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Conventional implicatures, a distinguished class of meanings*

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1 A fresh look at an old definition

The history of conventional implicatures is rocky, their current status uncertain. It seems wise to return to their source and start fresh, with an open-minded reading of the original definition (Grice, 1975) and an eye open for novel support. Suppose the textbook examples (*therefore*, *even*, *but* and synonyms) disappeared. Where would conventional implicatures be then? This paper argues that they would still be widely attested, and moreover that if we move a few years forward from their genesis, we find in Karttunen and Peters' (1979) multidimensional semantics the basis for an ideal description logic.

Conventional implicatures were born into neglect. Early in 'Logic and conversation', Grice advances the term and a definition, but primarily to set such meanings aside. The pragmatic theory of Grice 1975 takes the form of an overarching cooperative principle and a set of maxims. Together, these help to shape both linguistic and nonlinguistic social interactions. The theory is thus tailored to describing conversational implicatures, a class of nonlexical meanings whose presence and nature are contextually determined and negotiable. In contrast, conventional implicatures trace back to individual lexical items and have the force of entailments. General principles of cooperative social interaction are of little

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help with them. So it is no surprise that Grice closes his passage on conventional implicatures abruptly: "I wish to represent a certain subclass of nonconventional implicatures, which I shall call *conversational* implicatures [. . .]" (p. 45).

Despite its brevity, the passage clearly identifies a class of expressions that permit speakers to comment upon their assertions, to editorialize in the midst of asking questions and imposing demands. Such expressions are bound to be significant, both for what they can tell us about how natural language semantic theory should look and for what they can tell us about how speakers use language. Unfortunately, Grice's (1975) definition is entwined with his example, the adverb *therefore*. Bach (1999) counters that *therefore* "is not the most convincing example, for it seems that the truth of the utterance *does* require the second proposition to be a consequence of the first" (p. 330). Bach's assessment seems sound. It naturally leads one to wonder whether Grice has defined "what is said (in the favored sense)" too narrowly, or arbitrarily. These concerns have, I think, resulted in misplaced skepticism about the usefulness of Grice's concept.

Subsequent research added somewhat to the stock of examples (see Levinson 1983 for an accounting of them), but we can, and should, do without such textbook cases. In (1) I extract from Grice 1975:44–45 the central properties of conventional implicatures (henceforth CIs).

(1) a. CIs are part of the conventional (lexical) meaning of words.

b. CIs are commitments, and thus give rise to entailments.

c. These commitments are made by *the speaker of the utterance* "by virtue of the meaning of" the words he chooses.

d. CIs are logically and compositionally independent of what is "*said* (in the favored sense)", i.e., the *at-issue entailments*.

Throughout, I use *at-issue entailment* as a coverterm for regular assertive content ('what is said'). This term sets up a useful contrast with CIs, which are secondary entailments that cooperative speakers rarely use to express controversial propositions or carry the main themes of a discourse.

It's the work of section 3 to explore definition (1). For now, suffice it to say that (1) picks out a class of speaker-oriented entailments that are, by clause (1d), independent of the at-issue entailments. This conjunction of properties characterizes no other class of meanings (presuppositions, conversational implicatures, intonational meanings, at-issue entailments). The pressing question is whether (1) picks out anything in natural language. The answer is a definitive yes; Potts 2005

uncovers a wide range of constructions that meet (1), and others are sure to turn up in future investigations.

The properties in (1) come right to the fore when one studies the semantics of appositive expressions, the factual basis for this paper. I focus on *nominal appositives* (NAs) like those italicized in (2) (Barwise and Perry 1983:156–158; McCawley 1998:§13e; Aoun and Choueiri 2000; Aoun et al. 2001; Elbourne 2001:268–269). Potts 2005 extends the analysis to a wider range of supplemental expressions.

(2) a. The agency interviewed Chuck, *a confirmed psychopath*, just after his release from prison.

b. Yewberry jelly, *toxic in the extreme*, will give you an awful stomachache.

c. Ed, *in trouble with the law once again*, has altered his identity.

I refer to the intonationally-isolated phrase — *a confirmed psychopath* in (2a) — as the *appositive*. The nominal that is obligatorily left-adjacent to the appositive is the *anchor*. 'Nominal appositive' seems a fitting label because the anchor in this construction is always a nominal with the semantics of a referring expression. The appositive takes the anchor's meaning as an argument to return a proposition.

The examples in (2) have conjunctive paraphrases; (2a) expresses the proposition that Chuck is a confirmed psychopath and that the agency interviewed Chuck just after his release from prison. When NAs appear in embedded clauses, though, their distinctness from simple coordination is apparent:

(3) a. Sheila says that Chuck, *a confirmed psychopath*, is fit to watch the kids.

b. Ali promises that yewberry jelly, *toxic in the extreme*, is delicious.

c. The FBI reports that Ed, *in trouble with the law once again*, has fled to Florida.

We expect indirect quotations — embedded, nonquotative clauses introduced by verbs like *say* — to be attributed to the grammatical subject of the verb of saying. Yet if Sheila said merely "Chuck is fit to watch the kids", we consider (3a) an accurate and complete report of this utterance. The appositive *Chuck, a confirmed psychopath* contributes the proposition that Chuck is a confirmed psychopath, but (3a) does not commit Sheila to this. (3a) contrasts in this respect with (4), which asserts that Sheila said roughly "Chuck is fit to watch the kids and a confirmed psychopath".

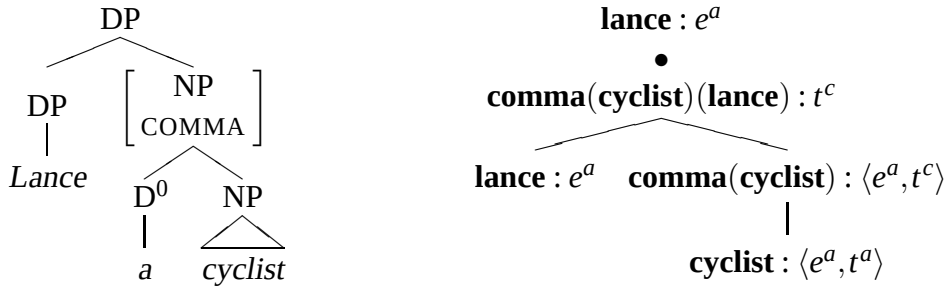
(4) Sheila says that Chuck is fit to watch the kids and that Chuck is a confirmed psychopath.

The contrast takes us back to the definition in (1). In (3a), the proposition that Chuck is a confirmed psychopath is a speaker-oriented contribution; in (4), this proposition is part of the indirect quotation, hence attributed to Sheila. The links with Grice's definition of CIs do not end here; NAs display the conjunction of the properties in (1). Though Grice does not mention these expressions as motivation for CIs, his description picks them out unambiguously.

Section 3 further supports the claim that (1) is suitable for no other class of meanings. Most of the examples are drawn from the realm of NAs, so that we arrive at a detailed picture of them as well.

Section 4 contains a multidimensional semantics for CIs. I locate the distinction between at-issue and CI content in the meaning language, after first heading off a model-theoretic division. Thus, CIs yield evidence that semantic translations are a nondispensable part of semantic theory. If we were to move directly from natural language expressions to model-theoretic denotations, we would lose the important distinction between at-issue and CI content. The only remaining alternative would be to locate the differences in the syntax, an approach I reject in section 2. On the type-theoretic conception advocated here, the syntax remains surface-true and unremarkable, as exemplified in (5).

(5)



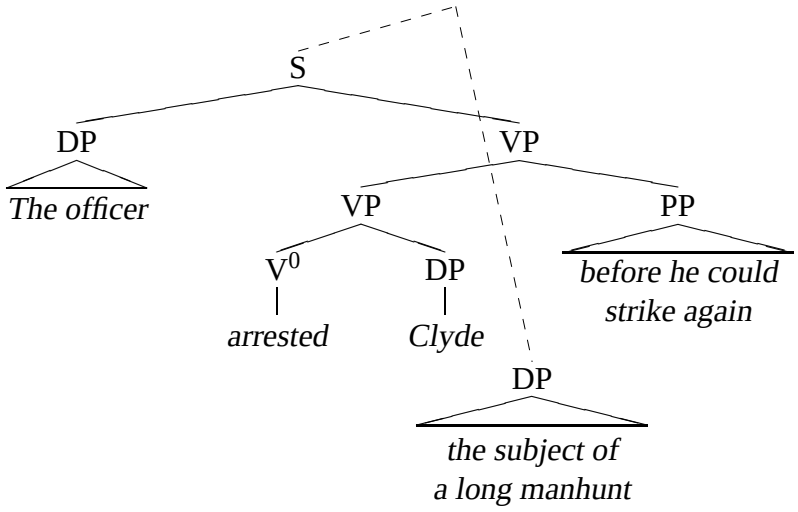
I represent natural language objects as pairs — a syntactic structure (represented graphically on the left) and a semantic parsetree (on the right). Since the bulk of the formal reconstruction of the at-issue/CI divide rests on the nature of the types, I always provide explicit typing information in the semantic parsetrees. The phrase **lance** : e^a glosses as 'the term **lance** is of the at-issue-entity type', for example. Section 4 provides a method for determining parsetrees with the desired shape and ensuring that the above is interpreted as denoting both the individual Lance and the proposition that Lance is a cyclist.

2 An integrated syntax

In (5), the appositive is right-adjoined to the anchor, so that the NA forms a constituent. This places the burden of achieving speaker-orientation (primary scope) on the semantics. To readers familiar with the literature on appositives, it might seem preferable to attach the appositive to the root node, rather than to an embedded constituent. Versions of this analysis have been offered many times in the past, by McCawley (1982, 1987, 1989, 1998), Emonds (1976, 1979), Huddleston and Pullum (2002), and Culicover (1992). For the most part, they converge on surface structures such as the one in (6). For the purposes of this discussion, I assume that the dashed lines represent a designated *supplement relation*, disjoint from dominance and precedence.

(6) a. The officer arrested Clyde, the subject of a long manhunt, before he could strike again.

b.



To ensure that the appositive is always given semantically widest scope, one can stipulate that every ordered pair of nodes in the supplement relation is such that its first member is the root. Alternatively, the structures could involve only dominance and precedence, with the relationship between them relaxed so as to allow *manhunt* to precede *before* in (6) (McCawley 1982; McCawley 1998:40). Either way, adjustments to the usual axioms for trees must be made (Potts, 2005).

Is this an adequate basis for a theory of appositives? I feel that we can answer firmly in the negative. The syntactic evidence points unambiguously to an

integrated syntax like that of (5). For instance, NAs, like many appositives, are subject to a strict adjacency requirement:

(7) a. *We spoke with Lance before the race, the famous cyclist, about the weather.

b. *Jan was the fastest on the course, the famous German sprinter, yesterday.

c. *Lance has, the famous cyclist, taken the lead.

The structure in (5), which right-adjoins the NA to its anchor, provides an immediate account of this when considered in the context of the logic developed in section 4. Roughly speaking, movement of a CI phrase would require a lambda term that takes CI meanings to CI meanings. The logic lacks such terms, though, rendering extraposition structures like (7) uninterpretable.

Strictly left-adjoining languages like Turkish provide an indirect argument in favor of right-adjunction of NAs. It seems that Turkish lacks NAs in the sense that those are construed here. The closest the language comes is (8), which more closely resembles the English construction represented by *the cyclist Lance Armstrong*. (My thanks to Jorge Hankamer for data and discussion.)

(8) Un-lU bisiklet-Ci Hasan-la yarIS-tan Once konuS-tu-k.
*fame-ous bicycle-ist Hasan-with race.*ABL *before speak.*PAST-*we*
'We spoke with the famous bicyclist Hasan before the race.'

Turkish seems not to have syntactically, morphologically, or intonationally distinguished appositive relatives either. Both gaps are expected on the present view (and that of Potts 2002a): if NAs and appositive relatives invariably right-adjoin, then a language that forbids right-adjunction cannot have them. On the view based on the supplement relation, the gaps seem accidental.

Perhaps the strongest evidence for an integrated NA syntax comes from German, which displays a case-matching requirement between anchor and appositive. Though exceptions are found, the appositive generally shares the case assigned to the anchor by the predicate (Durrell 1995:§2.6):

(9) Ich sah meinen Freund, den Pfarrer.
*I saw my.*ACC *friend, the.*ACC *parson*
'I saw my friend, the parson.' (Durrell 1995:37)

If we assume structures like the one in (5), then it is easy to state this case-matching requirement as sharing of features between the appositive and its sister: if an NP with the feature COMMA is adjoined to a DP, then the case-marking features of DP appear on NP.

When one studies other appositive and parenthetical expressions, the case for an integrated syntax grows stronger (Potts, 2002a,b, 2005). It quickly becomes clear that scope facts provide the only evidence for root-level adjunction. Because we can achieve the requisite widest scoping without complicating the natural language syntax or compromising our ability to state the necessary generalizations, root-level adjunction seems an unneeded complication.

It is worth pointing out also that structures like (6) implicitly call upon new semantic composition rules. We require a principle that places on the root node the result of applying the supplement-adjoined expression to a phrase to its immediate left. The condition is of course within reach (Potts, 2005), but it shows that we shouldn't favor an analysis like (6) over the description offered below on the assumption that (6) permits us to do without new semantic definitions. This assumption is false.

3 CIs vs. other meanings

At this stage in the history of CIs, it would be unwise of me to presuppose that Grice's definition, (1), deserves a place in linguistic theory. The existence of CIs has been denied explicitly (Bach, 1999) as well as implicitly, in the use of 'conventional implicature' as a synonym for 'presupposition' (Cooper 1983; Heim 1983; Beaver 1997, 2001; Krahmer 1998; Dekker 2002; Gamut 1991:188). Krahmer (1998:143) even goes so far as to say that "In this system, [...] the choice between *presuppositions* and *conventional implicatures* is just a matter of names". The statement is meant to convey only that one can move fairly freely between certain three- and four-valued logics, a mathematical fact that can have no bearing on the question of whether presuppositions and conventional implicatures are distinguished in natural language. But its rhetorical effect is to cast doubt on the usefulness of separating the two concepts. Thus, this section pursues two related goals: I seek to build a case that (1) is not merely a new, perhaps partial, encoding of a more accepted kind of meaning, and I seek to establish that it picks out some natural language facts. I use NAs to pursue the second end.

The tree in figure 1 summarizes the view of meanings described in this section. The only entailments — non-negotiable meanings — are at-issue entailments

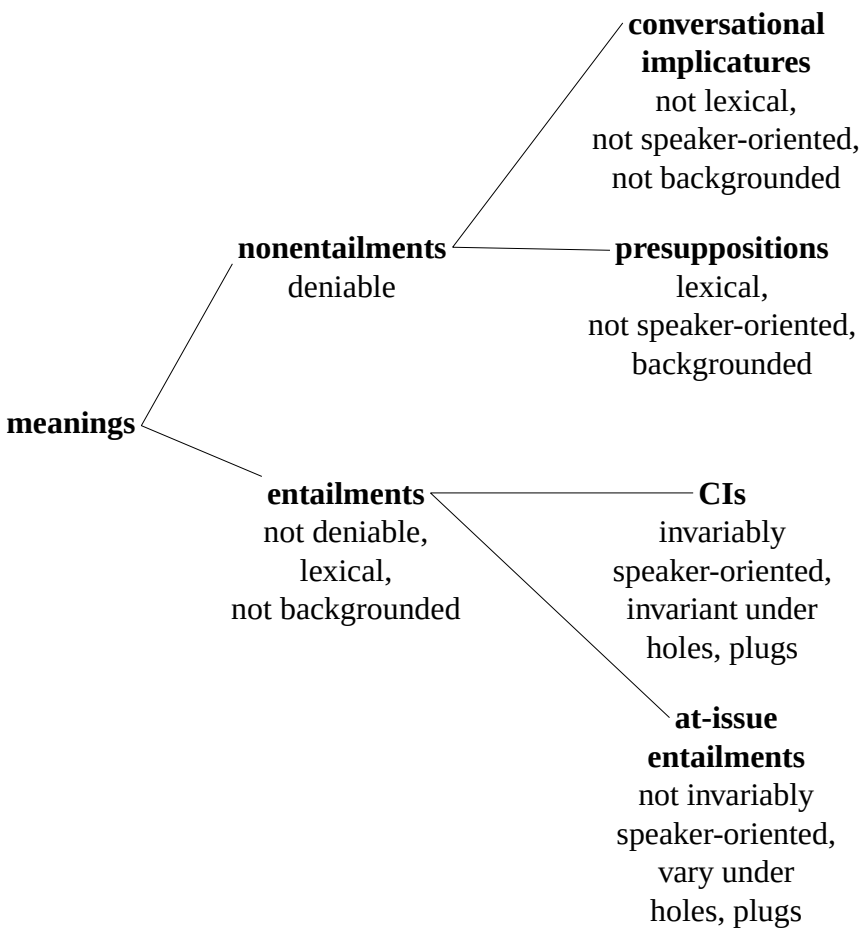


Figure 1: A MEANING TREE

and CIs. Thus, when proposing that a certain construction manifests CI content, the most threatening alternative appears to be an at-issue classification. The presuppositional viewpoint, too, can be tricky to dispel, since the definition of presupposition is not a settled matter, and many have used the term interchangeably with 'conventional implicature'. The next few subsections seek to show that NAs provide solid evidence for the linguistic reality of the CI branch.

3.1 CIs vs. conversational implicatures

Grice seems to have intended (1) to be obviously disjoint from the class of conversational implicatures. Clauses (1b) and (1c) achieve this split: conversational im-

plicatures are not entailments at all, as evidenced by their absence in certain contexts, and conversational implicatures are not invariably speaker-oriented (Chierchia, 2004).

At the heart of the difference between the two classes of 'implicature' lies the notion of *deniability*. The question, 'Is *p* deniable in *C*?' should be read as a shorthand for the question, 'Is it possible that *p* is a potential, but not an actual, contribution to *C*?' Nonentailments are deniable: it is often the case that the context conspires to alter or eliminate a potential nonentailment. In contrast, entailments are not deniable; there is no substantive distinction in this area between potential and actual meaning.

It is worth reviewing some examples to sharpen the point. It is a (generalized) conversational implicature of (10) that the speaker wishes to have the salt.

(10) a. "Can you pass me the salt?"

b. conversational implicature: pass the salt to me if you can

But (10b) arises only in contexts in which the literal answer to (10a) is obvious. In such situations, the literal answer fails to qualify as informative, relevant, and sufficiently brief. The hearer infers from this that the question is in fact something else, relying on general world knowledge to hear it as a request that the salt be passed to the speaker. But in other contexts, (10b) could easily be absent. Suppose that the addressee has recently broken both arms, or is living in a society in which people of his kind are rarely permitted to touch others' foodstuff. In such contexts, a "yes" or "no" answer provides new information, and a request that the speaker be passed the salt is unreasonable. As a result, the potential conversational implicature (10b) fails to become actual (perhaps).

CIs are defined to be regular logical entailments. We needn't worry about sentence-external factors removing content that is usually present in different contexts. In fact, to take such contextual information into account would be to needlessly complicate the theory of CIs. NAs support this narrowly semantic conception: their content is not deniable, (11a), nor is it suspendible with epistemic riders, (11b, c).

(11) a. Edna, a fearless leader, started the descent. #Edna is not a fearless leader.

b. #Lance Armstrong, the 2002 Tour winner, is training, if Armstrong did win the 2002 Tour.

c. #If Armstrong did win the 2002 Tour, then Lance Armstrong, the 2002 Tour winner, is training.

These facts also suggest that a presuppositional treatment is not feasible. Example (11c) is especially useful in this regard: if the proposition that Armstrong is the 2002 Tour winner were a presupposition engendered by the NA in the consequent, then the preposed *if*-clause would work to satisfy its requirements. That is, the example would work in the same fashion as the classic example *If Eddie has a dog, then his dog is a ferocious man-eater*, which does not itself presuppose that Eddie has a dog. But (11c) does assert that Armstrong is the 2002 Tour winner, hence the oddness of placing this content inside the antecedent of a conditional.

For Grice, clause (1a) also counts as a point of contrast between the two classes of 'implicature'. On Grice's (1975) view, conversational implicatures do not trace back to lexical items, or even to linguistic stuff. They result from relations among propositions (nonlinguistic objects). Chierchia (2004) challenges these points, and develops in its place a theory in which lexical items have conversational implicature dimensions. For instance, the denotation of *or* is that of classical logical disjunction, but with a *not and* conversational implicature dimension. However, this multidimensionality in no way threatens the autonomy of CIs. The issue is again deniability. Although Chierchia's (2004) derives the meanings in (12b, c) for (12a), contextual factors might still conspire to prevent (12c) from becoming actual.

(12) a. Mary will run the meeting or operate the projector.

b. at-issue:

$$\mathbf{run}(\mathbf{the}(\mathbf{meeting}))(\mathbf{mary}) \vee \mathbf{operate}(\mathbf{the}(\mathbf{projector}))(\mathbf{mary})$$

c. conversational implicature:

$$\neg\begin{pmatrix} \mathbf{run}(\mathbf{the}(\mathbf{meeting}))(\mathbf{mary}) & \wedge \\ \mathbf{operate}(\mathbf{the}(\mathbf{projector}))(\mathbf{mary}) & \end{pmatrix}$$

The utterance might be followed by "Hey, she'll do both!". Or it might be preceded by an agreement that if Mary does one, then she does the other. The maxims of quality and quantity then conspire to ensure that (12c) disappears. In sum, the conversational implicature dimension is a negotiable part of denotations. Even after building conversational implicatures into the lexicon, we still call upon the maxims to determine where they actually arise.

3.2 CIs vs. presuppositions

Presuppositions and CIs share the important lexicality property (1a). But they diverge on almost all other substantive points. Presuppositions are famously de-

niable (cancellable); Green (2000:461) identifies this feature as one of the few things that all presupposition researchers agree upon. But presupposition denial seems a different affair from conversational-implicature denial. One might argue that presuppositions are not cancelled due to specific discourse factors broadly speaking, but rather due to specific structural configurations (being in the scope of a special kind of negation, for example).

Clause (1d), which specifies that CIs are independent of the at-issue content, articulates why these classes of meaning require different theoretical treatments. Almost all presupposition logics create a dependency between the presuppositions and the at-issue entailments. This is the guiding intuition behind the reconstruction of presuppositions in terms of partial logics: if expression E's presuppositions are not true, then E should lack a defined value. (Karttunen and Peters (1979) might dissent from this statement. It depends on whether they intend their logic to model presuppositions in the usual sense.)

The exciting report in (13) nicely illustrates how the at-issue and CI dimensions operate independently.

(13) Lance Armstrong, an Arkansan, has won the 2002 Tour de France!

I know that Armstrong is a Texan; the CI is false. But I can still recover from (13) the information that Lance won this year's Tour. I need not accommodate the CI proposition to do this. In a multidimensional semantics, the situation is easy to describe in terms of truth values. If we stick to sentences containing one at-issue value and one CI value, we have a four-valued system akin to Herzberger's (1973) logic:

(14) $\langle 1,1\rangle \quad \langle 0,1\rangle$
$\langle 1,0\rangle \quad \langle 0,0\rangle$

In our world, the extensional value of (13) is $\langle 1,0\rangle$. In worlds where Armstrong is neither an Arkansan nor the 2002 Tour winner, (13) denotes $\langle 0,0\rangle$. Both $\langle 1,0\rangle$ and $\langle 0,0\rangle$ are the bane of a multidimensional theory of presuppositions. They represent situations in which a presupposition is false. One must either collapse these values to 'undefined' (Beaver 1997:956; Krahmer 1998:143), or else admit only those valuations in which all presuppositions are true (van der Sandt 1988:21). One or the other move is necessary to capture the intuition that *Ali doesn't realize her coat is on fire* is undefined if the presupposition that her coat is on fire is false.

The dependency of at-issue meanings on their presuppositions is the most important *theoretical* divide between CIs and presuppositions. The most important

pretheoretical divide is this: Grice (1975) makes no provision that CI content should be backgrounded (van der Sandt 1988:74), and, indeed, CI expressions usually offer information that is not part of the common ground when they are uttered. Although it is possible for true presupposition triggers to introduce novel information, this is accompanied by a particular discourse effect, viz., accommodation. In order to understand the utterance, the hearer must adjust his knowledge so that it entails whatever the speaker has presupposed. Outside of specialized discourse conditions, it is not possible to eschew accommodation — the adjustment is thrust upon any listener who wishes to use information provided by the utterance. As Heim (1992:215, fn. 6) says, following Soames (1989:578–579), "there is no *de jure* accommodation" of a proposition **p** unless the context entails the negation of **p** already (and hence accommodation of **p** would "give rise to a communicative impass"; Soames 1989:579).

Nominal appositives do not function in this way; their primary discourse function is to introduce new but deemphasized material. Beaver (2001) makes this observation, and supports it with an example so lovely it is worth repeating:

(15) "Sweden may export synthetic wolf urine — sprayed along roads to keep elk away — to Kuwait for use against camels."
(Associated Press, January 19, 1995; cited in Beaver 2001:20, (E34).)

Beaver observes that the proposition that wolf urine is sprayed along the roads to keep elk away is interpreted outside the scope of the modal, and that examples with this appositive below the other presupposition holes (negation, questioning, conditionalization) reveal the same invariance of this content. But the content is offered as new information — an aside, to be sure, but, as Beaver says, "the writer of the text very likely does not expect readers to have any previous knowledge of the subject" (p. 20). Chierchia and McConnell-Ginet (1990:351–352) offer much the same verdict for appositive relatives.

The generalization is that NA content does not express backgrounded information. We can strengthen this claim to an *anti-backgrounding requirement*: in cases where the content of a supplement is part of the initial context, the result is infelicity due to redundancy, as in (16b).

(16) a. Lance Armstrong survived cancer.

b. #When reporters interview Lance, a cancer survivor, he often talks about the disease.

c. And most riders know that Lance Armstrong is a cancer survivor.

With (16a) part of the context, the use of the factive predicate *know* in (16c) requires no accommodation of the content of its complement. But the same kind of backgrounding renders the appositive in (16b) infelicitous. As with at-issue content, we have an anti-backgrounding effect. In general, neither at-issue content nor CI content should be presupposed. (The exceptions to this explored by Horn (1991) show CIs and at-issue entailments patterning together.)

This suffices to establish that supplements do not meet the main pretheoretical requirements for counting as presupposed. The technical definition of 'presupposition' is much more flexible, though. Recent theories of presupposition (or, at least, recent uses of the term) somewhat weaken the strength of this argument. Steedman (2000:654) allows that "the listener rapidly and unconsciously adjusts his or her model of the domain of discourse to support the presuppositions of the speaker". If this can happen, then the difference between at-issue meanings and presuppositions is outside the bounds of detection by the usual sorts of linguistic argument. If accommodation is unconscious and freely available, then it is not distinguished from the sort of adjustments that speakers make to their models (world-views) when they accept new information. This basically assimilates presuppositions to at-issue meanings, a move that does not accord with colloquial uses of the term 'presupposition'.

Another compelling argument against a treatment of NAs as presupposed is that they are invariably invariant under the full range of presupposition *plugs* (verbs of saying and other performatives). Although Karttunen (1973:177) observes that "all the plugs are leaky", in the sense that they sometimes allow presuppositions to escape them, it is in general the case that a plug stops presupposition inheritance. For instance, in (17), the proposition that it is raining is presupposed by *realize*, but not by the whole sentence.

(17) Ed said that Sue realized that it was raining. (Later, we found out that Ed's report was wrong. Sue can't have realized it was raining, because it wasn't.)

Here again, we find that appositives behave differently. Example (3a) above has the appositive inside the complement to *say*. But the only reading of the sentence is one in which the appositive's content escapes up through this plug. This intuition is expressed in all the work on appositives known to me. (On NAs and appositive relatives, see Thorne 1972:553; Karttunen 1976:367; Emonds 1976:§II9; Emonds 1979 McCawley 1998:451; Aoun et al. 2001; Potts 2002a:83.) Boër and Lycan (1976) claim to find a small group of speakers for whom appositive content can end up in the scope of a cleft negation like *it is false that*. (I refer to Potts

2005 for a reassessment of their data and claims, which partially conflate direct and indirect quotation). But they do not challenge the idea that appositives always scope outside of propositional attitude predicates (see Boër and Lycan 1976:21, (45)).

However, I have met speakers who claim to allow appositives to be interpreted inside propositional attitude contexts. In assessing such claims, one must keep in mind that nothing about placing an NA inside a propositional attitude context entails that the subject of that propositional attitude verb *disbelieves* that NA's content. In (18), we do not attribute to Sheila the proposition that Chuck is *not* a psychopath, nor do we even indicate that Sheila is agnostic about the truth of this proposition.

(18) Sheila believes that Chuck, a psychopath, is fit to watch the kids.

What's more, propositional attitude predicates like *believe* do not impose any exhaustivity requirements, even as conversational implicatures. In saying "Sheila believes that Chuck is fit to watch the kids" one does not suggest that this is the only thing Sheila believes. So one is unlikely to arrive at the implicature that the subject of a propositional attitude verb does *not* endorse the content of an embedded NA. What one might do is draw the conversational implicature that the subject of the attitude predicate shares the speaker's beliefs. This is the most likely source of apparently embedded readings.

In light of this situation, I see just one way to test for cases of semantic embedding: follow the sentence in question with an explicit disavowal, in a main-clause utterance, of the content of the supplement. Such a continuation should reduce possible readings of the supplement to embedded ones if such exist, since the primary-scope reading is inconsistent. A relevant test case:

(19) Sheila believes that Chuck, a psychopath, should be locked up. #But Chuck isn't a psychopath.

I marked this example according to my intuitions, which are reflected in the work cited above by McCawley, Emonds, and others, which, when taken together, constitute compelling evidence that we do not have genuinely embedded readings.

3.3 CIs and intonational meanings

Any attempt to reduce CIs to intonational meaning would commit a fundamental mistake: intonational meaning is not a kind of meaning like presupposition or

conversational implicature, but rather a means for invoking additional non-at-issue content. Such content can yield conversational implicatures (focus on a phrase can suggest the falsity or irrelevance of alternatives). It can yield presuppositions (perhaps in interactions with additive modifiers like *too*; Heim 1992). And it can lead to CIs. In the analysis developed below, *comma intonation* plays a central role in the CI-based analysis of NAs. The initial sentences in (20a) and (20b) differ superficially only with regard to comma intonation. The continuations show that they have a contrasting semantics.

(20) a. Armstrong, the cyclist, is from Texas. #Armstrong, the astronaut, is from Ohio.

b. Armstrong the cyclist is from Texas. Armstrong the astronaut is from Ohio.

Speakers reliably indicate the comma intonation with dashes, parentheses, or commas. In speech, we get clear intonational-phrase boundary marks on either side of the appositive. This holds for a wide variety of appositive and parenthetical expressions that are profitably analyzed as CI contributors. Huddleston and Pullum (2002:§16) use the term *integrated* for constructions like *Armstrong the cyclist* in (20b). My proposal is that NAs, but not integrated appositives, have a special feature COMMA that can appear in syntactic structures. The semantics for this feature shift at-issue content to CI content.

3.4 CIs vs. at-issue meanings

Clause (1d) says, in no uncertain terms, that CIs are distinct from at-issue meanings (Grice's "what is said (in the favored sense)"). The above sections show that that clause has bite: NAs are invariant under presupposition holes and plugs, whereas at-issue content is highly sensitive to such operators.

Clause (1c) entails an additional split. A rigid interpretation of this clause (the one I adopt) means that a CI is never relativized to the beliefs of any entity other than the speaker. But at-issue content certainly is; in *Sue wrongly believes that it is raining*, the at-issue proposition that it is raining is asserted to hold only in *Sue's* belief worlds. Thus, this embedded proposition is not speaker-oriented, and hence not classifiable as a CI contribution, by (1c). We've already seen cases in which NAs are inside indirect quotations and yet interpreted relative to the beliefs of the speaker of the utterance.

However, CI and at-issue content are united in one fundamental respect: both are species of entailment. Hence, it might seem initially desirable to treat them as

one. In section 2, I explored and rejected a syntactic alternative that could facilitate this reduction. In section 6, I outline a scope-shifting approach that involves only at-issue meanings. When fully articulated, such an approach duplicates the main features of the CI-based analysis reviewed in the next two sections.

4 A CI logic

Most past proposals for CIs do not offer a formalism for talking about such meanings. With 'conventional implicature' often merely a label, it is not surprising that many have turned to more familiar concepts in handling them. This section takes the step of formulating a description logic for natural language expressions with CI dimensions. The approach is based on that of Karttunen and Peters (1979), though I apply their proposal to a much different factual domain.

A major innovation of Karttunen and Peters (1979) is that meaning language terms are marked as either at-issue or CI (their 'extensional' and 'implicature' meanings, respectively). I implement the distinction via the set of types in (21). (I provide intensional types but work almost exclusively with extensional ones.)

(21)
i. e^a, t^a, and s^a are basic at-issue types.
ii. e^c, t^c, and s^c are basic CI types.
iii. If τ and σ are at-issue types, then $\langle \tau, \sigma \rangle$ is an at-issue type.
iv. If τ is an at-issue type and σ is a CI type, then $\langle \tau, \sigma \rangle$ is a CI type.
v. The full set of types is the union of the at-issue and CI types.

I assume that the types serve to organize the terms of the meaning language. Thus, type distinctions need not reflect model-theoretic distinctions. For this paper, we can assume that for any $\tau \in \{e, t, s\}$, the types τ^a and τ^c have the same domains, and that for any types σ and ρ, if $\langle \sigma, \rho \rangle$ is a type, then the domain of $\langle \sigma, \rho \rangle$ is the class of functions from the domain of σ to the domain of ρ. This syntactic conception of types is rare in linguistics, where types more often serve only to organize the interpreted structure (Montague, 1970; Halvorsen and Ladusaw, 1979). But the job that they perform in the present paper is familiar. They serve roughly the same purpose as syntactic categories like N and V, which organize the natural language lexicon. And the relationship between the types and the models resembles Montague's (1973) decision to assign different syntactic categories to common nouns ($t//e$) and intransitive verbs (t/e) while giving them the same type

of translation and models. In essence, I recruit the types to do work often assigned to a categorial syntax.

The definition is asymmetric in this important sense: we have CI types in which the first member is an at-issue type and the second is an CI type. These correspond to the intuition that CIs are comments upon the at-issue core: in a sense, they borrow from the at-issue dimension. But we do not have any types in which the first member is a CI and the second an at-issue type. This would result in an at-issue composition that incorporated CI content, violating condition (1d) of the definition of CIs.

The pair in (22) helps indicate why the distinction we are after is not model-theoretic.

(22) a. Lance, a cyclist, is from Texas.

b. Lance, a Texan, is a cyclist

In (22a), the proposition that Lance is a cyclist is expressed as a CI. In (22b), this same proposition is expressed as an at-issue entailment. It seems a confusion to treat these propositions as model-theoretically distinct. For instance, CI content is as capable as at-issue content of serving as the antecedent for intersentential anaphoric dependencies like verb-phrase ellipsis, verb-phrase and sentential pro-forms, and presuppositions (which are anaphoric in the sense of van der Sandt 1992). Similarly, since no at-issue operators take scope over them, NAs are often able to establish discourse referents. Once we get beyond the internal composition of sentences and consider only the context, the line between at-issue and CI content disappears. This is expected if they have the same models.

The advantage the types bring is that they regulate composition via the set of well-formed lambda terms. The first tree in (23) is well formed, whereas the second is not.

(23) a.

$$\lambda x.\,\mathbf{believe}(\mathbf{cyclist}(\mathbf{lance}))(x) : \langle e^a, t^a\rangle$$

$$\lambda p \lambda x.\,\mathbf{believe}(p)(x) : \langle t^a, \langle e^a, t^a\rangle\rangle \quad \mathbf{cyclist}(\mathbf{lance}) : t^a$$

b.

$$\text{undefined}$$

$$\lambda p \lambda x.\,\mathbf{believe}(p)(x) : \langle t^a, \langle e^a, t^a\rangle\rangle \quad \mathbf{cyclist}(\mathbf{lance}) : t^c$$

Tree (23b) suffers a type mismatch: the functor is of a type that requires a t^a input. It is offered only a type t^c input.

The type-mismatch in (23b) represents a desirable gap in the type-logical space defined in (21). The functor is an appropriate extensional meaning for a propositional attitude verb. The CI proposition in its complement cannot serve as its argument. Moreover, we cannot have propositional attitude verb meanings that take CI meanings as their arguments. Such a verb would have to be of type $\langle t^c, \langle e^a, t^a \rangle \rangle$, that is, it would have to have an initial member of CI type but itself be of at-issue type. Such types are not in the set defined in (21). Analogous reasoning applies to negation, conditionals, modals, and the like. This is the basis for the explanation for why CIs never form part of the argument to these operators. We also have an explanation for why CI operators never take CI meanings as their arguments. For instance, in (24), the available reading of the *As*-parenthetical (argued in Potts 2002b to be a CI construction) ignores the content of the NA.

(24) a. As Sue said, Lance Armstrong, a cancer survivor, won this year's Tour.

b. *As*-parenthetical = Sue said that Lance Armstrong won this year's Tour

c. *As*-parenthetical ≠ Sue said that Lance Armstrong is a cancer survivor

d. *As*-parenthetical ≠ Sue said that Lance Armstrong is a cancer survivor and that he won this year's Tour.

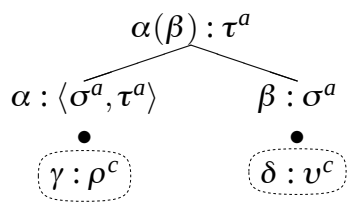
Kratzer (1999) makes similar observations about the interaction of the German discourse particle *ja*, which means something like 'as you probably know', and epithets: *ja* ignores appositive epithets that appear to be in its scope. On the present approach, this is the behavior we expect. We do not have any types $\langle \sigma^c, \tau^c \rangle$, and hence no way to allow such combination schemes.

The remaining logical issue I address here is the nature of semantic composition. I state the composition principles as tree-admissibility conditions, which place restrictions on singly-rooted trees with a branching factor of at most two. These structures have a dominance relation, but no linear precedence relation. We can associate the semantic predictions of the theory with the set of finite parsetrees consisting only of subtrees licensed by the conditions in (25), (26), (27), and (35) below, along with a condition that says a single-node tree decorated only with a lexical meaning is well-formed.

For at-issue composition, I adopt the rule in (25), which is a version of the rule for functional application of sisters of Klein and Sag (1985:171) and Heim

and Kratzer (1998:44), but here stated over semantic parsetrees and with the specification that we are dealing only with terms of at-issue (superscript a) type.

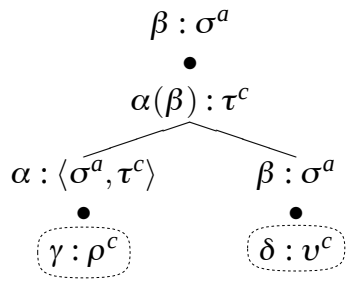
(25) **at-issue application**



As noted above, the terminal elements are not ordered by any linear adjacency relation. Here and in the statement of the other rules, I indicate optional material inside dotted lines. The motivation for the optional material is that we must allow that there might be CI content hanging around. The rule for parsetree interpretation, (28) below, ensures that such material forms part of the overall interpretation. But it is not relevant to the local calculations that these rules determine. The bullet • is a metalogical symbol for graphically separating independent lambda terms. It has no interpretation.

We come now to the central tree-admissibility condition, **CI application**:

(26) **CI application**



The action of (26) is easy to describe: if a functional CI term is sister to an at-issue term in its domain, then we apply that CI term to the at-issue term to yield part of the value of their mother. But we also pass on to their mother the unmodified value of the at-issue term. In the parlance of resource-sensitive logics like linear logic and categorial grammar, we *multiply consume* the at-issue meaning. Multiple consumption is permitted only in this specific configuration; I claim that it lies at the heart of the way CI meanings interact with the at-issue semantics.

This rule functions to ensure that the at-issue dimension is always insensitive to the presence of adjoined CI operators. In other words, for any tree $\mathscr{T}$, the at-issue content of $\mathscr{T}$ is the same as the at-issue content of the tree $\mathscr{T}'$ gotten from

$\mathscr{T}$ by pruning all nodes dominating items with a CI semantics (i.e., translating as a term of type σ^c).

I posit a special rule, **feature semantics**, for representing the semantic contribution of certain syntactic features.

(27) **feature semantics**

$$\begin{array}{c} \beta(\alpha) : \tau \\ | \\ \alpha : \sigma \\ \bullet \\ \boxed{\beta : \upsilon^c} \end{array} \qquad \text{(where } \beta \text{ is a designated } \textit{feature term} \text{ of type } \langle \sigma, \tau \rangle\text{)}$$

This rule sees heavy use in the analysis of CIs; in the diagram in (5), it is the rule that permits us to include the **comma** in the semantics.

A single sentence might contain multiple CIs, as in *Ed, a plumber, is married to Sue, a physicist*. One can imagine a variety of methods for ensuring the proper interpretation (a heritage function, a CI store). The most direct method, the one adopted here, simply gathers together the desired meanings:

(28) **parsetree interpretation**

Let $\mathscr{T}$ be a semantic parsetree with the at-issue term α on its root node, and distinct type t^c CI terms $\iota_1, \ldots, \iota_n$ on nodes in it. Then the interpretation of $\mathscr{T}$ is the tuple

$$\langle [\![\alpha]\!]^{\mathscr{M}}, \{[\![\iota_1]\!]^{\mathscr{M}}, \ldots, [\![\iota_n]\!]^{\mathscr{M}}\} \rangle$$

where $[\![\cdot]\!]^{\mathscr{M}}$ is the interpretation function, taking formulae of the meaning language to the interpreted structure $\mathscr{M}$.

It's time now to look at the internal structures of NAs, to see how to capture the conditions on these constructions using the multidimensional logic just defined.

5 A multidimensional analysis of NAs

5.1 The anchor

In general, quantified expressions are not possible anchors in NAs:

(29) a. *Every climber, {an/the} experienced adventurer, was found sipping hot cocoa in the lodge.

b. *No climber, {an/the} experienced adventurer, was found sipping hot cocoa in the lodge.

This is part of a broader generalization:

(30) Nonrestrictive modifiers associate only with referring expressions.
(Thorne 1972:553; Karttunen 1976:367; McCawley 1998:451;
Potts 2002a:83; Huddleston and Pullum 2002:1060; and others)

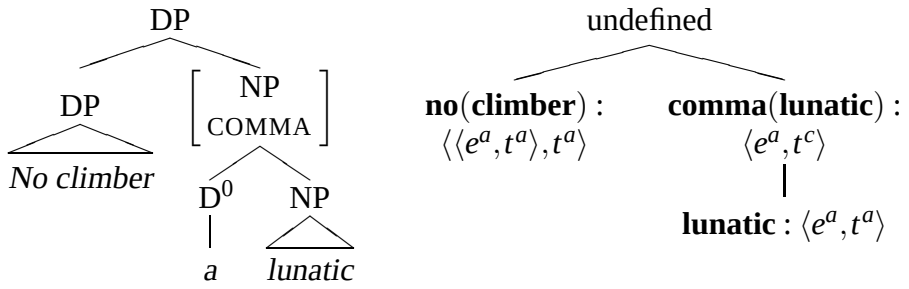
(31) a. *Susan interviewed every senator, who is crooked.
(McCawley 1998:451, (24b′))

b. *No person, who knows everything, is perfect.
(McCawley 1998:451, (24c′))

c. *No candidate, who scored 40% or more, ever failed.
(Huddleston and Pullum 2002:1060, (7i))

The CI logic (considered so as to include lexical items) cannot derive meanings for structures in which the anchor is quantified. I illustrate in (32).

(32)



The quantifier cannot take the appositive as its argument, because the appositive is of type $\langle e^a, t^c \rangle$ but the quantifier takes only meanings of type $\langle e^a, t^a \rangle$. So we have a type-mismatch. To ensure that this type-mismatch holds for all structures, we need to say that the appositive cannot shift to type $\langle\langle\langle e^a, t^a \rangle, t^a \rangle, t^c \rangle$, taking the quantifier meaning as its argument. The meaning we would derive for *No climber, a lunatic, survived* would be equivalent to *No climber is a lunatic; no climber survived*.

But such type-shifting is easy to prevent. Type-shifting functions are of course terms of our logic. In order to take a CI term τ of type $\langle e^a, t^c \rangle$ into a term of type $\langle\langle\langle e^a, t^a \rangle, t^a \rangle, t^c \rangle$, we would require a type-shifter with the type

$$\langle \langle e^a, t^c \rangle, \langle \langle \langle e^a, t^a \rangle, t^a \rangle, t^c \rangle \rangle$$

Both immediate subtypes of this type are, of necessity, CI types. The type definition does not contain such types. The only remaining concern is that the type shift might happen prior to the move to CI types. To block such a composition scheme, we just need to limit the range of types that **comma** can have. For this paper, I assume that the only possibility is (40).

So the logic itself handles a ban on quantified anchors quite nicely. But the underlying generalization is more complicated than this. An example of a grammatical anchor that has the form of a quantifier is (33a), which I owe to Lyn Frazier (p.c., 2/03).

(33) a. Every climber, all experienced adventurers, made it to the summit.

b. Every climber, experienced adventurers all, made it to the summit.

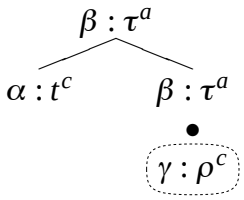
c. *Every climber, experienced adventurers, made it to the summit.

How are these cases best handled? In locating an answer, I think we should look at examples like (34).

(34) The students, most of them linguists, missed the buss.

In this example, the appositive is semantically complete. It is a small-clause of some kind. It needn't apply to the meaning of *the students*, though this appears to be its syntactic anchor. The logic developed in Potts 2005 includes the tree-admissibility condition **isolated CIs**, (35), which allows this kind of appositive into semantic parsetrees.

(35) **Isolated CIs**



This rule licenses structures in which the CI bears no semantic function–argument relation to its anchor. If we analyze *all experienced adventurers* as

$$\lambda w.\forall x[\textbf{climber}_w(x) \rightarrow (\textbf{experienced}_w(x) \wedge \textbf{adventurer}_w(x)) : \langle s^a, t^c \rangle$$

then we can use **isolated CIs** and maintain the descriptive generalization about true NAs and quantified anchors.

5.2 The appositive

In most cases, the appositive is property-denoting; the result is that NAs are strongly reminiscent of predicative copular clauses with individual-denoting subjects. The syntax seems not to impose further limitations: nominal, adjectival, and prepositional phrases are all possible, as seen in (2).

In general, quantified appositives are ungrammatical (excepting cases like (34) and (33), discussed above as involving propositional appositive meanings). Some examples:

(36) a. *We spoke with Tanya, every assistant in the department, about the broken printer.

b. *We approached Tanya, most support staff, about the broken printer.

c. Armin, Jaye, and Junko, (*all) the tenured phonologists at UCSC, got their doctorates from UMass.

However, quantifiers that can appear in predicative positions are also fine in NAs:

(37) a. We spoke with Hillary, no amateur climber, about the dangers.

b. We spoke with Tanya, everything to everyone around here, about the broken printer.

The parallel between predicative copular constructions and NAs is grounded in the logic itself. In general, theories of predicative copular constructions converge on a function–argument structure in which the predicate applies to the subject. In NAs, the appositive applies to the anchor in roughly the same way.

5.3 Comma intonation

A central feature of Grice's definition of CIs is that they are part of lexical meanings. It's not immediately obvious how to fit NAs into this picture. I argue that we

should take a cue from the fact that comma intonation is often the only perceptible difference between appositives and their integrated counterparts. The guiding idea is that it is COMMA that enables NAs to meet the specification in Grice's (1975) definition that CIs be lexical. The shift from at-issue to CI content is achieved by the semantic reflex of the syntactic feature COMMA.

For basic NAs, we need the meaning of COMMA to take $\langle e^a, t^a \rangle$ expressions to $\langle e^a, t^c \rangle$ results:

(38) COMMA $\rightsquigarrow \lambda f \lambda x.\, f(x) : \langle \langle e^a, t^a \rangle, \langle e^a, t^c \rangle \rangle$

I henceforth write this meaning as **comma**. It works in conjunction with **feature semantics**, (27), to license subtrees of the form in (39), a part of (5).

(39) **comma**(**cyclist**) : $\langle e^a, t^c \rangle$
|
cyclist : $\langle e^a, t^a \rangle$

In order to allow for COMMA to play a role in isolated CI examples like those in (33), we need a slightly more general meaning for COMMA:

(40) COMMA $\rightsquigarrow \lambda X \lambda x.\, X(x) : \langle \langle \sigma^a, t^a \rangle, \langle \sigma^a, t^c \rangle \rangle$, where $\sigma \in \{e, s\}$

5.4 There are no inverted cases

It seems at first as though examples like (41a) are best analyzed as inverted variants of (41b).

(41) a. A former linguist, Edward Witten, is now the top-dog in string theory.

b. Edward Witten, a former linguist, is now the top-dog in string theory.

On an inverted analysis, the semantic parsetrees for the subjects in (41) would be identical to each other (recall that the leaves of the parsetrees are not ordered). The differences would reside entirely in the syntactic structures.

But all the evidence known to me suggests that this is incorrect. We must state that NAs always involve right-adjunction of the appositive to the anchor in the syntax, and moreover that this right-adjoined item is always the functor. Clear evidence for this analysis derives from existential constructions. Consider, first, the existential-*there* environment in (42).

(42) a. There was a former linguist at the party.

b. There was a former linguist, Ed Witten, at the party.

c. #There was Ed Witten at the party.

d. #There was Ed Witten, a former linguist, at the party.

We see definiteness effects only when the lefthand nominal is definite. These facts suggest that the anchor — the at-issue meaning contributor that interacts with the meaning of *there be* — is always on the left. That claim is bolstered by another existential construction, the one determined by *have* (Partee, 1999). This environment imposes somewhat different restrictions than existential-*there*, but the prohibition on referential expressions is constant across both constructions. An inverted analysis of the complements to *have* in (43) wrongly predicts that (43d) is semantically identical to (43b).

(43) a. Ray had a student.

b. Ray had a student, Ed Witten.

c. #Ray had Ed Witten.

d. #Ray had Ed Witten, a student.

Finally, I offer some support from a slightly different domain: the two kinds of NA behave differently with regard to definite appositives, as seen in (44).

(44) a. Lance Armstrong, the cyclist, is from Texas, where he sometimes trains with fellow cyclists.

b. #The cyclist, Lance Armstrong, is from Texas, where he sometimes trains with fellow cyclists.

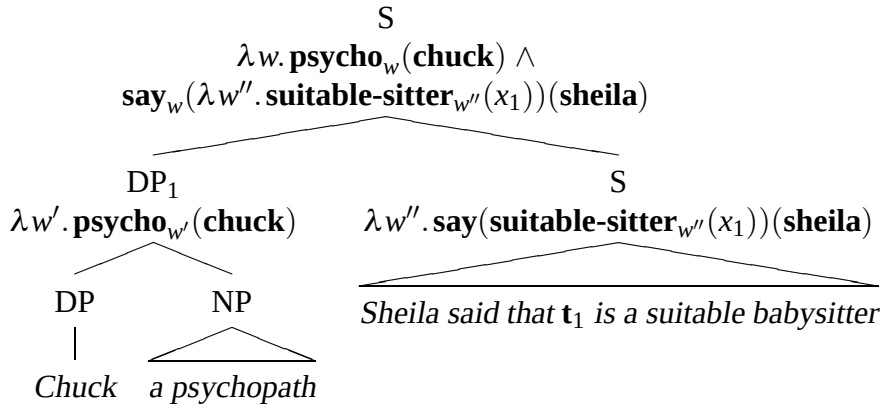
In general, speakers use a definite article in the appositive part of an NA when the NA expresses an essential or defining property of the anchor's denotation. (This property might have little to do with furthering the argument or narrative.) Speakers use an indefinite article in the appositive part of an NA when the NA expresses a proposition that is essential to furthering the argument or narrative. (The information might have little to do with fixing or understanding the meaning of the anchor.) There is not space to explore the nature of these generalizations, the free-variation they predict when the appositive is essential both to the anchor and the narrative, or the question of why the options are not available for appositive relatives. I note only that we are left helpless even to describe these facts if the examples in (44) are viewed as semantically identical.

6 A scope-shifting alternative

Given a rich and flexible enough theory of intensionality, it is possible to provide a semantics for NAs that meets the definition in (1). Though such an account has not to my knowledge been formulated yet, one can see how it might go. The essential step is the stipulation that NAs are always evaluated as though they were root-level clauses. That is, we saturate their intensional argument with the actual world (or world–time pair, etc.). The account requires a movement operation or a type-shifting equivalent, for the simple reason that NAs have both propositional and individual components of meaning. *Chuck, a psychopath* denotes both the entity Chuck and the proposition that Chuck is a psychopath. In a one-dimensional theory, multiple components of meaning can, to a limited extent, be modelled by moving them, resulting in a kind of discontinuous constituent. In (45)–(46), the proposition-denoting NA is adjoined at the root level and syntactically associated with an individual-denoting trace.

(45) Sheila said that Chuck, a psychopath, is a suitable sitter.

(46)



In order to arrive at this structure, we must appeal to a number of extra assumptions. First, the raised NA, though proposition-denoting, must leave behind an individual-denoting trace that it does not bind in the semantic sense. A meta-logical condition on admissible assignment functions must ensure that this trace denotes the same individual that the anchor in the raised appositive denotes.

A second requirement: we must stipulate that the NA always raises to adjoin to the root. As we've seen, NAs never appear in the scope of any other operator. The CI approach achieves this by ensuring that an NA's content cannot form (part of)

the argument to anything. On this scope-shifting alternative, we must cash out the facts in terms of obligatory widest-scope. The condition can be formulated as a statement that any NA appears as daughter to the root node syntactically, roughly as in the supplement-relation account rejected in section 2. But this essentially removes any genuine parallel between NA interpretations and other expressions held to undergo quantifier raising or an equivalent. The closest example is that of indefinites, which can take widest scope even when deeply embedded. But they can also take narrow and intermediate scopes (Farkas, 1981; Reinhart, 1997). This variability is precisely what motivates a scope-shifting account of them.

My final objection is fundamental: (46) denotes just one proposition (a single truth value in a given world). But (13) shows that NA content and at-issue content can have different values even in a single situation and utterance: the NA can be false, the at-issue content true, or the reverse. The analysis in (46) is not so flexible. If either conjunct is false, so is the whole.

We should ask what is right about the scope-shifting solution. Stepping back, we see that some essential ingredients are here, but obscured by the formalism. The special conditions we have to place on how NAs move and what they associate with are versions of the lexical marking that is achieved in a single stroke (type assignment) within the CI analysis. In order to bring the scope-shifting analysis in line with the multidimensional insight (1) expresses, we must allow that the propositional denotations of the root node's daughters remain separate. That is, the structure itself should denote a pair of meanings. This is precisely what the interpretation rule (28) achieves.

7 Conclusion

Until recently, conventional implicatures appeared in danger of getting dropped entirely from semantic theory, or else swallowed up (via shifts in terminology) by other mechanisms. But when we return to Grice's (1975) definition and consider its entailments closely, we find that CIs are both irreducibly distinct from other meanings and widely attested in natural language. What's more, the multidimensional approach that Karttunen and Peters (1979) introduced into linguistics provides the basis for a satisfactory formalization. By separating the at-issue and CI dimensions, we achieve the needed independence of the two classes of meaning without further stipulation.

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