an important category of information. This content, and/or the process of providing it, goes by a variety of labels: ‘generalized implicature’, ‘explicature’, ‘unarticulated constituents’, ‘default heuristics’, ‘implicature’. In this study we first take a sample of such phenomena and, from the point of view of pure pragmatics, survey the central descriptions of the content expressed and the mechanisms that might deliver these contents. We then, from the point of view of experimental pragmatics, focus on two accounts: Levinson’s I-heuristic, and Bach’s standardization. We find experimental evidence for the existence of such implicatures, and for the use of language specific standardizations over language neutral background information.

### o. Introduction

Recent pragmatics has uncovered a category of content that is putatively non-Gricean, i.e., is not a part of the meaning of the sentence, is not a part of what Grice would have called ‘what is said’, and is not a part of what is traditionally considered a (particularized) conversational implicature.<sup>1</sup> This content, or the process of providing it, goes by a variety of labels: ‘default heuristic’, ‘unarticulated constituent’, ‘explicature’, and ‘implicature’. This variety suggests a family of conceptually distinct but overlapping phenomena, though the relationships among these categories has not been sorted out. Numerous controversies rage over this information: Is it semantic or pragmatic? Is it really not a part of what is said, nor a part of what is implicated? Is it linguistically represented or not? Is it subject to compositional mechanisms? Is the information recovered during or after sentence comprehension? And what are the mechanisms that provide this information?

In the face of the intractability of some of these questions by the methodology of (pure) pragmatics, i.e., intuition and argument, some have suggested that it is

time to turn to the experimental methodology of psycholinguistics for guidance.<sup>2</sup> In what follows we take a sample of such phenomena and ask about the purported mechanisms that might deliver the requisite contents, first from the point of view of (pure) pragmatics, then from the point of view of psycholinguistics. We survey previous relevant work, propose an experimental study for getting at this information, and report on some preliminary results.

### 1. Implicature: Some pragmatic background

We will use the term ‘implicature’ broadly to cover the communication of information not explicitly contained in the words uttered, but not worked out by typical Gricean mechanisms of particularized conversational implicature, i.e., something between linguistic meaning and speaker meaning conveyed by ‘flouting’ a maxim. We will represent this information in brackets.<sup>3</sup> This area covers a diverse group of research projects and attendant terminologies, data and theories, where almost nothing is uncontroversial. Here is a brief survey to locate ourselves.<sup>4</sup>

Grice (1975/1989) introduced ‘generalized conversational implicature’ (GCIs) to mark off a class of implicatures with the distinctive feature that uttering the expression involved would ‘normally’ carry the implicature, unlike ‘particularized’ conversational implicatures which typically require special circumstances to be properly understood. Grice’s (limited) examples include *He’s meeting a woman* [not his wife, mother, sister or close Platonic friend]. Perry (1986) introduced the term ‘unarticulated constituents’ (UCs) for elements of thoughts expressed in an utterance not linked to items in the sentence uttered (and hence ‘unarticulated’).<sup>5</sup> Flagship examples are weather sentences: *It is raining [here]*. He did not propose any specific mechanisms for recovering this constituent in communication. The idea that there are such constituents, or that typical examples of them really are such, has recently been challenged by Stanley and Szabo (2000) and Stanley (2000), but defended by Bach (2000) and differently by Recanati (2002). Sperber and Wilson (1986) introduced the term ‘explicature’ for similar phenomena (see also Carston, 1988, 2002) and propose that they be explained with mechanisms of ‘enrichment’ (spelled out in terms of relevance theory). Flagship examples are mealtime sentences: *I have eaten breakfast [today]*. Recanati (1989, 1993, 2004) agrees with most of this data, but introduced some of his own terminology. He distinguished between what he calls (i) ‘primary’ pragmatic processes, devoted either to building a proposition from a nonproposition using procedures of ‘saturation’ and ‘metonymical transfer’, or building a second, intended, proposition from a first, using procedures of ‘strengthening’ and ‘expansion’, and (ii) ‘secondary’ pragmatic processes, mostly devoted to traditional conversational implicature.

Bach (1994) also agrees with much of the above data and introduced some of his own.<sup>6</sup> He distinguished between ‘completion’ implicatures (similar to saturation), and ‘expansion’ implicatures. Unlike Sperber and Wilson, Carston and Recanati, Bach follows Grice in holding to a narrow, strict construal of what is said, one in which the words, their order and grammatical construction must be respected. (we return to Bach). Levinson (1995, 2000), adapting Grice’s category of (GCI)s, proposed that communication is governed by a small number of shared ‘default heuristics’ (DHs) that allow a speaker to compress, and the hearer to correspondingly expand, a message in the face of information flow restrictions, ‘a significant bottleneck’ in the human vocal-auditory channel. Flagship examples here are so called ‘scalar implicatures’ such as *Some [but not all] of the guests have left the party*<sup>7</sup> (we return to Levinson).

Many of the above options can be represented as competing paths through information and mechanisms getting the hearer from a sentence with its linguistically encoded meaning (whatever exactly that turns out to be), through what is said, the implicature (explicature) to what is conversationally implicated. See Figure 1.<sup>8</sup>

It is still an open question in pragmatics how the proprietary data from each of these projects is related to the others, and it is an open question what the relationship is between the mechanisms each proposes to deal with the data. What is the relationship between these (kinds of) examples? *First*, one might view these as mostly competing theories of one and the same phenomena, with allowances made for the generally recognized distinction between completion (saturation) and expansion (strengthening) phenomena and the difficulty in finding a unique general characterization of it. *Second*, one might view these as different theories of (mostly) different phenomena. This seems to be the view implicit in the field, but it must be taken with the proviso that the phenomena can overlap, in particular, that completion implicatures might be cases of unarticulated constituents. On this view, information (directly) communicated, but not said<sub>G</sub><sup>9</sup> can have different characteristics, and be explained by different mechanisms: (i) what is implicated by GCIs: explained by GCI; (ii) what is implicated by DHs: explained by DHs; (iii) what is communicated by expansion implicature<sub>E</sub>: explained in part by standardization; (iv) what is communicated by completion implicature<sub>C</sub> or is an UAC: explained by some so far unspecified form of contextual supplementation. *Third*, one might view these as different labels for different aspects of the same phenomena. I.e., suppose ‘implicature’ (explicature), and ‘UAC’ label the *character* of certain information that is ‘conveyed’ but not said<sub>G</sub>, and ‘GCI’, ‘standardization’ (for ‘expansion’ cases of implicature at least), and ‘DH’ label the *mechanisms* that contribute the information so characterized.

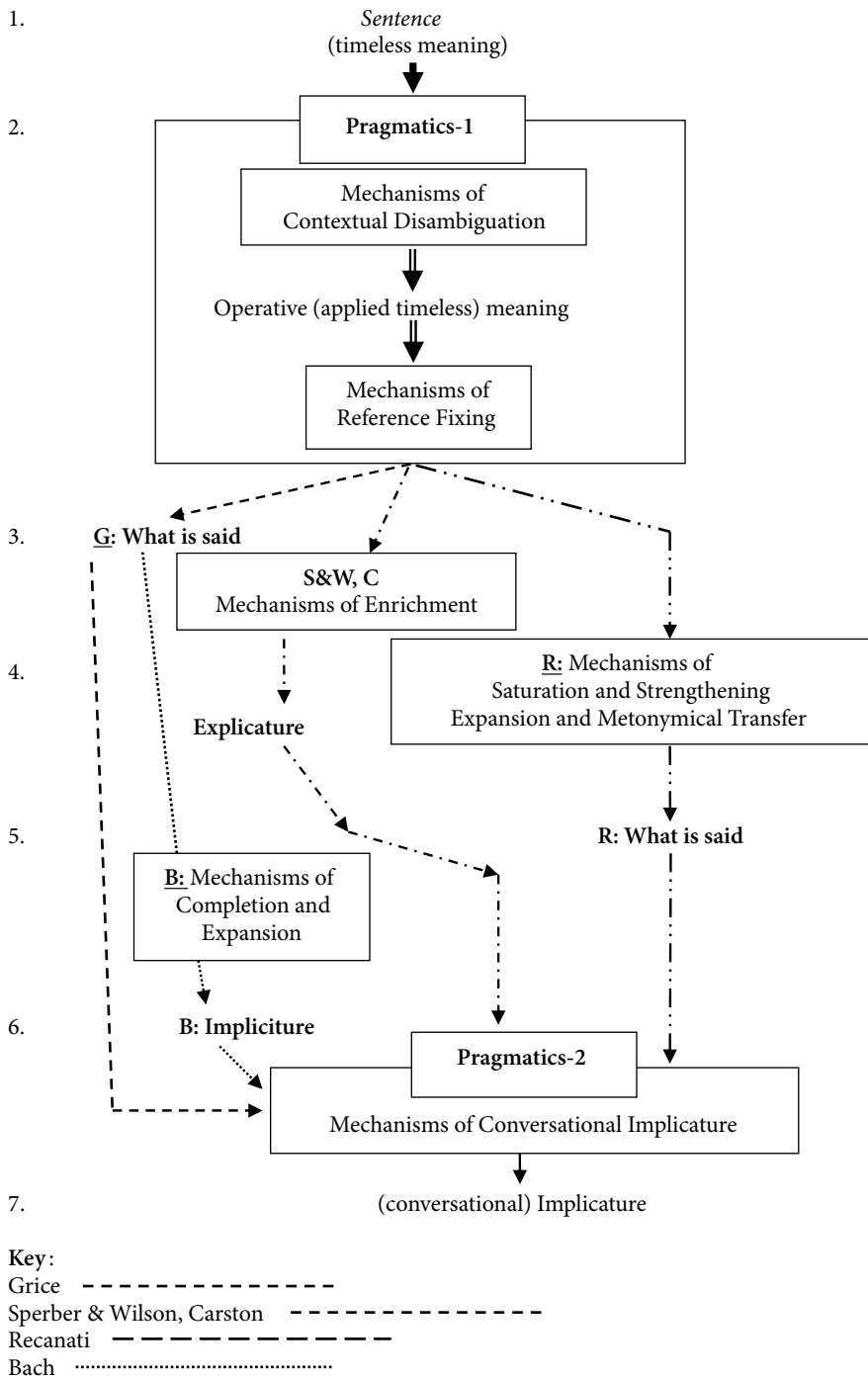


Figure 1. Pragmatic options: From linguistic meaning to conversational implicature.

## 2. Implicature: An issue

Our interest here is more narrowly focused on just two proposed mechanisms: Bach's application of 'standardization' to implicatures and Levinson's Q2 (1996)/I (2000) heuristic.<sup>10</sup> Bach introduced 'implicature' to cover phenomena of not being explicit in what one says:<sup>11</sup>

The speaker says something, but means some qualified version of that ... the speaker failed to make explicit part of what he meant ... In each of the ... examples the speaker could have made fully explicit what he was trying to convey by including the italicized material (or its equivalent — the exact words don't matter) in his utterance (Bach 2001: 252).

'Standardization' was first proposed in Bach and Harnish (1979: Chapter 9) as a relation that certain sentence forms have to indirect illocutionary acts when those sentence forms gain, by precedence, instruction, etc., a use that, though not a part of the sentence's literal and direct illocutionary potential, nevertheless does not have to be figured out from scratch each time the way non-standardized forms typically are.<sup>12</sup> Parade examples of standardized indirection are *Can, could, would you VP?* as contrasted with the semantically similar form *Do you have the ability to VP?*<sup>13</sup> Standardization plausibly extends to nonliterality in the sense that some nonliteral uses of language also do not have to be figured out from scratch each time. They recur often, are used for instruction, etc. Think of proverbs, familiar (as opposed to novel) metaphors and other figures of speech. To these cases of nonliterality, which Bach calls cases of 'constituent' nonliterality, he adds cases of 'sentence' nonliterality, where "the whole sentence is used nonliterally, without any of its constituent expressions being so used" (Bach 2001: 249).<sup>14</sup> It is this notion he would like to use to explain some implicature phenomena.

Levinson's I-heuristic ("What is expressed simply is stereotypically exemplified"; Levinson 2000: 37) says, basically, that if a remark is unqualified and the vocabulary undistinctive, then the situation reported will have the stereotypical features of such situations, even where not explicitly linguistically encoded.<sup>15</sup> This contrasts with two other heuristics we will not be concerned with, the Q-heuristic<sup>16</sup> ("What isn't said, isn't"; Levinson 2000: 35), and the M-heuristic<sup>17</sup> ("What is said in an abnormal way isn't normal"; Levinson 2000: 38). Regarding the contrast between the I-heuristic and the Q/M-heuristics, Levinson says "... the Q- and M- inferences [are] based primarily on linguistic alternates, and the I-inferences [are] based primarily on stereotypical presumptions about the world ..." (Levinson 2000: 40).<sup>18</sup>

There is a relevant issue surrounding I-heuristics: what is the relation between 'specific' or 'stereotypical' information and general knowledge? Regarding the

I(Q2) heuristic, Levinson says: “such a heuristic is extremely powerful — it allows an interpretation to bring all sorts of background knowledge about a domain to bear on a rich interpretation of a minimal description” (Levinson 2002: 33).

But if such a line cannot be drawn then the I-heuristic is tantamount to interpreting an utterance against general beliefs (‘knowledge’), and that would pose a number of problems regarding both the relation of general knowledge to linguistic knowledge and context, and the internal structure of general knowledge. For the purposes of this study we will assume that information appealed to by the I-heuristic is part of general beliefs (‘knowledge’), and that in the communication situation some of this information is either assumed or made mutual by the speaker.<sup>19</sup> In lieu of having answers to all these problems, we will adopt the strategy of selecting intuitively plausible pieces of information to play the role of shared or background information on a case by case basis.

### 3. Standardization and the I-Heuristic: Pure pragmatics

We will now give analyses of some implicature examples in terms of two dimensions: (i) the intuitively plausible *content* of the implicature, and (ii) the postulated *mechanism* underlying that content. As will readily become apparent, these are linked — different content analyses demand or preclude different mechanisms. In many cases we will see that the correct analyses of content and mechanisms are underdetermined by intuition and plausibility (though more data could help). This is, then, an area ripe for experimental evidence. In each case we will display the full range of content analyses employed (in so far as they are) by the major views, but we will only explore the default heuristic and standardization mechanisms here.<sup>20</sup> Furthermore, in the case of standardization, two options are available — non-standardized first (standardized second) and standardized-first. Traditional Gricean implicature inferences suggest that with these implicatures, the nonstandardized, compositional interpretation is taken first and rejected for the standardized interpretation only if contextually inappropriate. On the other hand, the characterization of standardization given earlier makes it possible that the standardized interpretation is the most salient one, and is operative in neutral and enabling contexts. Both are possible from the point of view of pure pragmatics, so we will carry along both versions by putting an asterisk next to the step using a contextual trigger, which can be skipped in the case of the standardized-first option. We will return to this issue in the experimental portion of the paper.<sup>21</sup> Here are some samples (with approximate implicatures):

- (1) It’s raining [here]

- (2) I've had breakfast [today]
- (3) He went to the edge of the cliff and [then] jumped [off it]
- (4) You won't die [now/from that]
- (5) There's beer in the fridge [to drink]
- (6) Anna turned the key and [so] the engine started

We will look at the first two in some detail.<sup>22</sup>

- (1) It's raining (uttered in San Francisco)

### I. Content

- *Unarticulated Constituent (UAC)*: This would express an incomplete proposition (or proposition 'radical'): 'It's raining ...'

<rain, now, ( )<sub>loc</sub>><sup>23</sup>

- *Completion Implicature (IMP<sub>C</sub>)*: (Same as UAC)
- *Expansion Implicature (IMP<sub>E</sub>)*: This would express the complete proposition: 'It's raining somewhere or other':

<there is a location l: rain, now, l>

- *'Hidden Indexical' Semantics (HIS)*: This would express the proposition: 'It's raining here'.<sup>24</sup>

<rain, now, here>

### II. Mechanism

*DH*: Levinson might appeal to the I(Q2) heuristic, and infer, similarly to the Gricean:<sup>25</sup>

- a. 'It is raining' means 'It is raining somewhere or other',
- b. 'It is raining somewhere or other' is inappropriately weak or unspecific as a contribution to the talk exchange at this point,
- c. I(Q2) Heuristic: 'Minimal forms warrant maximal interpretations' (maximally informative),
- d. 'It is raining in San Francisco' would be maximally (appropriately) informative,
- e. So S communicated (implicated) that it is raining in San Francisco.

*Standardization*: As an expansion, it might have the quasi-Gricean analysis:

- a. 'It is raining' means 'It is raining somewhere or other',

- \*b. 'It is raining somewhere or other' is inappropriately weak or unspecific as a contribution to the talk exchange at this point,
  - c. 'It is raining' is standardized for 'It is raining here',<sup>26</sup>
  - d. Here = San Francisco,
  - e. So S implicitly (directly) communicated that it is raining in San Francisco.
- (2) I've had breakfast (uttered 1/1/2000)

### I. Content

- *Unarticulated Constituent (UAC)*: expresses an incomplete proposition (or proposition 'radical'):

<have breakfast, ( )<sub>time</sub>>

- *Completion Implicature (IMP<sub>C</sub>)*: (Same as UAC)
- *Expansion Implicature (IMP<sub>E</sub>)*: Expresses the complete proposition: 'I've had breakfast sometime before':

<there is a time t in the past: had breakfast, t>

- '*Hidden Indexical*' *Semantics (HIS)*: Expresses the proposition: 'I've had breakfast today':<sup>27</sup>

<have breakfast, today>

### II. Mechanism

*DH*: Levinson might appeal to the I(Q2) heuristic, and infer, similarly to the Gricean:

- a. 'I've had breakfast' means 'I've had breakfast at some time or other',
- b. 'I've had breakfast at some time or other' is inappropriately weak or unspecific as a contribution to the talk exchange at this point,
- c. I(Q2) Heuristic: 'Minimal forms warrant maximal interpretations' (maximally informative),
- d. 'I've had breakfast today' would be more (appropriately) informative,
- e. So S communicated (implicated) that they have had breakfast today.
- f. Today = 1/1/2000,
- g. So S (directly) communicated that S has had breakfast on 1/1/2000.

*Standardization*: As an expansion, it might have the quasi-Gricean analysis:

- a. 'I've had breakfast' means 'I've had breakfast at some time or other',
- \*b. 'I've had breakfast at some time or other' is inappropriately weak or unspecific as a contribution to the talk exchange at this point,
- c. 'I've had breakfast' is standardized for 'I've had breakfast today',

- d. So S implicitly (directly) communicated that S had breakfast today (on the day of utterance).
- e. Today = 1/1/2000,
- f. So S (directly) communicated that S has had breakfast on 1/1/2000.

**Conclusions:** The above remain rough approximations to the stories these theories would tell about these examples, but they are, hopefully, enough to both get a feel for each theory, and to motivate some general experimental questions. So far, we have to face the following facts:

Default Heuristics:

- 1. We have no criterion for being a 'simple' form.
- 2. We have no criterion for stereotypical information associated with a form.

Standardization:

- 3. We have no criterion for when a form is standardized for what.<sup>28</sup>
- 4. We don't yet know how to characterize the interaction of context and standardization. Does context *override* (and/or *suppress*) the standardized interpretation, where it is present but not contextually operative (like an irrelevant meaning)? Or is the standardized interpretation *suspended* (and/or *disabled*) in the sense that the form does not have that meaning in that context?

There is only so far one can go in resolving these issues on the bases of intuition and reflection, and though the field has not reached the end point of such efforts yet, we will turn now to the experimental phase, and propose an experiment to get at some of these issues.

#### 4. Standardization and the I-Heuristic: Experimental pragmatics

##### 4.1 Preliminaries

To evaluate these two competing views we must derive different testable predictions from each of them. Even staying within the same general methodology as earlier studies, i.e., presenting sentences as utterances in context and having subjects respond in various ways to them,<sup>29</sup> we need to make some additional assumptions in order to get these predictions. On the standardization side, we noted earlier that the standardized (*vs.* non-standardized) interpretation could be: (i) the most salient, (ii) the less salient, (iii) overridden by context, or (iv) suspended by context. In what follows we will apply the following working assumptions:

- A1. Standardized interpretations are like meanings in that they ‘attach’ to the type of form being uttered, and are retained in canceling contexts.<sup>30</sup>
- A2. Standardized interpretations are more salient, preferred, etc.
- A3. Standardized interpretations must be overridden by context when the (compositional) linguistic interpretation is favored.

On the I(Q2) heuristic side, we will assume:

- A4. Stereotypical information that heuristics allude to is a part of general background information we bring to most talk-exchanges (the earlier ‘outer circle’), which then is either (i) modified by contextual information (the earlier ‘middle circle’) (ii) or modifies it.<sup>31</sup>
- A5. Utterance interpretation takes place with ready access to such information and important triggers for such information include specific lexical items and the evolving topic of discourse.

We examine mechanisms of implicature modulo the assumptions just outlined. We first take note of some existing experimental findings that bear on the questions and then report our initial experimental steps.

Experimental work most immediately relevant to our interest in implicature addressed two main issues. The first of these is the ability of naive language users to categorize utterance contents as a part of what is said vs. implicatures and implicatures (Gibbs and Moise 1997: Experiments I-IV; Nicolle and Clarke 1999: Experiments I, II; Bezuidenhout and Cutting 2002: Experiment I). The second is the effort to describe the mechanisms underlying the recovery of implicatures (Nicolle and Clarke 1999: Experiment III; Bezuidenhout and Cutting 2002: Experiments III, IV. These experiments tested several of the sentence types we have discussed).

All these studies sought to elicit categorization judgments that would distinguish literal from enriched interpretation. Various approaches for instruction in the relevant distinctions were tried. None were effective. Though this apparent opacity of naive language users to the difference between what is said and what is implicated for the sentence types tested is interesting and in some respects surprising, we will not consider it further.<sup>32</sup>

Our focus is on the mechanisms for recovery of implicatures. In addition to categorization questions, the three experimental studies just cited also used context manipulations to bias interpretations. Those reliably induced selection of minimal or enriched interpretations. Though not observable in the reflective judgments of naive speakers for context free presentation, interpretive differences emerged robustly in processing driven by context. The Gibbs and Moise and the Nicolle and Clark studies suggested a multi-step processing account.

Bezuidenhout and Cutting (2002) used similar materials to extend and more sharply test the conclusions from those studies. They tested contextual influence on minimal interpretations for the test sentences, aiming to determine whether there is a necessary stage in pragmatic processing at which such is recovered. This question requires measures sensitive to the time course of the mental events that lead to an interpretive preference. To this end, they measured reading times for the target sentences in differing contexts. They contrasted three processing models they abstracted from the literature. Two of these models assumed that multiple processes support pragmatic interpretation and one model assumed a single process. They described a Gricean based process as a 'literal-first serial model' (LFS). On this view, listeners first recover a minimal proposition (including reference fixing and disambiguation) before engaging in (other) pragmatic processing. A second multi-process model was intended to reflect proposals of Gibbs and of Levinson. It combined parallel processing with a preference ranking favoring enriched interpretations ahead of the minimal. This they termed a 'ranked parallel model' (RP). The third option was a single process model based on their interpretation of Relevance theory. That model eliminated any special status for minimal interpretations. They termed this the 'local pragmatic processing model' (LPP): pragmatic processes were assumed to be called on from the beginning of the utterance, with full contextual interaction occurring as the utterance unfolds.

Bezuidenhout and Cutting developed test sentences representing six categories labeled scalars, cardinals, possession, time-distance, temporal relations, and quantifier. These were visually presented as the final sentence of a story. Stories were varied so as to bias towards the enriched interpretation or towards the minimal interpretation. The contexts were evaluated in a preliminary experiment (using a paraphrase measure) that demonstrated the relevant biasing effects on the sentence interpretations.

Test sentences were presented in a self-paced reading task that was immediately followed by a judgment task meant to test for the presence of minimal interpretations. That second task did not produce a decisive result and we will not discuss it here (though it was compatible with the reading time result).

Reading time for each target sentence provided a measure of processing efficiency in the two types of constraining contexts. On Gricean assumptions (minimal interpretation is first computed: LFS), reading times should be faster in minimal contexts than enriched contexts. Minimal context would fit and response times should be relatively 'fast'. In enriched contexts, a mismatch would arise and processing should be slowed. By contrast, the RP model predicts the opposite profile, with faster reading times for enriched contexts because enriched interpretations are assumed to have a higher preference ranking. In a minimal context, there would be a mismatch, requiring a shift to the second ranked alternative, thereby

slowing processing. The LPP model predicts no difference as a function of context since it assumes that context drives interpretation from the outset. Mismatches do not occur in either context.

Results showed reading times were faster in enriched contexts than in minimal contexts. This is decisively against the LFS model and fits the ranked parallel pattern. LPP is not supported since, other things being equal, it predicts equivalent times for the two contexts. Bezuidenhout and Cutting's discussion of these results is cautious and emphasizes the potential for differences among the several different types of sentences included in their experiments, and they raise the possibility that different processing accounts may apply for some of the different sentence types. They note that the one-process model may be viable in some instances and the multiple process model in others.<sup>33</sup>

We agree that this is an important avenue for study. The question of when interpretation is driven by the form of the sentence is central. The cases of implicature that we have discussed are prime candidates for answering such a question. Does the demonstrable context free implicature arise when contrary contextual constraint is present? If so, how is contextual evaluation then applied? If not, how can contextual constraint avert the consequences of standardization? The analyses based on Bach's claims re standardization and Levinson's re default heuristics implicate context in different ways and these form the basis for questions that we wish to pose for experimental analysis.

#### 4.2 Experimental studies of implicature

We report an exploratory evaluation of three types of implicature that test their interaction with contextual constraint. We first assess context free preferences for several examples of each type of standardization. This provides sets of items for which the implicature is reliably elicited in context free conditions.

Given sentences with a clear context free preference for the standardized interpretation, the second step is a test of the interaction of that interpretation with contextual constraint. What is the impact of enabling and canceling contexts? Is an implicature computed even in a context that defeats it? On the strongest reading of our assumption A3, context can not eliminate context free patterns. On our assumptions A4 and A5, canceling contexts should eliminate the availability of the I(Q2) heuristic. Intermediate results (*viz.* a change in the time course or a reduction in strength of the implicature) for canceling contexts will require analysis based on the detail of the data profile.

Our experimental approach relies on the presumptive 'spelling out' of the implicatures. In each of the test cases that we use, standardization postulates an unspoken expression (or at least a limited range of concepts) conveyed by the form of

the test sentence. This information is implicit in an utterance of the test sentence. For example, *It's raining* conveys ['It's raining' + [appropriate stipulation of location]]. The experimental test relies on the assumption that what is expressed is the fully fleshed out version. The methodological issue is to say what that fully fleshed version is and then to test for the presence of the implicit component.

We report here a pilot experiment using a speeded question answering task on a subset of the six sentence types discussed earlier. The objective is to demonstrate the viability of the materials and provide a conservative measure of contextual effects. In the longer term, we will pursue more sensitive time dependent measures.

#### 4.2.1 *Pilot experiment 1: Testing context free interpretation with a question answering task*

Our aim was to assess the strength of implicatures that depend only on the form of words in the test sentence. Two sets of stimulus sentences were used: an implicature set and a non-implicature set. Each member of the implicature set had a roughly matched (structurally similar) sentence lacking the implicature. The non-implicatures serve as rough comparison base for the strength of the implicature effects and as foils to encourage attention to the task and promote comprehension based responses. The measure used was a timed question answering task.

**Implicature probes:** These are the words generally used to overtly express the presumed implicature (as these have been discussed in the pragmatics literature) or a syntactically and semantically comparable word that is not in the implicature. The probes used for the implicature sentences were also used to test the non-implicature sentences. For example, the implicature sentence 'It's raining' was matched by a nonimplicature such as 'It's my birthday'. The probe words *HERE* and *THERE* followed the sentence as possible answers to a question word presented at the end of the test sentence. The probe word *HERE* expresses the presumed implicature for 'It's raining', while the probe word *THERE* does not. Implicature probes should be strongly preferred and produce faster response times (RT) following the implicature sentences than when they follow a non-implicature sentence. For the non-implicature sentences, no location concept/word should be automatically elicited. Responses to the implicature probe in that environment should be slower and less systematic.

#### *Methods*

**Procedure:** Subjects heard stimulus sentences presented from computer controlled sound files. Every test sentence was preceded by a short, neutral phrase ("Somebody said: [experimental sentence]"). The sequence of presentation events was as follows:

- a. introductory phrase
- b. test sentence
- c. probe QUESTION

Presentation of the test sentence was at normal speaking rates, and with normal prosodic phrasing. The introductory phrase facilitates this by providing a prosodic carrier and alerting stimulus. The forced choice task was initiated by visual presentation of a single question word appropriate to the implicature (e.g., ‘when?’, ‘where?’, ‘whose?’; see examples of stimulus materials below) with the two probe words printed beneath it. Subjects hit a response key to indicate their choice.

Design: Sentences and probe types are crossed. The implicature/non-implicature contrast is a within-subjects comparison. The implicature/non-implicature sentences were matched on syntactic structure but varied in principal lexical content. Each participant saw 14 exemplars of each of 3 sentence types, and similarly for the matched set of non-implicatures.

Materials: Three types of sentences were used to test the materials and methods. Examples of each of the three types are listed below. Fourteen instances of each of the three types were tested. The examples provide an implicature, a non-implicature control, and the probe questions and answers (related/unrelated) used for the example items.

- 1a. Somebody said: ‘It’s raining’ WHERE?  
HERE THERE
- 1b. Somebody said: ‘It’s my birthday’ WHERE?  
HERE THERE
- 2a. Somebody said: ‘I’ve had breakfast’ WHEN?  
TODAY ONCE
- 2b. Somebody said: ‘I’ve had a long life’ WHEN?  
TODAY ONCE
- 3a. Somebody said: ‘John cut a finger’ WHOSE?  
HIS OURS
- 3b. Somebody said: ‘Paula waved a flag’ WHOSE?  
HERS OURS

### *Results*

The results for both the choice profile and the time taken to select a response are directly related to the presumptive implicit information. Differences between probe types for the implicatures were systematic and substantial and differed significantly from corresponding contrasts for the non-implicatures. Relevant contrasts are briefly described below. We do not present a detailed statistical analysis of all the patterns in the data comparing the two sets since the main intention of this was to

evaluate the question answering method and to identify a set of implicatures with strong context free bias for subsequent use in pilot experiment 2.

**Table 1.** Forced choice task.

Table 1 Forced choice task		Implicature Items			Non-Implicature Items		
		Implicature Response	Non-Imp Response	No Response	Implicature Response	Non-Imp Response	No Response
<b>Location</b>							
(Here/There)	<i>Mean</i>	1289	1761		1870	2076	
	<i>N</i>	306	19	11	206	100	18
<b>Possession</b>							
His/Yours	<i>Mean</i>	1368	1877		1770	2241	
	<i>N</i>	321	10	5	256	30	38
<b>Time</b>							
Today/Once	<i>Mean</i>	1243	2187		1713.5	1623	
	<i>N</i>	306	24	6	95	232	9
<b>Total</b>							
	<i>Means</i>	1300.17	1941.67		1784.50	1980.33	
	<i>N</i>	933	53	22	557	362	65

<b>t tests</b>	Location	t(23) = 8.9	$p < .001$
	Possession	t(23) = 3.9	$p < .001$
	Time	t(23) = 4.4	$p < .001$

In this table, entries provide: (a) The number of choices made for each probe type following the implicature and non-implicature sentences. N is the number of observations for 24 subjects across 14 sentences of a given type; numbers in some cases do not sum to 336 because of missing data. (b) The mean response times in milliseconds for each probe type. (c) Contrasts for implicature sentences vs non-implicature sentences: t-tests (two sided) use all responses (i.e., collapsed across response types) for implicature and for corresponding non-implicature sentences (note: these are sentence based tests; subject based tests are also highly significant).

Several features of the results indicate the special status of the implicatures. First, the choice between probes was uniformly for the implicature word following an implicature sentence: 95% of responses followed that pattern. Overall, a comparable bias was not found for the non-implicatures: 60% of those responses were implicature words. There was, however, a substantial variation in question answering preferences among the 3 types for the non-implicature sentence. (No such variation was present for the implicatures.) Two of the non-implicature types showed the same direction of preference as the implicatures, and one the opposite.

The most similar to the implicature choice profile was for the possession sentences; that profile, however, had a quite different response time (see below).

The response times to select an answer were substantially and significantly different for the implicatures and non-implicatures. Overall, responses following implicature sentences were much faster than those following non-implicatures (528ms). Further, in the few instances in which a non-implicature response was made following an implicature sentence, the response time was very long compared to the implicature choice (mean difference between types: 641 ms). By contrast, response time differences between the two probe types following the non-implicature sentences were substantially and significantly smaller (mean difference between types: 195 ms). Again, the possession sentences were most similar to the implicatures in that response times were faster for implicature words than non-implicature words following the non-implicature sentences that were matched to the possession set. So, the preference was similar, but the time taken to effect it was much longer: implicature responses for the possession implicatures were 402 ms faster than the comparable response following the non-implicature possession sentences. None of this is surprising based on the strong intuitions that we begin with in selecting the test materials for evaluation. The non-standardized answers seem infelicitous following the implicatures and are simply not chosen; the decision times strongly reflect the bias. This attests to the brute facts of standardization. The most essential outcome of this experimental comparison is the demonstration of a strong context free bias in favor of implicature driven choices. There was some variability among the fourteen individual examples of implicatures included in each of the three sets, but that internal variation was substantially smaller than the differences between implicature and non-implicature sentences. As, we note below, for the next step of investigating context, we used the results of pilot experiment 1 to choose test items for pilot experiment 2 that minimize the variability in strength of implicature.

#### 4.2.2 *Pilot experiment 2: Manipulating context*

This experiment tested the impact of biasing contexts on the processing of sentences evaluated in experiment 1. Enabling contexts (supporting the implicature) were contrasted with canceling contexts (which disable the implicature). The pattern of outcomes can ultimately help adjudicate between the standardization and default heuristic descriptions of implicatures. On standardization assumptions A1-A3, we should continue to observe evidence for the activation of the meanings associated with the implicatures even in a canceling context, since the standardized interpretation attaches to the form of words. On default heuristic assumptions A4-A5, responses related to the implicature should be activated only in the enabling context, since the stereotypical information (*viz.* the implicature) is a part

of background information. The context manipulation was pretested off-line for effectiveness. In this experiment, we used visual presentation of all the materials in order to get reading time measures for contexts and implicatures. We again used the question answering procedure, but in this case, responses were oral and timed by voice trigger.

### *Methods*

**Procedure:** All materials were presented visually. The contexts were presented line by line and were self-paced. The last line of the presentation was the implicature sentence. The question word and the forced choice alternative probes followed the last sentence. Reading time for each line of context was separately recorded, as was reading time for the implicature sentence. The participants pronounced their answers and the time to onset of the verbal response was recorded.

**Design:** Two counterbalanced sets of materials paired each test sentence with an enabling and a canceling context. For each participant, the materials sets were evenly split between enabling and canceling contexts. No participant saw any individual test sentence more than once.

**Materials:** Eight sentences were taken from each set of the 14 used in experiment 1 and contexts were designed for each. The eight 'best' in terms of speed and uniformity of choice in experiment 1 were selected. In each case, a sentence standardized for a given interpretation was presented in two contexts: one compatible with the standardized interpretation, and one that canceled that interpretation. NB: The canceling contexts were designed to be strongly compatible with the non-implicature response alternative. Thus, supporting context dictated the implicature response word, and canceling contexts dictated the non-implicature response word. For every context/implicature sentence combination, the objective was to insure that a felicitous answer was provided in the probe pair presented following the question word. To determine the success of the context construction, an off-line test was done. Context sentence pairs were presented in test booklets with layout exactly as that to be presented on the computer screen in the response timed experiment. In this test, participants circled their preferred answer. 24 subjects provided responses (12 for each of the counterbalanced lists). Choices favored the context determined responses at rates of 95% or better for all three sentence types and for all contexts, both supporting and canceling. By this measure, canceling contexts canceled as effectively as enabling contexts supported. The two types of contexts were equated for length. Examples for each of the three types are given below.

- (1) It's raining.

**Enabling Context (EC)** John and Mary were vacationing in San Francisco. They planned to spend their first afternoon playing tennis. But the weather forecast was

definitely not encouraging. And, when John looked out the window at lunchtime he sighed, and said to Mary: “It’s raining” [here/San Francisco].

Canceling Context (CC) John left his Boston job early to rush home and catch the Red Sox-Yankee game on TV from New York. But the game is iffy because thunderstorms have been threatening. During the pregame show, his fears come true. “Nuts”, he said. “Just as I thought. It’s raining” [there/New York].

(2) I’ve had breakfast.

Enabling Context (EC) John and Mary meet at the bus stop in front of a coffee shop. They work for the same company division and frequently commute to work together. This morning, they have met for a very early departure to attend a special meeting that is scheduled at the company’s main headquarters. It’s a long bus ride across town. John, who is always late, says hopefully: “I had to leave the house in a rush. I’m really hungry. Do you want to grab a quick bite before the bus comes?” Mary, who is always on time, replies with a smile: “No thanks, I’ve had breakfast” [today].

Canceling Context (CC) Zoog the alien from Zog lands his spaceship on Earth. He is cleverly disguised as a human, but knows little of the local food and customs. Poor Zoog gets arrested after blundering around for a week and confesses that he is an alien. Naturally, nobody believes this. When the police psychiatrist questions him, Zoog proudly reports: “I figured out the traffic lights, and when to cross the street. I got my shoes shined. I ate some ice cream at a Baskin Robbins today. And a few days ago, I visited McDonald’s in the morning, so I’ve had breakfast” [once/not today].

(7) I cut a finger.

Enabling Context (EC) Al is busy in the kitchen helping his wife by chopping the salad veggies. This is not his usual practice and he is feeling quite pleased with himself for volunteering. But, he’s not really paying close attention as he is also watching a baseball game on TV. He gets a little too careless with his knife and lets out a sudden yelp. “Ouch! I cut a finger!” [his own]

Canceling Context (CC) Mabel is a new manicurist. She is nervous on her first job and her very first client is a fussy old man who had been coming to the shop for years. Mabel was in tears as she explained to her boss why the man shortly left in a huff. “Oh”, she wept, “I worked carefully, but he moved his hand all of a sudden. You heard him say ‘Ouch’? Well, I cut a finger” [his/not hers].

Subjects: Twenty-four University of Arizona undergraduates were tested for this pilot study. They were volunteers who received class credit for participation.

## Results

1. Reading times for the context passages leading up to the target sentence were compared for enabling and canceling contexts. This provides a rough index of the complexity of the contextual information. The average time to read each line of the context was compared for the two contexts. These times showed no consistent pattern and did not differ statistically. In addition, reading time for the target sentences was compared following each context type. A difference would be expected if reading time reflects integration time, and if the implicature is available and interferes with integration. There was some indication that it took longer to read the target sentence following the canceling contexts, but it was weak. This difference was not statistically significant.
2. The question answering task: since the passages were pre-tested in an untimed task with materials distributed just as they were in the timed experiment, it was established that the passages did reliably select the contextually appropriate answer word following both enabling and canceling contexts. The expectations for the timed task were: first, subjects would continue to choose the context driven answers even under time pressure, and this proved to be the case. Accuracy for the contextually driven response was very high for all sentence types. Second, if context can suppress the implicature, other things being equal, the two context types should not differ systematically. But, if the implicature is invariably computed, this should set the stage for response competition and times for the canceling context should be longer than those for the enabling context. The results revealed a substantial and statistically reliable difference between the contexts, with the enabling context being faster.

**Table 2.** Contextual constraint results: Supporting and canceling contexts for implicature sentences.

		Context Types		Difference
		Enabling	Canceling	
Locative	context	11872.5	12105.15	232.65
	implicature	1134.8	1143.685	8.885
	answer Vk	1461.7	1588.25	126.55
Temporal	context	13104.1	13842.15	738.05
	implicature	1236.65	1308.2	71.55
	answer Vk	1655.15	1939.45	284.3
Possession	context	13316.85	13294.55	-22.3
	implicature	1154.95	1212.1	57.15
	answer Vk	1390.9	1593.1	202.2

t-tests	context	implicature	answer VK
two-tailed	$p < 0.490528$	$p < 0.469231$	$p < 0.005895$

In this table, entries are: (1) reading time for *context*: values are the summed reading time for the 8 context lines; (2) Reading time for *implicatures*: these appeared as the 9th line of text; (3) *answer VK*: these are voice key times for question answering after presentation of the implicature sentence.

### Discussion

This pilot experiment used a measure that relies on a conscious decision about the meaning of the target sentences in a constraining context. The time to respond ranged from about one to three seconds, with the mean response time at around 1.7 seconds. It should be borne in mind that this response time included reading time for both the question word and the response alternatives. The task is a relatively natural one. Subjects did not report difficulty with task demands and were quite accurate. On the basis of results from this task, we can affirm the presence of some factor that slows question answering following the canceling contexts. We cannot affirm that it is because the implicature was activated, though that is a plausible construal. It remains possible that the canceling contexts were more complex, and it remains possible that the fit between the target sentence and contexts was less felicitous for the canceling contexts. The comparable reading times for the two contexts and the high accuracy rates provide some basis for arguing against those alternatives. It remains to directly demonstrate activation of the implicature in canceling contexts. Our intention is to test this using other measures. We are currently working with a naming task rather than a question task. The essential change from the current task will be to remove the question word and present only one target word to pronounce. If the implicature is computed, we would expect to see facilitation for the implicature related target even following a canceling context. That work is in progress.

The initial results of our study with implicatures supports a processing picture that is similar to the one favored by the outcome of the Bezuidenhout and Cutting (2002) study. Some differences are present. Their materials spanned a greater range of sentence types than we used. And, we did not find a reading time difference. Materials differences may be part of that failure to find the reading time effect. But it is also possible that with a larger sample size, the rather weak trend we did observe might emerge with greater force.

The question answering times we observed were quite robust and were significant for each of the three types of implicatures that we tested. They argue in favor of a model that distinguishes a response to sentence form that is distinct from context. We focused our analysis on a contrast between the standardization ideas

as expressed in work by Bach, and default strategies as formulated by Levinson. To do this, we were obliged to elaborate Levinson's I-heuristic. One might choose not to embrace that move. Setting that specific matter to one side, the more general observation is this: a single process theory does not readily accommodate the resistance to contextual constraint demonstrated by the implicatures in our experiment.

## 5. Some conclusions

The experimental investigation of standardized forms that we outlined seems to us a promising avenue for deepening our understanding of the way in which pragmatic mechanisms relate to language processing systems. The implicit context-free 'continuations' of these kinds of sentences are powerful. They afford excellent test vehicles for an investigation of interactions between pragmatic processes that are heavily reliant on sentence form with those that arise from the contents of specific context. The interpretive outcomes of contextual interactions with sentence form are richly played out in various aspects of pragmatic theory, and have given rise to a range of alternative accounts of pragmatic phenomena. We believe that progress on the theoretical issues that divide pragmatic theorists will require a broadening of the data base. The effort to fit the theory to the constraints of real-time processing models seems well worth the effort. An increasing number of investigators interested in pragmatics have been taking this tack. We think these efforts will be valuable not only to those interested in pragmatic theory, but will also hasten a healthy infusion of systematic pragmatic issues more aggressively into mainstream psycholinguistics.

## Notes

1. Harnish (1976, 2005) argues that Grice had the category, but not a label.
2. See Noveck and Sperber (2004).
3. Later we will also use it more narrowly in discussing particular phenomena so labelled by Bach (1994).
4. Generative grammar has recognized such 'understood elements of content' for at least fifty years, both in the form of 'linked' contents (ellipsis) and 'free' contents (PRO, argument structure).
5. Not to be confused with the linguistic notion of an unpronounced, but linguistically real, constituent.

6. Bach (1994) introduced 'implicature' to replace Sperber and Wilson's (1986), 'explicature' because of the nonexplicit nature of the information.
7. There are systematic similarities and differences between Grice's 'generalized conversational implicatures' and Levinson's 'default heuristics' which we will not go into here.
8. For relevance theorists (Sperber and Wilson, Carston etc.) pragmatics 1 = pragmatics 2 = principles of relevance.
9. 'Said<sub>G</sub>' in the strict, narrow, 'Gricean' sense.
10. Bach has been critically discussed by Bird (1997), Vicente (2002), and Levinson by Bezuidenhout (2001).
11. We assume that all cases of narrow implicature involve the possibility of adding words and making it explicit, following Bach "what one means includes an implicit qualification on what one says, something that one could have made explicit but did not" (2001: 252). We leave it open whether or not all cases of broad implicature are cases of narrow implicature, i.e., whether all cases of conveyed (but not encoded or implicatured) information could have been made explicit by adding words to the original.
12. Searle (1975) associated 'conventions of usage', which are not 'conventions of meaning' with these forms. See also Morgan (1978) and Geis (1995: Chapter 5). On the Bach and Harnish (1979: Chapter 9) view, standardization *contrasts* with conventionalization.
13. It is currently an open question how schematic standardization is, i.e., does it govern just specific sentences, or can it govern sentence frames (as in the text), and to what variety of sentences does it apply. Bach and Harnish (1979: Chapter 10), for instance, apply standardization to performatives.
14. It is possible to argue that this is not a distinction in kind but of degree, and that sentence nonliterality is just the limiting case of constituent nonliterality. Bach sometimes uses 'nonliteral' in a special way, where the utterance is nonliteral if the speaker does not mean *just* what the expression means. See Bach (1998) for a survey of the uses of 'standardized nonliterality' so conceived. The normal notion, which we will be using, is weaker, since it requires only that what the speaker means be at variance with the linguistic meaning. If the speaker means *at least* what the sentence means, the speaker is speaking literally.
15. Levinson elaborates on this by splitting the I-heuristic into two principles: "*Speaker's maxim* ... say as little as necessary; that is, produce the minimal linguistic information sufficient to achieve your communicational ends (bearing Q in mind) ... *Recipient's corollary* amplify the informational content of the speaker's utterance, by finding the most *specific* interpretation, up to what you judge to be the speaker's m-intended point ..." (2000: 114).
16. The 'Q' is an allusion to Grice's (1975, 1989) first maxim of Quality ('Make your contribution as informative as is required').
17. The 'M' is an allusion to Grice's (1975, 1989) maxim of Manner: 'Be perspicuous' (in one's conversational contribution).

18. In other words, the Q/M-heuristics have a metalinguistic aspect missing from the I-heuristic.

19. See Bach and Harnish (1979: Chapter 1) for the notion and role of ‘mutual beliefs’ in communication, and see Wilks and Bien (1983) for the idea of making a piece of information ‘mutual’ as the need arises. Taylor (2001) also sees such background information as playing a decisive role, though he does not relate it to Levinson’s heuristic, whereas Brennan (2003) does.

20. In the cases of unarticulated constituent analyses and completion implicatures, no specific mechanisms are generally proposed by theorists for getting the contextually provided information into the proposition expressed — see Bach (1994) and Recanati (2002). Stanley (2000) assimilates ‘unarticulated’ constituents to hidden indexicals, but the process of interpreting indexicals is also not completely settled.

21. We will say very little about the pragmatic complexities of these examples and treat them at a simple and intuitive level and (only) in the spirit of the theories they are modelled on. For instance, in some cases changing the wording even slightly can make a big difference; in other cases the forms are quite productive and the implicature is preserved. Comparative work, which is currently being conducted by Professor Liu Si at Beihang University, Beijing, will also address the question of the generality of these phenomena.

22. We do not include in this survey the recent and interesting ‘minimalist’ position of Cappelen and Lepore (2005: Chapter 10), wherein, roughly, (1) would express the proposition that it is raining (simpliciter) and (2) would express the proposition that the semantic value of ‘I’ in the context has had breakfast (simpliciter). For our limited purposes, these contents would function very much like expansion implicatures (though they would not be equivalent semantically to them). The differences would be handled by Cappelen and Lepore’s 2005: Chapter 13 ‘speech act pluralism’. See the journal *Mind and Language* 21(1) (2006), for some critical discussion of the book.

23. We follow the convention of enclosing propositional material in angled brackets.

24. The hidden indexical theory has to justify that the indexical is ‘here’ and not, e.g., ‘here in San Francisco’. This point holds for hidden indexicals in general.

25. Remember, although there are similarities, there are substantial differences between the Grice and Levinson frameworks.

26. Note the introduction of the indexical ‘here’ and its attendant problems.

27. As with ‘here’, the hidden indexical theory has to justify that the indexical is ‘today’ rather than, say, ‘this morning’. The answer, whatever it is, will have to accommodate the fact that the breakfast-script, as one of the mealtime-scripts, contains both typical breakfast foods, and typical breakfast times. Hence ‘breakfast’ can be used to refer both to a kind of meal and a time of meal-taking. Qua time of meal, one can have steak ‘for breakfast’. Qua kind of meal one can have breakfast (e.g., ham and eggs) at sunset. Interestingly, the two uses do not go together easily. It would be odd to report the sunset ham and eggs as ‘I had breakfast for dinner’, and a menu might say either: ‘Breakfast served from 7am to 11am’ or ‘Breakfast served 24 hours a day’, but unlikely both.

28. Bach (1989: 81) does propose a ‘test’ for standardized nonliterality. The idea behind it is that the standardized interpretation is asymmetrically dependent on the nonstandardized interpretation. It also appears that ‘standardized’ as used in the test is roughly equivalent to ‘common’ — which was not a part of the technical notion in Bach and Harnish.
29. See Gibbs and Moise (1997), Nicolle and Clark (1999), Bezuidenhout and Cutting (2002), and Bezuidenhout and Morris (2004). See below. We discuss these experiments and their attendant models in more detail in Garrett and Harnish (in preparation).
30. But it is not (yet) a full-blown meaning. Standardized indirect forms, for instance, are not linguistically ambiguous. The traditional theory of meaning really has no category for standardization.
31. There might be a psychologically relevant distinction here between what Putnam (1975) calls stereotypical information about things or events (think also of frames and scripts), and what Searle (1978) calls the ‘Background’ — information we would rarely think to report, though it is clearly at work during utterance interpretation. For now we will ignore this.
32. See Garrett and Harnish (in preparation) for further discussion.
33. There are other studies that raise issues that intersect with those we are examining. In particular, there are several studies of scalar implicature that contrast one-process and two process models. See, e.g., Bezuidenhout and Morris (2004), Breheny *et al* (2006). We do not address the work with scalars here as there are good reasons to distinguish them from implicatures. Indeed, they are treated by Levinson with the Q-heuristic rather than the I-heuristic that is our focus.

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