

# Bringing semantics to sociophonetics: Social variables and secondary entailments

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## *Abstract*

*This paper introduces a novel approach to the question of how sociophonetic information might be stored cognitively that makes use of the tools of formal semantics. This approach involves applying conventional semantic tests for types of lexicalized meanings (e.g. presuppositions, conventional implicatures) to sociophonetic variables, with the hypothesis that, insofar as sociophonetic meaning patterns like lexical meaning, it should be stored in the same way. Two examples of how this approach can be implemented experimentally are given, applying projections tests (Frege 1896) (i.e., the ‘Family of Sentences’ tests, Chierchia & McConnell-Ginet 1990) and the ‘Hey, Wait a Minute!’ test (Shannon 1976, von Stechow 2004) to patterns of |æ| tensing and retraction in Minnesotan English and |aɪ| monophthongization in Southern English, respectively. Preliminary results of these experiments indicate that sociophonetic meaning patterns like secondary entailments (such as presuppositions and conventional implicatures) from the semantics literature, being both conventional and subsidiary to the proffered content of an utterance, and thus should be considered lexical. The primary goal of the paper, however, is to present a new way of thinking rather than to provide conclusive laboratory evidence for a specific position.*

## **1. Introduction**

One of the questions addressed in the “social information in the lexicon” sub-theme of LabPhon 11 Conference was whether phonetic information in the lexicon is accompanied by social information. There are two primary ways to answer this question. First, given an explicit definition of the lexicon and what it contains, we could compare social information to this definition and determine whether it matched. Second, we could look at what types of information are currently assumed to be in the lexicon, and compare social information to those types. If social information is parallel to these other types of information in terms of its linguistic patterning, then it is reasonable to think that it is

parallel in terms of its location, as well. This paper illustrates how the latter choice could be implemented. Specifically, we are interested in the comparison of social information to lexical meaning as defined by formal semanticists. In this paper, we outline some of the classifications of lexical meaning and the tests that semanticists use to distinguish them and illustrate how these tests can be applied to sociophonetic variables and implemented in a laboratory setting. To the extent that these tests show that sociophonetic variables pattern like lexical meanings, they indicate that social meaning, like lexical meaning, should be stored in the lexicon.

The intention of this paper is to illustrate how conventional semantic tests can be used to examine the nature of social meanings, as a complement to studies in which the nature of social meaning is assessed with methods analogous to those used in phoneme- and word-identification, such as Drager's and Mack's papers in this volume. It is meant to be neither a comprehensive examination of formal semantic tests, nor an assessment of the relative utility of formal semantic tests to conventional perception measures. It is also not our intent to provide an answer to the question of what any particular sociophonetic variable "means" (that is, what social characteristics it indexes), a question which is at the heart of much work in sociolinguistics (see, e.g., Niedzielski 1999; Mendoza-Denton 2003; Eckert 2005; Campbell-Kibler 2009; and references therein). Rather, it is meant to be an introduction to a novel approach to the question of how sociophonetic information might be stored cognitively that makes use of the tools of formal semantics. We include two brief experiments to illustrate how this approach to classifying meaning might be implemented in a laboratory setting, but we acknowledge that the primary goal of this paper is to present a new way of thinking rather than to provide conclusive laboratory evidence for our position.

The structure of the paper is as follows. Section 2 discusses the term *social meaning* in the context of sociophonetics, while Section 3 introduces the relevant distinctions within *lexical meaning* from formal semantics. The two pilot experiments and their results are presented in Section 4, and Section 5 presents general discussion.

## 2. Sociophonetics

### 2.1 Defining social meaning

Before turning to the details of our argument, we must first define *social meaning*. Because the theme of LabPhon 11 Conference was "phonetic detail in the lexicon," we will here be focusing on the social meaning of phonetic variables, and not, for example, morpheme- or word-sized items, though similar arguments may hold for the social meaning of larger units as well. By "phonetic variable", we mean a set of particular pronunciations (phonetic vari-

ants) of a particular phonological category in a language (e.g., the pronunciations of the phoneme /aɪ/ in American English as [aɪ] or [a:]). A simple starting assumption invoked in many sociophonetic studies is that if changing the realization of a variable from one variant to another elicits changes in a particular response category, then it is justifiable to say that the variant “means” whatever parameter has been presented. This is the general tactic that was used by Munson et al. (2006b) to measure the meaning of different variants of /æ/, where the finding that different variants of /æ/ elicit judgments of different sexual orientations was taken as evidence that variation in /æ/ pronunciation means something about sexuality. Similar tactics can be seen in other work; sociophonetic studies have shown that phonetic variation can be linked to social categories in terms of both production (in which phonetic variants are shown to be produced by people who have certain characteristics; e.g., Stuart-Smith 2007; Mendoza-Denton 2007) and perception (in which listeners perceive variants to be associated with different groups either because those groups do produce those variants (e.g., Southerners tend to produce monophthongal /aɪ/) or because the association is stereotypical (e.g., there is a stereotype that gay men produce a frontal lisp) (e.g., Purnell et al. 1999; Clopper and Pisoni 2004; Hay et al. 2006).

This interpretation of what a phonetic variant means is based on the assumption that listeners have a consistent and direct association between a particular variant and an attribute like “speaker of a particular regional dialect” or “person with a particular sexuality”. It is possible, however, that these meanings associated with different phonetic variants have an internal structure that wouldn’t be revealed by the kind of rating tasks that have been used in many previous studies. For example, the meaning “gay” might itself be an amalgam of other more basic meanings which themselves are more closely tied to aspects of phonetic detail. This possibility was suggested by Munson et al. (2006b), who found that judgments of gay-soundingness could be predicted strongly by judgments of two other perceptual parameters, each of which has presumably more transparent relations with the acoustic signal: speech clarity and perceived height. This possibility is discussed in further detail in Beckman et al. (2007) and Munson and Babel (2007). Similarly, the meaning of sociophonetic variables has been shown to be highly flexible and context-dependent, giving rise to the notion of an “indexical field,” defined as a “constellation of ideologically related meanings, any one of which can be activated in the situated use of the variable” (Eckert 2008: 454).

Papers in the laboratory phonology series that have examined social factors have not explicitly defined the meaning conveyed by social variants. Rather, these studies use acoustic and perceptual analysis to refine the analysis of how pronunciation varies as a function of the categories typically analyzed by sociolinguists, such as age, social class, and gender (e.g., Docherty et al. 2006; Stuart-Smith 2007; Warren et al. 2007; Yaeger-Dror 1994).

Thus, there is still much research to be done about what any particular variant of a phonetic variable means, and we make no attempt in this paper to answer that particular question. What we are interested in is whether social meanings (whatever they turn out to look like internally) are stored in the lexicon alongside other types of semantic meaning (as opposed to being part of general cognition). We will address this question by looking at the formal properties of these other types of semantic meaning and comparing them to the properties of social meanings. Before we turn to this discussion, however, it is useful to examine the extent to which the discussion of different types of social meaning in the sociolinguistics literature has made claims about the cognitive representations of these meanings.

## 2.2 *Styles and stereotypes*

Two of the primary distinctions in the sociolinguistics literature regarding social meaning are the notions of linguistic *styles* and linguistic *stereotypes*. Styles are broad, highly dimensional collections of linguistic features that serve a particular communicative goal or which project a particular social identity. One example of this is the constellation of phonetic hyperarticulations, over-use of standard forms, and use of erudite vocabulary that are characteristic of what are generally perceived as formal speech styles. Stereotypes, in contrast, are overtly held beliefs that a particular variant or set of variants uniquely identifies a particular social group. One example of this is the widespread popular-culture belief held by many English speakers that gay men produce a frontally misarticulated /s/.

Early work by Labov (1972) discussed linguistic style as the amount of attention paid to speech, with formal styles appearing only in conditions in which speech was highly monitored. A subsequent and very influential theory of stylistic meaning is presented by Bell (1984). Bell argued that speakers use different linguistic styles to effect a particular relationship with the conversational partner(s) with whom they are communicating. In those cases where the interlocutor's social identity has been assessed correctly, and is determined to be desirable, the speaker will accommodate that listener by moving toward their style.

In contrast, Eckert (2001) maintains that linguistic styles are part of a broader matrix of semiotic markers that convey and consolidate membership in different social groups. This set of markers serves the purpose both of delimiting a group within a larger community, as well as providing a pool of resources for people to use when fashioning themselves as members of that group. In the context of Munson et al.'s (2006b) work on gay men's speech in Minnesota, linguistic variation like tense /æ/, fronted /u/, and highly negatively spectrally skewed /s/ serves both the group purpose of delimiting gay men from other groups of speakers in Minnesota, as well as the function of

being a pool of resources for men in Minnesota to use to convey their identities as gay men. Other examples like this are discussed in detail by Eckert (2008), who as mentioned above provides a treatment of the polysemy in stylistic meaning via indexical fields, but it should be noted that the meaning of styles and stereotypes is a topic that is actively being investigated, and there is no discipline-wide consensus on these issues (see Eckert & Rickford 2001, Eckert 2008, Campbell-Kibler 2009 for the breadth of the debate).

While Labov's, Bell's, and Eckert's theories of stylistic meaning differ from one another in quite substantive ways, it is noteworthy from our perspective that none of them makes clear predictions about how stylistic information would be represented cognitively. Labov's hypothesis would suggest that style is an artifact of the amount of attention paid to the task, with formal styles emerging when close attention is paid to speech. The cognitive representations of these styles would then be potentially reducible to the cognitive representation of attention to task, and not to a particular social variable. Stylistic meaning would be interpreted by listeners to index the talker's mental state, much as the existence of fillers like *um* and *uh* are used by listeners to ascertain the magnitude of an upcoming disfluency in continuous speech (Fox Tree 2001). Neither Bell's nor Eckert's theory makes an unambiguous prediction about the representation of these meanings cognitively. Just as with Labov, the cognitive representation of style in Bell's framework might be a representation of a set of shared expectations of how speakers would tailor their behaviors to effect a particular relationship with a listener. This would be roughly analogous to Pierrehumbert and Hirschberg's (1990) theory of intonational meaning, which is formalized as a set of expectations about how listeners will cue the status of information in an ongoing discourse. Though the emergence of different phonetic patterns would follow from speakers' intentions to effect a specific relationship with their audience, the relationship between the speech behaviors and the intended relationship would presumably be conventional, in the sense that all members of the community would learn the arbitrary relation between the behavior and the relationship. Similarly, Eckert's focus on stylistic variation as a set of resources available to the community implies that the meanings of different styles would be conventional. For example, for the production of a tense variant of /æ/ to be an effective community resource to convey a particular sexuality, Minnesotan English speakers would have to have a conventional association between that variant and that sexuality.

Another commonly discussed category of sociolinguistic variation is the *stereotype*; that is, listeners may hold overt beliefs about the ways that different social groups produce sounds. Stereotypes are a more specific type of variation than styles, and indeed the use of a stereotype can be part of a linguistic style. A number of examples of stereotypes can be found in the literature, including Munson and Zimmerman's (2006) finding that listeners in Minnesota associate frontal non-sibilant "lisped" variants of /s/ with gay-sounding

speech, despite the fact that Munson et al.'s (2006b) research showed that gay men in Minnesota do not produce these variants, at least in laboratory speech. This laboratory result corresponds to an often very strongly overtly held belief that gay men produce a fronted "lisped" /s/. Similarly, Niedzielski (1999) showed that listeners in Detroit hold tacit beliefs about the way that Detroiters and neighboring Canadians produce the vowel in the second syllable of the word *about*. Their beliefs about the ways that Detroiters produce this vowel (as revealed through performance on a perception task) appear to reflect stereotypes about Detroit speech, rather than ways that speech is actually produced in Detroit. Specifically, Detroiters labeled vowels as if they believed that Detroit speakers were not engaged in the Northern Cities Vowel Shift, while production studies showed that they in fact were.

The separation of variation into style and stereotypes has provided a useful framework for understanding some differences in the meaning of sociophonetic variants. In particular, we have some idea of the variation of types of social meanings, and the uses to which social meanings are put, and that in at least some cases, they are conventional. However, there are still a number of unresolved questions regarding the precise nature of these meanings. Some of these questions arise because the discussion of social meaning in the field of sociolinguistics and the discussion of other types of meaning in formal semantics have been conducted independently. Thus, questions like "is social information in the lexicon" remain unanswered, while parallel questions about whether other types of meanings reside in the lexicon have been examined in detail. Simply put, we don't know where social meanings fit in the kinds of taxonomies of meanings that semanticists have developed. Thus, we turn to formal semantics to learn about meaning in the linguistic system and the lexicon, and try to apply that knowledge to social meaning.

### **3. Formal semantics**

Most studies of sociophonetics or of laboratory phonology more generally do not incorporate a comprehensive view of semantics into their models. This is largely for practical reasons: it would be difficult to advance in any given field if many questions from another field had to be answered first. It is common, however, to reference semantics as a sort of "black box" to which other levels of linguistic process may have access. For example, Taft (2008) includes a model of orthographic word recognition that includes a phonological level, an orthographic level, and a semantic level, which he calls "form." While the former two levels include some representation of their contents (graphemes, phonemes, etc.), the latter is left as an abstract box that presumably contains some sort of information about the meanings of sets of sounds or letters (in his presentation, Taft suggests that semantic features make up "form").<sup>1</sup>

Formal semantics, however, is a well-developed discipline in linguistics, and semanticists have developed a number of tools that may be of use to those interested in social meaning. The primary tool of semanticists is the evaluation of *entailments*. Entailment is a logical relationship between the meanings of two sentences: if sentence B is necessarily true whenever sentence A is true, then the meaning of sentence B is entailed by the meaning of sentence A. Consider the example sentences in (1)–(3).

- (1) Exactly three students passed the test.
- (2) At least one student passed the test.
- (3) Exactly three students ate ice cream.

Whenever (1) is true, it is necessarily the case that sentence (2) is true—it is impossible for three students to have passed the test without at least one student passing the test. Thus, the meaning of sentence (1) entails the meaning of sentence (2). On the other hand, (1) does not entail (3): while it might be the case that any student who passed the test ate ice cream, making sentence (3) true if sentence (1) is true, it is clearly not *necessarily* the case that three students ate ice cream just because three students passed the test.

Evaluating sentences with respect to the truth of their meanings, as we do with entailment, is what makes “formal semantics” formal; though it is based on intuitions, interpretations can be represented symbolically. Formal semantics is sometimes contrasted with “lexical semantics,” in which, instead of evaluating the truth-conditions (i.e., which situations make a sentence true) of an entire sentence, the focus is on the meanings of individual words as well as their relationships to one another, such as synonymy. For example, WordNet, with its groups of words related to concepts, is in the tradition of lexical semantics. The division between formal and lexical semantics is an unfortunate misnomer, however, in that some formal semanticists work on the interpretation of single lexical items (e.g., *even* or *only* or *the*), and some lexical semanticists use formal or compositional tools in their search to find the denotations of lexical items. Thus, one could be both a formal and lexical semanticist. Though the non-formal lexical approach may be more familiar to the laboratory phonology community, in this paper, we will follow the tradition of formal semantics because it has provided the tests that will be useful in this investigation.

Entailments are useful to semanticists for a number of reasons. For example, two different sentences can be shown to have the same meaning if they have the same entailments. Also, as we’ll describe in more detail later, different kinds of meanings can be distinguished on the basis of entailments, as, for example, in the negation test where whether a meaning is a presupposition (one type of meaning) depends upon the entailments of a negated version of a particular sentence meaning. Because entailments serve to distinguish different



kinds of meaning, it is our hypothesis that they can be useful in classifying social meaning, as well.

We have seen above, in the definition and illustration of entailment, that it uses the language of logic: “necessarily”. If B is necessarily true whenever A is true, then B can be inferred to be true 100% of the time when A is. However, there is a difference between the domain of logic and the domain of experimentation. In the experimental domain, few things, including inferences, are ever true 100% of the time.<sup>2</sup> Participants in a study are free to imagine situations or interpretations that experimenters may not have intended to include, which may compromise the expected nature of entailments; few studies have directly tested how often participants actually interpret logically entailed propositions as being necessarily true, and those that have (e.g., Politzer 2007) do not show that participants interpret entailments as being entailed 100% of the time. Generally, in experiments, statistical significance is used to show an unusually high correlation. Thus, throughout this study, we will take a statistically significant correlation between the truth of sentence meanings A and B to indicate that whenever A is true it’s very likely that a speaker would take B to be true as well, i.e. to indicate a likely (or probable) semantic entailment relation.<sup>3</sup> We will return to this issue and discuss possible concerns about calling social meanings ‘entailments’ in Section 4.1 and Section 4.2.

We turn now to an examination of the first major divide that semanticists make between kinds of meaning: conventional versus conversational meanings.

### 3.1 *Conventional vs. conversational meaning*

The first divide that semanticists make between kinds of meaning is based on whether a meaning is consistent across different discourse contexts; this divide labels all meanings as either *conventional* or *conversational*. A discourse context is the *common ground* of a discourse, along with the set of *Questions Under Discussion* (QUDs) in the discourse. The common ground consists of “a situation that includes a speaker with certain beliefs and intentions, and some people with their own beliefs and intentions to whom the [speaker’s] assertion is addressed” (Stalnaker 1978:147), along with the content of the sentences that have so far been uttered in the discourse. A QUD is a question accepted by the interlocutors as the immediate topic of discussion (Roberts 1996). Note that a QUD does not have to be explicitly phrased as a question, but asking an explicit question is the easiest or most direct way of determining the QUD, so for purposes of exposition we will use explicit questions to establish the QUDs in this paper.

The conventional meaning of a linguistic item is always present when that linguistic item is used, regardless of the discourse context in which the item is uttered. A conventional meaning of a word contributes to the conventional



meaning of a sentence that contains it. The word's conventional meaning makes the same contribution to sentence-level meaning regardless of what sentence, common ground, or QUD it is uttered in. The conventional meaning of a sentence entails other sentence-level meanings that do not vary under different discourse contexts. Because these meanings are arbitrary (Saussure [1915] 1983), they must be stored in the lexicon along with information about the sound string they are arbitrarily tied to.

Conversational meanings, on the other hand, may change according to the discourse contexts in which items are uttered.<sup>4</sup> Because of this variability and dependence on context for interpretation, such meanings cannot be stored in the lexicon.<sup>5</sup> As an example, consider the scenarios below in which sentence (4) might be uttered.

*Context A: Do students ever switch subfields?*

(4) Kathleen, a phonologist, stopped studying syntax.

*Context B: Do all linguists study all subfields?*

(4) Kathleen, a phonologist, stopped studying syntax.

Because we attempt to understand utterances as relevant to the QUD, someone hearing (4) in context A will assume that the speaker meant for (4) to answer their question and deduce that some students do indeed switch subfields (Roberts, 1996). This is a conversational implicature that is part of the meaning of (4) in the given context (A). In Context B, however, sentence (4) means (in part) something like “not all linguists study all subfields,” and crucially does *not* mean “students sometimes switch subfields.” This difference in meaning is clearly not inherent to the sentence itself (because the same sentence is used in both cases), but rather is due to the difference in context (in this case, differing QUDs). As such, these meanings (“students sometimes switch subfields” or “not all linguists study all subfields”) are conversational meanings of the sentence.

Thus, one means of determining whether sociophonetic meaning is also lexical is to determine whether it, too, is conventional and arbitrary. Note that this methodology thus approaches the strong hypothesis that *anything* that is both conventional and arbitrary about language use would be stored in the lexicon, an issue about which there is much debate. As Jackendoff (2002:282) points out, however, finding a particular dividing line between formal semantic knowledge and general knowledge is difficult; he concludes that “we must consider the domain of linguistic semantics to be continuous with human conceptualization as a whole.” For the purposes of the present paper, in which we are simply trying to introduce a new approach to determining the lexicality of social information, we will assume that linguistic items that pattern like things that are already assumed to be lexical may be lexical themselves. If it is shown either that there are significant differences between sociophonetic variables

and lexical information, or that neither sociophonetic variables nor items that we currently think are lexical should be in the lexicon, then of course our position will have to change. As a starting point, however, we will take the strong hypothesis. In addition to demonstrating that the meanings of sociophonetic variables are conventional and arbitrary (this section), we will go one step further and demonstrate that they in fact behave similarly to a specific type of conventional meaning identified by formal semanticists as “secondary entailments” (Section 3.2, Section 4), thus further supporting our working hypothesis that social meaning should also be considered lexical. Note that this definition of the lexicon, as a list of all conventional and arbitrary sound-meaning pairs, excludes both conversational meanings, which cannot be stored in the lexicon because they change based on previous sentences within a discourse, and so-called “natural meanings,” which are meanings that are communicated without intention—e.g., red bumps communicating the presence of chicken pox or measles; see Grice (1957).

Figure 1 shows the basic classification of meaning: the first divide is between natural and non-natural meaning. Within non-natural meaning, there is both linguistic and non-linguistic meaning (an example of a non-natural, non-linguistic meaning would be knocking three times on the window to indicate you have arrived). Within linguistic meaning, there is both conversational and conventional meaning. Only conventional linguistic meaning is thought to be lexical. Thus, the first step in determining whether sociophonetic meaning is lexical is to determine if it is also conventional.

The first question to ask, then, is whether sociophonetic meaning is conventional or conversational. While the fact that conversational meanings are sometimes associated with pragmatics and the use of different contexts might make it seem intuitive that social meaning is conversational, previous sociophonetic research gives us reason to think that this is not the case. While the evidence is not definitive, many previous studies have suggested that at least

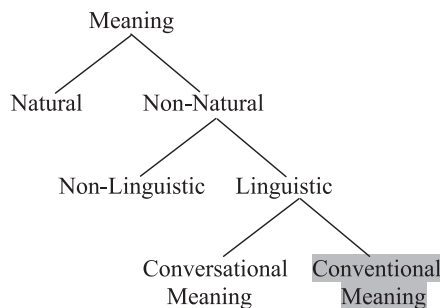


Figure 1. *Basic classification of meaning (cf., Grice 1957). Only conventional linguistic meaning, shaded in gray, is thought to be lexical.*

some types of social meaning are consistent across contexts (see also the discussion in Section 2.2). For example, Purnell et al. (1999) demonstrated that individuals can infer social-group membership from distinctive patterns of phonetic variation by showing that listeners readily associate ethnicities with different tokens of the word *hello* produced by a trained speaker emulating the phonetic characteristics of mainstream “white” English, Spanish-influenced English, and African American English.

This and other perception studies show consistent sound-category variant associations, giving at least partial evidence that social meaning is not conversational. However, Purnell et al. (1999) tested the consistency of an association across listeners rather than across contexts, which, while indicating conventionality, does not prove it conclusively. Like others, this study “controls” for context by not providing one. Further work needs to be conducted to see whether the association between a particular sound and social category (or categories) disappears in certain kinds of contexts. Campbell-Kibler (2006, 2009) is working in this direction and has shown that the use of different variants of the (ING) variable (e.g., *workin’* as opposed to *working*) can in fact be interpreted differently across contexts. While Campbell-Kibler found several consistent associations between the use of *-in* vs. *-ing* (including perceived level of intelligence, education, and regional background), these consistent associations were (1) not always present for all talkers and/or listeners and (2) somewhat malleable based on other cues that may have been present, leading Campbell-Kibler to suggest that the meaning of social variants may in fact be an “indexical field,” or a “network of related concepts” (2009: 148–149). It is unclear, however, whether the multiple interpretations of the variants of (ING) are due to some special status of social variables in general or whether they should be thought of as *sociophonetic homophones* (Keith Johnson, p.c.): the *-in* variant might conventionally mean both “less educated” and “from the South” (as well as the many other terms that Campbell-Kibler’s participants used to describe the use of this variant) just as *bank* can mean “financial institution” or “land next to a river,” with context serving to disambiguate these meanings.

What is clear, however, is that while the elements within this indexical field are somewhat disparate, they are all based on conventional, arbitrary associations between a particular pronunciation and a set of characteristics of the person who uttered it. This is evidenced by the fact that there are limitations on the associations that listeners make and that there are certain consistencies across listeners about the types and directions of associations.

It should be noted, however, that a relatively consistent association of a sociophonetic variant with a social meaning can have a number of different causes and interpretations. First, a speaker may or may not *intend* to convey a particular social meaning by using a particular phonetic variant. A speaker who is from the South but who does not know much about regional phonetic

variation may not be aware that using [ɑ:] where standard American English would use [ɑɪ] means “Southernness”, and thus use it simply as his way of indicating a particular vowel, and not as an indication of his geographic origins (though a listener who is aware of this conventional association might nonetheless perceive his speech as being particularly Southern). Furthermore, someone who is not from the South and has no intention of trying to get people to believe that s/he is from the South might nevertheless use [ɑ:] more frequently over the course of a conversation with a Southerner as a way of accommodating that person’s speech style. Although the speaker’s intention may not be to sound Southern *per se*, our point is that because of the consistent association (and, we propose, its conventionality), a bystander, hearing the non-Southerner use [ɑ:] and not knowing that that person is accommodating, might walk away with the impression that that person is in fact from the South. Of course, there may also be instances in which a speaker is indeed from the South and fully intends to mean “Southernness” as part of their speech, as, for example, the politician who proclaims “I’d [ɑ:d] like [lɑ:k] to welcome all y’all from my [mɑ:] home state!”

Second, sociophonetic variables may be manipulated by a speaker for various communicative effects. For example, a speaker who is not in fact from the South may substitute [ɑ:] for standard [ɑɪ], in imitation of Southern speech. A listener may or may not be convinced by this use, depending on other characteristics within the speaker’s utterances and whether the listener has prior knowledge of where the speaker is from or what they usually sound like. However, the common thread through all of these situations is that the speaker and listener know that the use of [ɑ:] instead of [ɑɪ] in some way means “Southernness”—regardless of whether this meaning is accurate in the sense of indicating the true geographic origins of the speaker. In other words, there is a conventional and linguistically arbitrary association between the phonetic variant [ɑ:] and some indexical field that revolves around Southernness. It clearly is not the case that using [ɑ:] means that the speaker is from the South—the speaker could be accommodating, imitating, or accidentally reproducing Southern speech—but there is nonetheless a link between the use of [ɑ:] and sounding Southern. One of the pursuits of sociolinguistics, then, is to determine the range of possibilities for what is involved in “meaning ‘Southernness’”. Semanticists, on the other hand, can tell us what the grammatical properties of this meaning are: that if a phonetic variable “means” a particular characteristic, then those characteristics will behave in ways similar to other semantic meanings that are triggered by linguistic cues.

### 3.2 Types of conventional meaning

By now we are familiar with the primary difference between conventional and conversational meaning: conventional meanings are invariant across discourse

contexts. Consider again the example scenarios in which sentence (4) could be uttered, repeated from above for convenience.

*Context A: Do students ever switch subfields?*

(4) Kathleen, a phonologist, stopped studying syntax.

*Context B: Do all linguists study all subfields?*

(4) Kathleen, a phonologist, stopped studying syntax.

In both contexts, part of the meaning of (4) is “Kathleen stopped studying syntax.” This part of the meaning is independent of the context in which the sentence is uttered (because it is present not just in the two contexts given, but also any others we might think of in which (4) is true), and is therefore part of the conventional meaning of the sentence. This type of meaning, then, is built up exclusively via lexical meanings or so-called ‘meaning postulates,’ a kind of lexical rule (which are all in the lexicon). There are, however, two main sub-types of conventional meaning, both of which are considered to be in the lexicon (see Potts 2005): *primary entailments* and *secondary entailments*.<sup>6</sup> Note that the term *entailment* is thus somewhat ambiguous: when used in isolation, it is the general term used for the relationship between sentences; when used in the phrase “primary entailment” or “secondary entailment” it refers to the proposition (sentence-level meaning) that is entailed.

Primary entailments are the main assertions of a sentence and usually answer the QUD in the discourse (Roberts 1996), so long as the speaker is being cooperative. For example, “Kathleen stopped studying syntax” is said to be the primary entailment of sentence (4), *Kathleen, a phonologist, stopped studying syntax*. Whenever (4) is true, it must be the case that Kathleen stopped studying syntax.

Secondary entailments, on the other hand, do not usually address the QUD, although, as Potts (2005) makes clear, they are also entailments of a sentence.<sup>7</sup> For example, sentence (4) has the following secondary entailments: “Kathleen once studied syntax” (a presupposition), “Kathleen is a phonologist” (a conventional implicature), and “Kathleen exists” (another presupposition). All of these are true if it is true that “Kathleen, a phonologist, stopped studying syntax,” but they are not the main assertions of that sentence (presuppositions and conventional implicatures are the two main kinds of secondary entailments). Again, however, their invariance across contexts leads semanticists to believe that they are conventional meanings. In addition to Potts’ work on the lexicon that includes the lexical building blocks of both primary entailments and conventional implicatures, the structure of the lexicon that includes presuppositions goes back to Karttunen (1973) (though the notion that secondary entailments, like other conventional meanings, are arbitrary, which puts them in the lexicon, goes back to Frege).

The question now is, does social meaning pattern like a primary entailment, like a secondary entailment, or like neither one?<sup>8</sup> Although semanticists do not

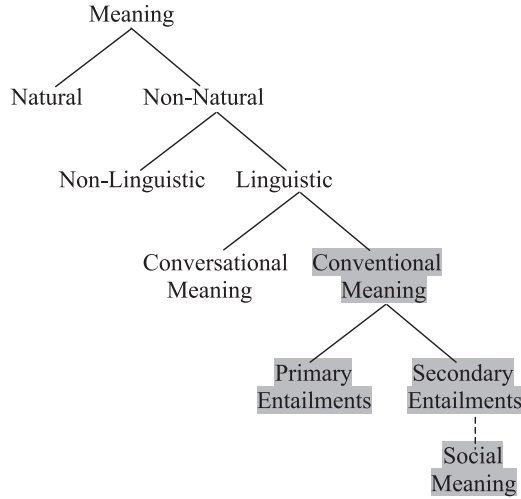


Figure 2. *Basic classification of meaning, with multiple types of conventional meaning added. Social meaning, by hypothesis, is listed as a type of secondary entailment, making it conventional and lexical.*

currently have a category of meaning that is both conventional and yet not either a primary or secondary entailment, such a category might theoretically exist. Thus, in order to show that social meanings might be considered lexical, we need to demonstrate that they pattern either like primary entailments or like secondary entailments. Figure 2 shows the same meaning diagram as Figure 1, but with the sub-types of conventional meaning added. Anticipating our hypothesis, the diagram places social meaning under the heading of secondary entailment.

#### 4. Testing primary entailments vs. secondary entailments

There are a number of tests that semanticists use to distinguish primary entailments from secondary entailments.<sup>9</sup> We will examine two of these in some depth, and illustrate how they can be applied to social meaning (Section 4.1, Section 4.2); Section 4.3 briefly outlines a few other possible tests that could be used in future research.

##### 4.1 *Answers to yes/no questions*

One property that distinguishes primary entailments from secondary entailments is, as mentioned above, whether they respond to the QUD; recall that only primary entailments address the QUD. Therefore, only primary entail-

ments can be rejected by a listener using direct negation such as “no, that’s not true.” Direct negation is not appropriate for secondary entailments, which instead must be called into question indirectly—for example, with a statement like “Hey, wait a minute, I didn’t think that was true.” Thus the first test used to distinguish these two types of conventional meaning is called the “Hey Wait a Minute” Test (HWAM); see Shannon (1976), von Stechow (2004), *inter alia*. According to the HWAM test, if a speaker says *p*, the hearer can respond “hey, wait a minute, I didn’t know *q*!” if and only if *p* presupposes *q*.<sup>10</sup>

Consider once again sentence (4).

(4) Kathleen, a phonologist, stopped studying syntax.

We said above that all of the following are conventional meanings of (4); that is, that they are entailed by (4) and therefore must be true if (4) is true:

- (5) Kathleen stopped studying syntax. (primary entailment)
- (6) Kathleen is a phonologist. (secondary entailment: conventional implicature)
- (7) Kathleen once studied syntax. (secondary entailment: presupposition)

If a talker utters (4) as being true, and her listener disagrees about any of (5)–(7), the listener can negate any of the entailments. Crucially, however, this negation takes a different form for (5) than it does for (6) and (7). In order to negate the primary entailment in (5), the listener can say (5’):

(5’) No, she didn’t stop studying syntax.

This is a direct negation of the primary entailment and is an acceptable response. However, a similar direct negation of (6) or (7) would be unacceptable, as marked by the use of a hash sign:

- (6’) # No, she isn’t a phonologist.
- (7’) # No, she never studied syntax.

Instead, in order to negate these secondary entailments, the listener must use an indirect negation, as illustrated in (6’’) and (7’’).

- (6’’) Hey, wait a minute, I didn’t know that she was a phonologist.
- (7’’) Hey, wait a minute, I didn’t know that she studied syntax.

Thus, the HWAM test distinguishes between primary entailments and secondary entailments. It can easily be applied to sociophonetic variables in order to determine whether social meaning is more parallel to a primary entailment or to a secondary entailment—and if neither type of negation is appropriate, then we might conclude that social meanings are unlike both types of conventional meaning. Though it may seem intuitive that social meanings are not like primary entailments, it is important to establish this formally. Section 3.1 of this paper demonstrated that social meanings appear to be conventional;



we are now therefore attempting to show concretely which type of conventional meaning they are most similar to.

As an example of how the HWAM test can be applied to social meaning, recall that a monophthongized realization of /aɪ/ as [ɑ:] means “Southernness” in American English (Plichta and Preston 2004). If this social meaning is a primary entailment, then we would expect that the Southernness association can be directly negated. On the other hand, if it is a secondary entailment, then we would expect that the Southernness association could only be negated indirectly. Consider the following scenario:

*Context: Person A orders pie. Person B asks:*

(8) Oh, is [pa:] their specialty?

In order to negate the Southernness association directly, Person A could respond “No, you’re not from the South.” In order to negate the Southernness association indirectly, Person A could respond “Hey, wait a minute, I didn’t know you were from the South.”

To determine which type of negation (if any) is acceptable for this sociophonetic variable’s meaning, we conducted a pilot survey, using a questionnaire to gather native speaker intuitions about different possible responses to two yes/no questions with monophthongized or diphthongized /aɪ/ vowels. As an example, respondents to the survey were given a context like the following:

*Two Ohio State University freshmen who live on the same hallway but haven’t interacted much decide to go out for lunch soon after the school year begins. Person A orders pie. Person B asks:*

Participants then heard a sound file of a talker saying either *Oh, is [paɪ] their specialty?* or the same talker saying *Oh, is [pa:] their specialty?* They were then given a list of possible responses that Person A could make and asked to indicate which of those responses they thought were appropriate (picking as many or as few as they wished):<sup>11</sup>

- i. No, it’s the chocolate cake.
- ii. Wait a sec—are you from the South?<sup>12</sup>
- iii. No, you’re not from the South.
- iv. Hey wait, it’s the chocolate cake.

The second stimulus set consisted of the following:

*Two OSU freshmen who live on the same hallway have both decided to go the first away football game. Person A asks:*

Participants heard a sound file of a talker saying either *Hey, do you need a [raid]?* or the same talker saying *Hey, do you need a [raɪd]?* The possible responses were:

- i. What? You're from the South?
- ii. Hang on, I already have one.
- iii. No, I'm covered, thanks.
- iv. No, you're not from the South.

If the predictions of the HWAM test are borne out, participants should prefer direct responses (e.g., (i), “No, it’s the chocolate cake”) to the primary entailment (the question about pie being their specialty) and disprefer indirect responses (e.g., [iv] “Hey wait, it’s the chocolate cake”). These preferences should not depend on whether the question is produced with a monophthongal or a diphthongal /aɪ/.

Additionally, if our hypothesis is correct that the meaning of Southernness of the monophthongal /aɪ/ vowel patterns like a secondary entailment, then the HWAM test would predict that participants should prefer indirect responses (e.g., [ii], “Wait a sec—are you from the South?”) and disprefer direct responses (e.g., [iii], “No, you’re not from the South”). If the question is posed with the diphthongal variant of the vowel, however, we anticipated that there would be no particular cue to Southernness in the question, thus making both of these answers dispreferred.

Preliminary results from seven native English-speaking graduate students at the Ohio State University suggest that these predictions are indeed borne out, as illustrated in Figure 3 below (because of the small number of stimuli and participants, we refrain from applying formal statistical tests). Note that all seven subjects thought that a direct response to a primary entailment was appropriate, and only one thought that an indirect response to a primary entailment was (across both stimuli). None of the participants thought that a direct response was appropriate to the hypothesized secondary entailment (meaning “Southernness”), but about half of the participants (four for the first stimulus and three for the second stimulus) did think an indirect response was appropriate as long as the vowel was a monophthong. When the vowel was a diphthong, only one of the participants thought the indirect response about Southernness was appropriate, indicating that the use of the monophthongal variant did indeed have some sort of association with “Southernness” in the minds of our participants.<sup>13</sup>

As mentioned above, the expected behavior of an “entailment” would be that participants would *necessarily* interpret the use of monophthongal [a:] for /aɪ/ as meaning “Southernness”; our preliminary results indicate only that on average, participants think that it is preferable to call a person’s Southernness into question using indirect negation than direct negation. Given that not all participants judged the indirect response to be appropriate, and that we did not ask about the necessity of the Southern meaning, this experiment does not address this aspect of our hypothesis. However, several of our participants clearly did interpret the monophthong as meaning “Southernness”, and our

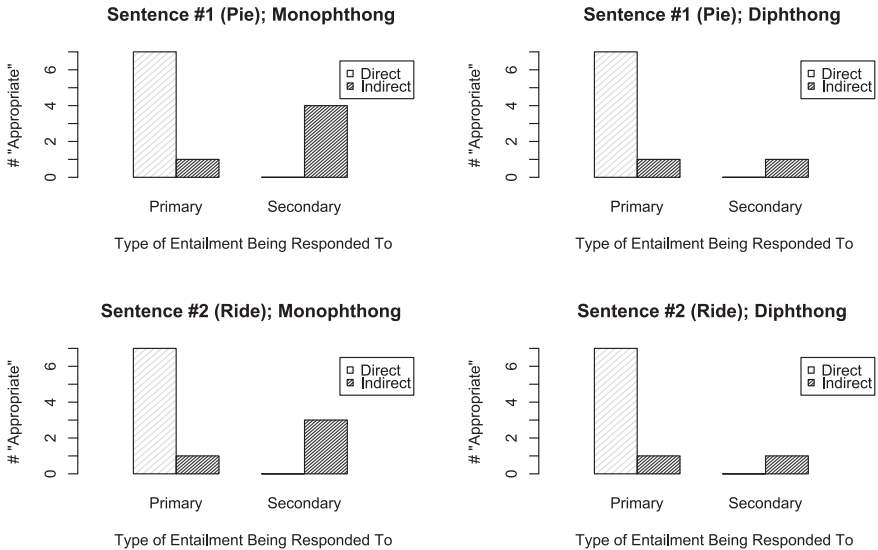


Figure 3. Results from a pilot study testing the preferences for direct vs. indirect responses to primary vs. secondary entailments. The height of the bars indicates the number of participants (out of a total of seven) who deemed the response type (indirect vs. direct) “appropriate” as a response to the given question, as a function of whether the response was responding to the primary or the secondary entailment of the question.

results do indicate that this meaning can be indirectly negated, just as a secondary entailment can.

Thus, these results indicate that this social meaning patterns like a secondary entailment and not like a primary entailment: it should be responded to with an indirect rather than a direct response type. This experiment is clearly a preliminary step rather than conclusive evidence, but it (a) demonstrates that our own intuitions are shared by at least a few other native English speakers and (b) serves as an illustration of the means by which our hypothesis can be experimentally implemented. In follow-up work to extend this initial experiment, care should be taken to expand the stimuli set and participant pool, as well as to refine the stimuli based on the results of this pilot study. Any other conversational biases in the stimuli (e.g., participants associating “pie” with the South) should be avoided. Furthermore, a wider variety of sociophonetic variables should be tested—for example, ones that are part of a style as opposed to being a stereotype like Southern monophthongization—to determine whether all sociophonetic variables pattern similarly.

#### 4.2 The “Family of Sentences” test

As mentioned above, there are a number of other tests that semanticists use to distinguish primary entailments from secondary entailments. Another particu-

larly common test is actually a set of tests known as the “Family of Sentences” test, which evolved from Frege (1896). These tests rely on the fact that certain types of grammatical contexts “cancel” primary entailments but allow secondary entailments to survive (“project” is the usual semantics term for this kind of survival). Negation is one example of this kind of grammatical context. Compare the now familiar sentence (4) with its negation in (9):

- (4) Kathleen, a phonologist, stopped studying syntax.
- (9) Kathleen, a phonologist, did not stop studying syntax.

Recall that “Kathleen stopped studying syntax” is the primary entailment of sentence (4), while “Kathleen is a phonologist” and “Kathleen once studied syntax” are secondary entailments. In the negated form, (9), the primary entailment “Kathleen stopped studying syntax” is no longer true (in fact, it’s what is being negated)—the primary entailment has been canceled. The secondary entailments, however, are still true—they survive. That is, it is still the case in (9) that Kathleen is a phonologist and that she once studied syntax, even though it is no longer the case that she has stopped studying syntax.

Other grammatical contexts show this same behavior with respect to canceling primary entailments while allowing secondary entailments to survive. For example, questions, antecedents of conditionals, possibility modals, and imperatives are all environments in which only secondary entailments are thought to survive. This pattern is shown by Table 1.

If social meanings pattern like secondary entailments and not like primary entailments, as hypothesized here and suggested by the results of the HWAM pilot test in Section 4.1, then the same survival behavior should be found with them. For example, (10) contains a monophthongal /aɪ/ that should be associated with the speaker’s meaning “Southernness”; (11) is the negated version of that sentence. If the social meaning is a secondary entailment, it should be the case that in both (10) and (11), the speaker is meaning “Southernness”; the negation should not cancel this social meaning. Similar examples can be constructed for the other relevant grammatical contexts; these are shown in Table 2.

- (10) Ben, a professor, rides [rɑːdz] his scooter to work every day.
- (11) Ben, a professor, does not [rɑːd] his scooter to work every day.

As can be seen by comparing the pattern of cancellations versus survivals in Table 2, the social meaning that the monophthongal variant means “Southernness” behaves in the Family of Sentences test in exactly the same way that secondary entailments behave, surviving in all sentence types. Again, then, we have evidence that social meanings may in fact be analogous to secondary entailments (at least insofar as semanticists have developed tests for secondary entailments).

The check marks in the final column of Table 2 are, like the ones in the other columns, determined simply by our own introspection as native speakers

Table 1. *Illustration of the Family of Sentences test, as used in formal semantics to differentiate primary and secondary entailments.*

<i>Sentence</i>	<i>Test</i>	<i>Things that might follow from the sentence.</i> ✓ = “survives” ✗ = “cancelled”			
		Kathleen stopped studying syntax. (Primary Entailment)	Kathleen exists. (Secondary Entailment: Presupposition)	Kathleen is a phonologist. (Secondary Entailment: Conventional Implicature)	Kathleen at one time studied syntax. (Secondary Entailment: Presupposition)
<i>Kathleen, a phonologist, stopped studying syntax.</i>	(Base sentence)	✓	✓	✓	✓
<i>Kathleen, a phonologist, didn't stop studying syntax.</i>	Negation	✗	✓	✓	✓
<i>Did Kathleen, a phonologist, stop studying syntax?</i>	Question	✗	✓	✓	✓
<i>If Kathleen, a phonologist, stopped studying syntax, I'll eat my hat.</i>	Antecedent of a Conditional <sup>14</sup>	✗	✓	✓	✓
<i>It's possible that Kathleen, a phonologist, stopped studying syntax.</i>	Possibility Modal	✗	✓	✓	✓
<i>Tell that phonologist Kathleen to stop studying syntax!</i>	Imperative	✗	✓	✓	✓

of American English. It is possible, however, to implement the Family of Sentences test in a laboratory setting. We anticipate doing this for both the standard-issue secondary entailments of formal semantics and for social meanings, but in the current paper, we present for illustrative purposes only the results of a pilot study on the social meaning aspect of this test. In this experiment, we asked listeners to rate how surprised they would be to learn that a talker had a particular social characteristic, based on a spoken sentence. The sociophonetic variable used in this experiment was the association of a low, retracted /æ/ vowel with the speech of gay rather than straight men in Minne-

Table 2. Illustration of the Family of Sentences test, applied to a sociophonetic variable.

Sentence	Test	Things that might follow from the sentence. ✓ = “survives” ✗ = “cancelled”			
		Ben rides his scooter to work every day. (Primary Entailment)	Ben exists. (Secondary Entailment: Presupposition)	Ben is a professor. (Secondary Entailment: Conventional Implicature)	[ɑ:] means ‘Southernness’. (Unknown type)
<i>Ben, a professor, [ra:dz] his scooter to work every day.</i>	(Base sentence)	✓	✓	✓	✓
<i>Ben, a professor, does not [ra:d] his scooter to work every day.</i>	Negation	✗	✓	✓	✓
<i>Does Ben, a professor, [ra:d] his scooter to work every day?</i>	Question	✗	✓	✓	✓
<i>If Ben, a professor, [ra:dz] his scooter to work every day, I’ll eat my hat.</i>	Antecedent of a Conditional	✗	✓	✓	✓
<i>It’s possible that Ben, a professor, [ra:dz] his scooter to work every day.</i>	Possibility Modal	✗	✓	✓	✓
<i>Tell that professor Ben to [ra:d] his scooter to work every day!</i>	Imperative	✗	✓	✓	✓

sota (see, e.g., Munson et al. 2006a; Munson et al. 2006b; Munson 2007a, 2007b). As mentioned in Section 2.1, in perception tasks, listeners appeared to associate these variants with judgments of men’s sexuality. Henceforth in this paper we refer to the variant associated with judgments of gay-sounding speech as retracted /æ/, abbreviated rAE, and those associated with judgments of heterosexual-sounding speech as tense /æ/, abbreviated tAE.

In the pilot experiment, tokens of /æ/, both retracted and tense, were embedded into sentences that either had no grammatical environment that would cancel primary entailments (“basic sentences”) (n = 9) or were sentences that contained primary-entailment-canceling environments of the types shown in Table 2 (n = 9). Crucially, these primary-entailment-canceling environments do not cancel secondary entailments. The stimuli are listed in the Appendix.

Ten trained male speakers produced these eighteen sentences, once each with rAE and once with tAE, along with ten filler sentences that contained no tokens of /æ/. The filler sentences included both primary-entailment-canceling (“Family of Sentences”) and non-canceling environments. The /æ/ tokens were measured acoustically to validate that they differed in the expected directions. As is reported in Munson et al. (2009), the tAE variants had both a higher first-formant frequency than rAE at vowel midpoint and a more sharply negatively sloping second-formant trajectory over the first quarter of the vowel. The sentences were designed not to convey any obvious, overt information about the talker’s sexuality. They also excluded words containing the sounds /o/, /u/, or /s/, as these are also associated with actual and perceived sexual orientation in the North-Central dialect region, as shown by Munson et al. (2006a).

A total of 73 listeners participated. Of these, 33 had been born and spent most of their lives in the North-Central dialect region, and only the responses of these listeners are reported here. Their average age was 26.3 years (SD = 11.1 years). There were 23 women and 10 men. Listeners participated by completing an on-line questionnaire in which they heard each of the thirty sentences in pseudo-randomized order, hearing only one version (tense or retracted) of each /æ/-ful sentence. Listeners answered a set of three questions after each audio file, describing how surprised they would be to discover that the talker who had produced the sentence had a particular social characteristic. The sentences, and the questions associated with each sentence, are shown in the Appendix. There were five basic categories of question: sexual orientation (*straight, gay*), age (*under 20 years, over 60 years*), weight (*skinny, overweight*), smoking history (*chronic smoker, never smoked*), and mood (*good, bad*). Each of these categories was instantiated by two different possible questions: for example, for sexual orientation, the listener might be asked how surprised they would be to discover that the talker is gay, or they might be asked how surprised they would be to discover that the talker is straight. There were similar choices for each of the other categories, as listed above. For each follow-up question, listeners were asked to rate their surprise level on a Likert scale of 1 to 5, with 1 being “extremely surprised,” 3 being “not sure,” and 5 being “not at all surprised.” As shown in the Appendix, all of the listeners answered all ten questions, though not for each sentence. The association between the content of the spoken stimuli and the set of questions that was asked was the same for all listeners. One group of listeners (n = 14) heard a fixed set of half of the sentences with one /æ/ variant, and the other half with the other variant. Another group (n = 19) heard the opposite pairing. The two groups did not differ in the age of participants ( $F[1,31] < 1$ ,  $p > 0.05$ ) or in their sex composition ( $\chi^2_{[df=1]} = 1.815$ ,  $p > 0.05$ ).

After completing the experiment, participants reported demographic information, indicated how they had listened to the files (i.e., over headphones or



over speakers), gave a subjective rating of the audio quality, and indicated how often they had needed to repeat the audio prompts before providing an answer. The 33 talkers whose data were analyzed reported high quality and did not report repeating stimuli multiple times before making a judgment. For each listener, the average responses to the 10 questions were calculated separately for the two different /æ/ types. These were subjected to a variety of analyses. The first was a set of matched-sample t-tests examining the effect of /æ/ type on these questions. The results of these are shown in Figure 4. This figure indicates, rather surprisingly, that the difference between tAE and rAE was not consistently associated with a talker's sexual orientation. Instead, the difference was associated with other characteristics of personal well-being: tense [æ] was consistently and significantly associated with a talker's not being in a good mood, not having never smoked, not being skinny, being over sixty, and being overweight. Retracted [æ], meanwhile, was consistently and significantly associated with a talker's not being overweight, not being over sixty, being skinny, being in a good mood, and never having smoked. A subsequent experiment, described in greater detail in Smith et al. (2008), examined whether these characteristics were related to the content of the sentences. While those related to age and weight were, those related to smoking and mood were not. To the extent that the different sentences used invoked different social contexts, then, the use of tAE versus rAE appears to be conventional and not conversational, although the conventional association is to a different set of characteristics than was originally hypothesized. Subsequent work reported in Munson et al. (2009) showed that this apparent contradiction with Munson et al. (2006) was because the tense and retracted /æ/ in the second study had subtly different acoustic characteristics from the /æ/ productions in the earlier study.

Furthermore, we found that the consistent association of personal well-being characteristics did not vary across sentences that contained no primary-entailment-canceling environments as compared to those that did. For example, a sentence like (12), which contains no canceling environment, was judged to be produced by a talker with the same social characteristics as the talker who produced (13), in which the sociophonetic cue for these characteristics is grammatically negated. This is what we would predict if the tAE/rAE difference is a secondary entailment.

- (12) The cab [kæb] is coming at 10:30. (produced with a retracted [æ])  
 (13) He couldn't even pack [pæk] for the trip. (produced with a retracted [æ])

This latter result is somewhat difficult to confirm conclusively, however, because of the interaction between different lexical items contained in each sentence and different grammatical environments: each sentence is composed of different words and conveys a different compositional meaning (for example, the sentence "Pick up your hat!" does not mean the same thing as either "The

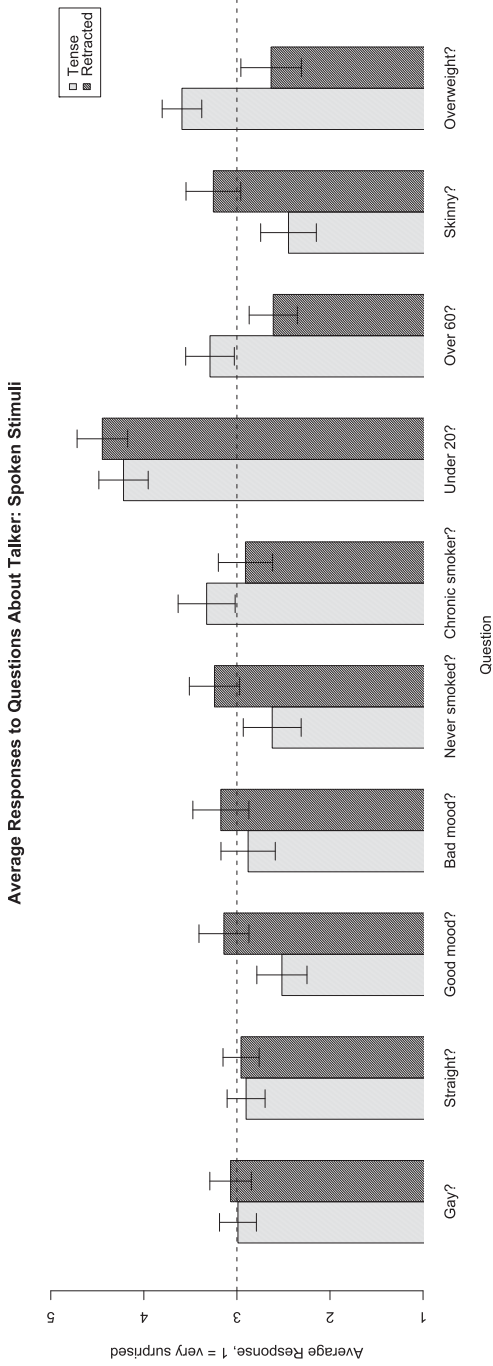


Figure 4. Average responses to the questions “How surprised would you be to learn that the speaker is . . . ?,” categorized by whether listeners heard tAE or rAE.

cab is coming at 10:30” or “He couldn’t even pack for the trip”). Thus we cannot be sure that it is the primary-entailment-canceling environment distinction that is relevant for the responses to questions about social characteristics, or whether it is something else about these sentences in particular (for example, that listeners think it is more likely for a chronic smoker to care about timeliness or packing for trips efficiently than a man who has never smoked, or vice versa).

To counteract this problem, we used general linear models (GLMs) to predict the listeners’ responses to each social characteristic question from either the grammatical environment of the sentences or the identity of the sentences, and compared these models for goodness of fit. If the model based on sentence identity is a better predictor of the listeners’ responses than the model based on grammatical environment, then we can assume that the grammatical environment does not in fact particularly matter, but that instead, certain sentences with similar grammatical environments happened to pattern together to give the illusion that environment is relevant. The two GLMs for each social characteristic question can be compared using an ANOVA. Table 3 presents the results of these ANOVA comparisons.

For almost every social characteristic we asked about, the GLM based on sentence identity proved to be a significantly better model than the GLM based on grammatical environment. Thus, for these sentences, there was no evidence that the grammatical environments of the sentences had any effect on responses, though the lexical content of the sentences may have (cf. Campbell-Kibler 2006, 2009). Given the hypothesis that social meaning might pattern like other secondary entailments, this is exactly what we expected to find: there should be no difference in the association of phonetic variant to social characteristic across grammatical environments. However, further experimentation that controls more carefully for sentence meaning needs to be

Table 3. *Comparison of GLMs based on individual sentences vs. grammatical type for each social characteristic.*

Social Characteristic	Comparison of Models (ANOVA of GLMs)	Significant difference between the two models?
Gay	F[297, 304] = -30.55; p = 0.02	Yes
Straight	F[297, 304] = -65.79; p < 0.001	Yes
Good Mood	F[165, 168] = -19.37; p = 0.007	Yes
Bad Mood	F[165, 168] = -76.09; p < 0.001	Yes
Never Smoked	F[165, 168] = -57.59; p < 0.001	Yes
Chronic Smoker	F[132, 134] = -0.14; p = 0.951	No
Under 20	F[132, 134] = -2.94; p = 0.398	No
Over 60	F[165, 168] = -58.71; p < 0.001	Yes
Skinny	F[132, 134] = -74.18; p < 0.001	Yes
Overweight	n/a <sup>15</sup>	n/a

conducted before any firm conclusions are drawn. Furthermore, there were two characteristics (“chronic smoker” and “under twenty”) in which the two GLMs were not significantly different. In other words, a model that predicted listener responses based solely on whether the sentence contained primary-entailment-cancelling environments performed as well a model that predicted responses based on the specific sentence being used, indicating that smoking/age characteristics might be less stable across grammatical contexts than other characteristics (though note that their counterparts, “never smoked” and “over sixty” did not show this lack of stability). Again, further testing is needed to clarify these results.

### 4.3 *Other tests*

Other tests for distinguishing primary and secondary entailments do exist, though they fall into two main types, each of which makes them less desirable for the purposes of this paper. The first type are those that are less well established in the literature or are less conclusive. As an example, Singh (2007:2) claims that “[i]t is odd to explicitly assert ignorance about X and then go on to presuppose X in the next sentence. . . . This prediction seems to be correct:

- (14) I don’t know whether John has a dog or not, but if he has a German Shepherd, I’ll invite him to the party.
- (15) #I don’t know whether John has a dog or not, but if his dog likes to play, I’ll invite him to the party.”

While we agree that (15) is odd, we’re not sure that this test really distinguishes presuppositions (and other secondary entailments) from primary entailments; we hypothesize that it is similarly odd to state ignorance about X and then to state X as a primary entailment, as in (16).

- (16) #I don’t know whether John has a dog or not, but John has a dog.

Using a conditional sentence to follow an expression of ignorance is crucial for the acceptability of examples such as (14), but the first clause of a conditional is not entailed by the conditional as a whole (as we saw with the Family of Sentences test), so this test may be a related restatement of the conditional Family of Sentences test. Thus, we are reluctant to use this test (and others like it) until they are more clearly motivated.

The second category of tests that we do not present here are those that distinguish different subtypes of secondary entailments. While demonstrating that social meanings pattern like a specific type of secondary entailment is of course evidence for their status as secondary entailments, we thought it preferable to start with the larger category first; we anticipate applying some of these other tests in future research to determine which type of secondary entailments social meanings are most like. For example, Potts (2007) presents a number of tests that expressives are said to pass but that other secondary en-

tailments should fail. One of these is paraphraseability: Potts claims that people have difficulty paraphrasing expressive meanings in that any chosen paraphrase does not seem to cover the whole range of cases. For example, the expressive “bastard” might generally be paraphrased as something along the lines of “vile, contemptible person,” but “this paraphrase misses its wide range of affectionate uses [17a], it wrongly restricts to humans [17b], and it is, in any event, much too strong in general for this particular lexical item” (176).

- (17) a. “Here’s To You, Ya Bastard!”  
b. “So my story begins with my X-Box [. . .] Unfortunately, the bastard won’t open. This is a problem.”

Intuitively, we feel that this difficulty in paraphrasing the meaning of an expressive is strikingly parallel to the difficulty we have in paraphrasing the meaning of a sociophonetic variable; as discussed in Section 3.1, there are many different possible causes and interpretations of these variables.

Similarly, another of Potts’ (2007) tests for expressives is repeatability. Repeating a primary entailment is redundant (e.g., “Kathleen is a phonologist. Kathleen’s a phonologist.”),<sup>16</sup> whereas repeating an expressive strengthens it (e.g., “Damn, I left my damn keys in the car”). Again, intuitively, we feel that sociophonetic variables pattern this way as well: using monophthongal [ɑ:] for /ɑ/ repeatedly in a sentence simply strengthens the association with Southernness, rather than making it redundant. As stated before, however, we wanted first to examine the viability of interpreting sociophonetic variables as secondary entailments at all, so we present here only the HWAM and Family of Sentences tests, and leave these further tests for future research.

## 5. Discussion

In this paper, we have illustrated how tests devised by semanticists to classify different kinds of meaning can be applied to sociophonetic variables. Such an application allows us to identify parallels between social meaning and other types of meaning, thus giving us insight into the question of whether phonetic information is stored with social information in the lexicon. The application of these tests to sociophonetic variables so far has indicated that at least some social meanings are similar to secondary entailments and thus should be stored in the lexicon. Figure 5, repeated from Figure 2 above, illustrates the classification of different kinds of meaning.

It should be noted that the thrust of our argument is that, in order to study social meanings, we should consider the discipline of linguistics that specializes in the study of meaning—i.e., semantics—and make use of the tools that semanticists have developed. This does not take away from the necessity of studying their social contribution and other properties as well; the point is that they have other linguistic attributes that have been overlooked. While we have

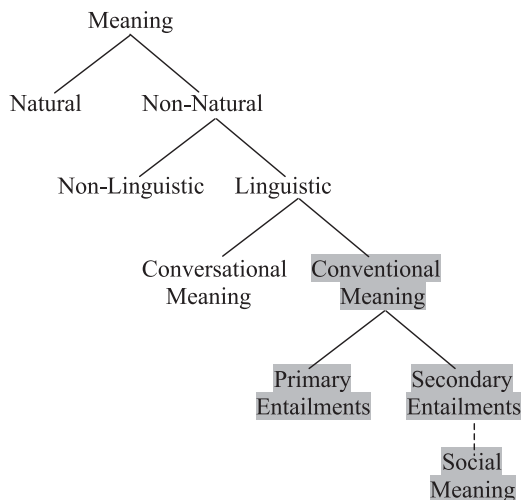


Figure 5. One possible classification of meaning according to formal semantics, and the hypothesized location of social meaning in such a classification. Elements on the tree that are shaded in gray are hypothesized to be lexical.

seen similarities between social meaning and secondary entailments, indicating that social meanings, too, should be considered lexical, there are also a number of caveats to this conclusion.

First, the conclusion that social meanings must be lexical because they pattern like secondary entailments derives from the fact that most theories of semantics place secondary entailments in the lexicon (see Potts 2005, *inter alia*). If it were definitively shown that secondary entailments must not be in the lexicon, based on some new definition of the lexicon, then we would suppose that the same would hold of social meanings. Our purpose here is to illustrate the parallels between social meanings and secondary entailments in order to make use of knowledge about secondary entailments; if what we know about secondary entailments changes, then its application to social meanings must also change.

Second, we should also be careful to look for *differences* between social meaning and secondary entailments, rather than assuming that some shared parallels make the two things the same in all respects. This is especially important given that, as mentioned in Section 3 and again in Section 4.3, there are in fact multiple types of secondary entailments in the semantics literature: presuppositions (and within presuppositions, a wide variety of proposed subdivisions) and conventional implicatures (and within conventional implicature, supplements and expressives). The study of the differences between these subtypes is a relatively new area of semantics, but we anticipate applying further semantic tests to the social meanings that parallel secondary entailments to

further determine which type of secondary entailment they are most similar to and whether they should constitute their own new category of secondary entailments. We make no claim about the sub-classification of sociophonetic variables in this paper; we are simply pointing out the similarities between sociophonetic meaning and secondary entailments, and using those similarities as an argument for including social meaning in the lexicon.

Third, we have barely scratched the surface of looking at sociophonetic variables and social meanings. We have no *a priori* reason to believe that all social meanings will be the same; like more traditional semantic meanings, there may be many different types of social meaning. Much further investigation needs to be done in order to confirm the parallels between social meanings and secondary entailments described here, to determine what the differences between them are, and to test other sociophonetic variables and other social meanings. A particularly interesting question is whether the meanings of variables associated with linguistic styles and linguistic stereotypes pattern differently. The monophthongization of /aɪ/, shown in this paper to pattern as a secondary entailment, is arguably a stereotype of Southern US dialects of English (one that does accurately reflect a phonetic characteristic of much Southern speech). In contrast, the lowering and retraction of /æ/ is arguably part of a gay-speech style in Minnesota, which also encompasses a number of other features, such as the production of /s/ with a highly negatively skewed spectrum and, to a lesser extent, the fronting of /u/. The fact that the Family of Sentences test was less conclusive than the answers to the yes/no question test may be due in part to the fact that these tests work best when evaluating stereotypes, or when evaluating sentences that contain stereotypic variants, or which contain all, or perhaps many, elements of a linguistic stereotype. Clearly, this requires a rigorous investigation, examining the nature of stylistic and stereotypic meanings separately.

Despite the preponderance of necessary future work, we have demonstrated that using semantic tests is a promising avenue of research to address questions about the meanings and lexicality of sociophonetic variants. The goal of this paper was to illustrate an approach to the investigation of these questions that utilizes a range of inter-sub-disciplinary tools within linguistics. In its course, we've raised additional questions, suggested experimental ways of testing the hypotheses created as a result of looking through a semantic lens, and seen that pilot results show an interesting relationship between secondary entailments and social meanings.

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## Appendix: Stimuli for the Family of Sentences Experiment

Sentence	Grammatical Environment	Target Question	Filler Questions
A <i>cat</i> would be better in an urban environment than a dog.	Basic sentence	Gay	<ul style="list-style-type: none"> <li>• Over 60</li> <li>• Bad mood</li> </ul>
Did he pinch Jill during the play? What a <i>brat</i> .	Basic sentence	Gay	<ul style="list-style-type: none"> <li>• Over 60</li> <li>• Chronic smoker</li> </ul>
Hitting <i>tab</i> may occasionally cause the computer to freeze.	Basic sentence	Gay	<ul style="list-style-type: none"> <li>• Skinny</li> <li>• Never smoked</li> </ul>
The <i>cab</i> is coming at 10:30.	Basic Sentence	Gay	<ul style="list-style-type: none"> <li>• Under 20</li> <li>• Chronic smoker</li> </ul>
The little boy on his mother's <i>lap</i> is really adorable.	Basic Sentence	Gay	<ul style="list-style-type: none"> <li>• Never smoked</li> <li>• Good mood</li> </ul>
If it becomes much colder in the lodge, the paint might <i>crack</i> .	Consequent of a conditional—in this instance, acting as a hole for secondary entailments	Gay	<ul style="list-style-type: none"> <li>• Overweight</li> <li>• Bad mood</li> </ul>
Watch out for the wet paint on the <i>path</i> there.	Imperative	Gay	<ul style="list-style-type: none"> <li>• Over 60</li> <li>• Overweight</li> </ul>
The new intern has no <i>tact</i> . He always teases the mail clerk.	Negation	Gay	<ul style="list-style-type: none"> <li>• Chronic smoker</li> <li>• Good mood</li> </ul>
Is Molly allergic to the <i>cat</i> ?	Question	Gay	<ul style="list-style-type: none"> <li>• Overweight</li> <li>• Good mood</li> </ul>
And then Tom remarked, "The <i>cap</i> was taken at the game."	(Direct quotation) <sup>17</sup>	Gay	<ul style="list-style-type: none"> <li>• Skinny</li> <li>• Chronic smoker</li> </ul>
I heard her <i>laugh</i> and wondered why she thought it was funny.	Basic Sentence	Straight	<ul style="list-style-type: none"> <li>• Under 20</li> <li>• Never smoked</li> </ul>
I was nearing the end of a really <i>bad</i> day when I learned I was caller number nine.	Basic Sentence	Straight	<ul style="list-style-type: none"> <li>• Never smoked</li> <li>• Bad mood</li> </ul>
She's one of these women who always claims to be <i>fat</i> .	Basic Sentence	Straight	<ul style="list-style-type: none"> <li>• Over 60</li> <li>• Good mood</li> </ul>
Then the guys behind me <i>tap</i> me in the middle of the film because they don't want me to keep talking.	Basic Sentence	Straight	<ul style="list-style-type: none"> <li>• Chronic smoker</li> <li>• Bad mood</li> </ul>
If the drywall begins to <i>crack</i> , call me.	Antecedent of a conditional	Straight	<ul style="list-style-type: none"> <li>• Over 60</li> <li>• Skinny</li> </ul>
Pick up your <i>hat</i> .	Imperative	Straight	<ul style="list-style-type: none"> <li>• Never smoked</li> <li>• Overweight</li> </ul>
He couldn't even <i>pack</i> for the trip.	Negation	Straight	<ul style="list-style-type: none"> <li>• Under 20</li> <li>• Good mood</li> </ul>
That isn't a <i>tack</i> ; it isn't even a pushpin.	Negation	Straight	<ul style="list-style-type: none"> <li>• Under 20</li> <li>• Skinny</li> </ul>
I could <i>trap</i> the <i>rat</i> with peanut butter.	Possibility modal	Straight	<ul style="list-style-type: none"> <li>• Skinny</li> <li>• Bad mood</li> </ul>
I think I'd like it in <i>black</i> .	(Propositional Attitude Complement) <sup>18</sup>	Straight	<ul style="list-style-type: none"> <li>• Under 20</li> <li>• Overweight</li> </ul>

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## Notes

1. It is possible that another level of Taft's system, the "lemma" level, might also contain something semantic, but our point still holds that even exemplary laboratory phonologists leave semantic content unspecified.
2. Perhaps surprisingly, humans do not always follow the logic of entailment in evaluating everyday situations. As shown by, e.g., Tversky & Kahneman (1983), people will assign a higher probability of occurrence to certain events than they do to other events that are logical supersets of the first events (the "conjunction fallacy"). For example, Tversky & Kahneman show that people will assign a higher probability to the event that a fictitious character named Linda is a bank teller and active in the feminist movement than to the event that Linda is a bank teller, despite the fact that there must logically be a higher probability that she is a bank teller (because being a bank teller is a superset of being a bank teller and active in the feminist movement). Thus, even though Linda's being a bank teller is entailed by Linda's being a bank teller and a feminist, people do not always see that 100% of the time that Linda might be a bank teller and an activist, she must be a bank teller.
3. Of course, it is possible that two meanings would co-occur for reasons other than entailment, such as the meanings of *it is raining* and *I should carry an umbrella* where situational information leads to semantic similarity but not entailment. To avoid this problem in our experiments, we made use of General Linear Models; this will be discussed further in Section 4.2.
4. It should be noted that conventional meanings may be *disambiguated* by context, but that this is not the same thing as being *determined* by context. For example, there are at least two conventional meanings of the word *bank*, one referring to the side of a river and the other referring to a financial institution. Context may make it clear which of these conventional meanings is intended by a speaker, but crucially, context can't establish a new meaning for the same phrase without explicit metalinguistic statement (e.g., "when I say *bank*, I mean *ice cream*").
5. Though it might be tempting to think that meanings could be stored as a list along with the contexts that condition them within a lexical item, this both is impractical (possible contexts are infinite) and misses important pragmatic generalizations.
6. Potts' recent (2005) work in formal semantics identifies a new class of linguistic entities that meet Grice's requirements for conventional implicatures. This work has influenced a plethora of related research and thinking, including Potts and Kawahara (2004); Kratzer (2004); Portner (2006); von Stechow (2006); Pinker (2007); and Amaral et al. (2007). It should be noted that Potts (2005) actually calls what we refer to as primary entailments *at-issue* meanings, and doesn't often use the term *secondary entailment* because he refers to each of the subcategories of secondary entailments separately.
7. Secondary entailments may occasionally be used to answer the QUD, as in the following exchange (Roberts, p.c.), where the primary entailment of B's response is that John's wife is beautiful, and the secondary entailment is that John has a wife, which actually answers A's question:
 

A: Is John married?  
 B: Oh, you should *see* his wife – she's beautiful!

Current work in the field, however, still uses answering versus not answering the QUD as the fundamental dividing line between primary and secondary entailments (e.g., Roberts, Simons, Beaver, & Tonhauser 2009).

8. Though ultimately we are interested in, for example, whether social meanings are more like expressives (a kind of conventional implicature that is thought to express emotion; see also Section 4.3) than presuppositions, those divisions require further tests and require the prior establishment of sociophonetic variables as secondary entailments, which is why that is the focus of the present paper. Other questions are left for future research.
9. These tests actually distinguish primary entailments from both secondary conventional meanings *and* conversational meanings, but given the conclusions of the last section, and to avoid confusion, we refer to them as distinguishing just primary entailments and secondary entailments here.
10. This test has traditionally been thought of as a test for presupposition, as originally intended. However, it is unambiguously the case that it distinguishes all secondary entailments (as well as other things like meanings associated with gestures) from primary entailments. That is, it could be reworded as “the hearer can respond “hey, wait a minute, I didn’t know *q*!” if and only if *q* is a secondary entailment of *p*.”
11. The use of the word “appropriate” in the instructions was admittedly vague, but avoids the problem of having to explain a technical term such as “infelicitous.”
12. Note that (ii) does not match the exact form of the HWAM test, in that the rejoinder after “Wait a sec” is an interrogative rather than stating “I didn’t know that. . . .” Asking a question, however, implicates not knowing the answer. In follow-up experiments, we are planning to use the exact form of the HWAM test, which has the additional advantage of making all of the possible responses declarative sentences.
13. As one of our reviewers points out, the rejoinder after “hey, wait a minute” could be almost anything (e.g., “Hey, wait a minute, my shoe’s untied!”) because phrases such as “hey, wait a minute” can be used to pause or change the topic entirely, in addition to indirectly calling into question something that is in the discourse. However, the fact that our participants did disprefer the HWAM responses when there were no cues to Southernness in the original question indicates that they were in fact interpreting the responses as being tied to the discourse in question.
14. Note that only the antecedent of a conditional acts as a “hole” for secondary entailments, allowing them to survive. The consequent of a conditional is a “filter”—that is, it acts as a hole except when its antecedent expressly questions it. For example, in the sentence *If John let her into the house, then Abby stopped smoking*, the secondary entailment of the consequent, “Abby once smoked,” survives. On the other hand, in the sentence *If she ever smoked, then Abby stopped smoking*, the secondary entailment of the consequent, “Abby once smoked,” is canceled because the antecedent specifically brings it into question.
15. Because of an error in the stimulus design, the filler question “How surprised would you be to learn that this talker is overweight?” appeared only with grammatical contexts that would cancel primary entailments, making it impossible to calculate a GLM based on grammatical contexts.
16. Note that the redundancy reading is strongest when the intonation is the same across both repetitions. When different intonation is used, particularly with more stress on the second one, many listeners will in fact interpret the repetition as a signal of some sort of expressive reading on the part of the talker (e.g., “Kathleen’s a phonologist, and you know what that means”). This is presumably precisely *because* repeating a primary entailment is redundant, and so listeners will assume that the talker is trying to convey new information.
17. In this appendix, we show all the target stimuli we used in the experiment. However, direct quotation is not actually a member of the Family of Sentences test (it cancels both primary and secondary entailments); it relates to further research questions we anticipate doing. The responses to this sentence are not included in the analysis presented in the current paper.

18. Responses to this stimulus, like direct quotation, are not included in the analysis presented here. Although this particular sentence acts as a hole for secondary entailments while cancelling primary entailments, propositional attitude complements as a general rule do not.

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