Varieties of Conventional Implicature: Evidence from Japanese*

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Abstract

This paper examines the linguistic realization of conventional implicatures, taking the semantics and pragmatics of the Japanese adverbials *sekkaku* and *yokumo* as a test case. It is shown that their meanings involve an interesting and hitherto unstudied mix of asserted and conventionally implicated content. An extension of Potts's (2005) $\mathcal{L}_{CI}$ logic for supplementary conventional implicatures is proposed which is capable of analyzing objects of mixed conventional implicature and at-issue type, and objects with conventionally implicated meanings which provide the main content of their utterances. The logic is then applied to a range of other constructions and lexical items in several languages, and used to repair an infelicity in the original system.
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1 Introduction

The nature of conventional implicatures has been under debate since their existence was proposed by Grice (1975). Some philosophers deny that they even exist (Bach, 1999). In linguistic semantics, however, there has been a recent surge of interest in their analysis, starting with the work of Potts (2005, i.a.). The work of

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Potts in this area has centered on conventional implicatures that provide content which supplements the main, at-issue content of the sentence in which they are used.

(1) a. John, a banker I know, played golf with Bernie yesterday.
b. Frankly speaking, I don't know what you're talking about.

Here, the content of the nominal appositive in (1a) and that of the speaker-oriented adverbial in (1b) add content to the utterance, but in a way intuitively independent of the claim the speaker intends to make by her utterance.

Previous research therefore suggests that conventionally implicated content is supplementary by nature. The present paper is concerned with conventionally implicated content that does not fall neatly into this picture. The main test case for this claim involves a pair of Japanese adverbials, which, although their content is (I will argue) conventionally implicated at least in part, are not purely supplementary, as I will show. These are the Japanese adverbs *yokumo* and *sekkaku*. Both adverbials are extremely complex in meaning, but in very different ways. They share several common properties: both must modify propositions that describe things that actually have taken place, and both contribute content independent of 'what is said;' but otherwise they are very different, both in lexical meaning and distribution. In particular, *yokumo* must appear in main clauses, but *sekkaku* is precisely the opposite: it can appear only in embedded clauses, a peculiar fact.

One of my aims in the present paper is to analyze the meaning of these two adverbials and to explain the facts about their distribution. I analyze the facts about possible targets for modification as following from a pragmatic requirement for actuality. McCready (2004, 2007) already presents analyses of the basic lexical meaning of these phenomena according to which the facts follow from an actuality presupposition, but careful examination yields a question about the treatment. Namely: how can one be certain that the requirement is due to a presupposition rather than a conventional implicature? The issue has other ramifications for the present paper, in that much of the meaning of the two adverbials involves nonasserted content. This question, and the more general issue of how one should distinguish presupposition and conventional implicature in cases where the content is 'metalinguistic' in a sense to be made precise, will be a main theoretical focus of the paper. To preview, the conclusion will be that much of the content of *sekkaku* and *yokumo* should be treated as conventionally implicated. However, since some of it is asserted, the question arises of how the meaning is computed; the currently standard treatment of Potts (2005) has no means of handling nonsupplementary conventional implicatures. In particular, it fails to adequately model

the behavior of two types of conventional implicature: cases where the conventionally implicated content is the main content of the utterance, and 'mixed' cases of conventionally implicated and asserted content. I therefore extend the logic $\mathcal{L}_{CI}$ proposed by Potts (2005) to deal with such cases; the extension is called $\mathcal{L}_{CI+}$. This is the second theoretical focus of the paper. The tension between conventional implicated and asserted content will prove to be the key to understanding the distribution of the adverbials with respect to root and subordinate clauses.

The discussion will proceed as follows. Section 2 will address the lexical meaning of the two adverbials, excluding the issue of actuality. Two main claims will be made (both distinct from the analyses in McCready 2004, 2007): i) *yokumo* introduces exclusively 'pragmatic' content, if we wish to understand conventional implicature as pragmatic, and makes no assertion at all, indeed removing the assertoric force of the proposition it modifies, and ii) *sekkaku* is actually a 2-place predicate of propositions, rather than a 'standard' adverbial modifier. Both of these claims, if correct, show that these adverbials have highly peculiar properties. Section 3 turns to the distribution of the adverbials: 3.1 considers the distribution of the two adverbials with respect to main and subordinate clauses. The claim here is that, although the two adverbials exhibit precisely opposite distribution, this distribution follows directly from their lexical semantics as presented in section 2. Section 3.2 addresses the issue of actuality, along with the question of distinguishing presupposition and conventional implicature in cases like this one. Section 4 discusses a range of additional cases of conventionally implicated content that is, like *yokumo*, main content on the one hand, or, like *sekkaku*, mixed content, on the other. Section 4.3 examines the Quechua evidential system, which I argue can be viewed as a grammatical system that shows conventionally implicated content of all three types: main, mixed, and purely supplementary. Section 4.4 shows how the extension to $\mathcal{L}_{CI+}$ can be used to solve a potential problem in the original $\mathcal{L}_{CI}$. The paper concludes with a summary and some brief discussion.

2 Lexical meaning

This section addresses the lexical meaning of *yokumo* and *sekkaku* in turn, following the discussion in McCready (2004) and McCready (2007). I will argue that the analyses in these two papers, while close to correct, in fact must be modified. In my earlier work on the subject, I failed to consider the possibility of conventional implicature in sufficient depth. Taking issues surrounding conventionally implicated content into account yields a substantially improved analysis, as I will

show; and indeed one that makes correct predictions about the distribution of the adverbials, the topic of section 3. But doing so also necessitates extending existing analyses of conventional implicature, something I will carry out concurrently with the lexical analysis.

2.1 Yokumo

I start by considering *yokumo*. In line with McCready (2004), I will argue that *yokumo* introduces three pieces of content: a) a statement of the speaker's emotional attitude toward the modified proposition φ, b) a statement regarding the prior probability the speaker assigned to φ, and c) a condition on mutual knowledge of φ. Unlike McCready (2004), however, I will analyze conditions (a) and (b) as conventionally implicated rather than asserted, for reasons which will become clear. The question of the status of (c) is more difficult to resolve, but in the end I will conclude that it is presuppositional.

2.1.1 The components of *yokumo*'s meaning

The meaning of *yokumo* is complex, as may already be clear from the brief discussion above. Here are some representative examples, with somewhat rough translations.[1]

(2) a. Yokumo koko ni kita (na)!
YOKUMO here to came (PT)
'You have a lot of guts to come here!'

b. Yokumo ore o damasita (na!)
YOKUMO me ACC tricked (PT)
'I can't believe you had the gall to trick me.'

The most obvious approximation of the meaning of the adverbial is a simple negative statement about the propositional content.

(3) $[\![yokumo]\!] = \lambda p.[\ \mathbf{bad}(p)\ ]$

However, this cannot be right: as a little reflection makes clear, *yokumo* can also be used with a positive meaning.

[1] Most examples in this section come from McCready (2004).

(4) omae yokumo konna ii sakuhin dekita na
you YOKUMO this-kind-of good artwork was.able-Pst PT

'I can't believe you were able to make a piece this good!'

Whether the attitude expressed by *yokumo* is positive or negative appears to depend on several factors. First, the content of the sentence: in (2b), the modified proposition describes an event that (we can assume) was negative for the speaker, while (4) is clearly positive. Other facts about the world also must play a role, though. Suppose that it is the speaker's birthday, and he comes home to find a surprise party. The hearer had told him earlier that everyone had forgotten his birthday. Here, the tricking lacks a negative character. For (4), suppose that speaker and hearer are competing for the final slot in an art program. Here the adverbial has a negative character.[2] The identity of the speaker also obviously plays a role. These facts are reminiscent of what we find with modification by the particle *man* (McCready, to appearb), which has the introduction of emotional attitudes as one of its functions.

(5) Man, you really hurt him.

In ordinary circumstances, the adverbial is understood to express something negative, but if one imagines that (5) is uttered in a conversation between employees of a loan shark on the way home from a collection, for example, a positive meaning appears (if one makes certain assumptions about people with this sort of job). As a result, the emotional content of *man* can be analyzed as involving a function from Kaplanian contexts and propositions to emotional attitudes.

(6) $E : c \mapsto (\wp(W) \mapsto A)$, where $A \in \{\textbf{bad, good}\}$.

The meaning of *yokumo* can now be characterized as making use of E, as follows. Here it is assumed that the context supplies the initial value to the E function.

(7) $[\![yokumo]\!]^c = \lambda p.[E(p)(p)]$

E, given a context, is a function from propositions to emotion predicates. This function in turn takes the propositional content of the modified sentence as input.

[2] As with e.g. particles (McCready, to appearb), intonation can influence interpretation here, but the facts remain similar when this influence is corrected for.

The resulting emotional predicate is applied to the propositional content.[3] The adverbial thus states that the speaker holds some emotional attitude (good or bad) to the sentence content.

The second component of *yokumo*'s meaning involves likelihood. *Yokumo* indicates that the speaker did not expect the event described by the modified sentence to occur, and that she is surprised that it actually did. There are a variety of ways to model this situation.[4] The main issue that must be addressed is a temporal one: how can it be that the speaker views the modified proposition as being unlikely, given that it has actually happened?[5]

We can model this in a relatively straightforward way by making use of probability functions.[6] Let μ be a probability function assigning probabilities to propositions, and let μ be indexed to times, so $\mu_t(\varphi)$ indicates the probability assigned to φ at time t: $\mu : \wp(W) \mapsto \mathbb{R}$. μ is also associated with an agent (as probabilities should in this context be construed as subjective, as argued by McCready to appeara), but I will suppress this. Suppose as usual that learning new information

[3]It is not completely trivial to define the semantics of E, something which was not done in McCready (to appearb). Roughly, the context should set values for what is taken to be positive or negative by a given speaker in a given world of evaluation. The resulting system of values determines whether the proposition p is understood as good or bad. I believe existing systems for describing preferences, together with changes in such preferences, would be useful in this situation (e.g. van Benthem and Liu 2007). This would take us far afield, however, so I leave the discussion informal here.

[4]In previous work I made use of a formulation following Guerzoni (2003), on which an ordering on propositions was defined based on their likelihood with respect to a contextually given set of facts. I then analyzed *yokumo* as stating that the proposition it modifies is lowest on the likelihood ordering, compared to other relevant propositions. The analysis proposed in the main text can be viewed as a refinement of this approach.

[5]One may compare this to Aristotle's puzzle of the sea battle, is the following true or false?

(i.) There will be a sea battle tomorrow.

At the point of utterance, it may be indeterminate whether there will be a battle or not, and so the sentence may seem to lack a truth value, but in two days the sentence will plainly have been true or false. This situation has been analyzed by MacFarlane (2003) via a notion of truth at time of evaluation, rather than at time of utterance. For the present case, we need not resort to such extreme remedies; it is clear that subjective probabilities do change over time, with gains and losses in information.

[6]The approach outlined in footnote 4 would also be able to do so, but instead of using conditionalization and probability functions indexed to times as in the main text one would have to model the change in likelihood by assuming that the set of propositions that count as relevant changes over time. This is of course a possible route, but I think the solution in the main text is more explicit.

induces an update in the probability function and that this update is modelled by conditionalization on the new information (cf. Jeffrey 1983; Kooi 2003). Let s, t be times such that $t = s + 1$. Let $\mathsf{K}_a\varphi$ hold at t but not at s, meaning that the agent has learned that φ holds between s and t. Then, μ_t is defined by

$$\mu_t(\phi) = \mu_s(\phi|\varphi) = \begin{cases} \dfrac{\mu_s(\phi \cap \varphi)}{\mu_s(\varphi)} & \text{if } \mu_s(\varphi) > 0 \\ 1 & \text{if } \mu_s(\varphi) = 0 \end{cases}$$

for each sentence ϕ.[7] All this is as in McCready and Ogata (2007b), where conditionalization is used to define the action of evidence.

Given this machinery, it is straightforward to define the notion of unlikelihood introduced by *yokumo*. The idea is that the proposition ϕ that is modified was unlikely before the speaker learned ϕ. This is just to say that $\mu_s(\phi) < i$, for $s \prec t$, where t is the time at which ϕ was learned. In the framework of McCready and Ogata (2007b), this would be $\tau(\mathsf{E}_a\phi)$, the time at which the agent a acquires evidence for ϕ. E in this formula is an evidence-introducing operator in the McCready-Ogata logical system $L_{\mathsf{E},\triangle,\mathsf{F}}$, and τ is the temporal trace function of Krifka (1992), here used just to yield the interval at which $\mathsf{E}\phi$ holds. Finally, i is a point on the probability distribution ($\in \mathbb{R}$) below which probabilities cannot be considered likely: an *unlikeliness threshold*, which can be taken to be determined by context in the manner discussed for gradable adjectives by e.g. Kennedy (1999, 2007).

This looks roughly correct, but we must be slightly more careful, because it is not enough that the speaker took ϕ to be unlikely at some time in the distant past, for example. The speaker must have taken ϕ to be unlikely up to the point at which it was learned. We therefore want $\mu(\phi) < i$ to obtain up to the moment at which ϕ was ultimately learned. This is straightforward to define; we need only add the following condition: $\neg\exists t'[\tau(\mu(\phi < i)) = t \wedge \tau(\mathsf{E}\phi) = t'' \wedge t \prec t' \prec t'']$. For convenience, we can define a notion of surprise at this point.[8][9]

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[7] If the probability of ϕ was initially zero, the probability of $\dfrac{\mu_s(\phi \cap \varphi)}{\mu_s(\varphi)}$ is undefined. In this case, the conditional probability of ϕ on φ is stipulated to be 1. This is analogous to the situation in classical logic, where every sentence is made true by a contradiction in the premises of a proof.

[8] Note that this predicate is factive, though instead of presupposing ϕ it presupposes that the speaker has (taken herself to) learn ϕ at some past time. (If this is not the case, $\tau(\mathsf{E}\phi)$ is undefined.) I am not sure whether this is preferable to the simple presupposition or not.

[9] Some may worry that the formula is falsified by the density of time; how can there be no point between t and t''? The reason is that these times are intervals. We could as easily have

(8) $surprise(\phi) \longleftrightarrow$
$\exists t[\mu_t(\phi) < i \wedge \tau(\mu(\phi < i)) = t \wedge \tau(\mathsf{E}\phi) = t'' \wedge t'' \prec n \wedge \neg\exists t'[t \prec t' \prec t'']]$

At this point, then, the denotation of *yokumo* looks like this:

(9) $[\![yokumo]\!]^c = \lambda p.[E(p)(p) \wedge surprise(p)]$

One element of this adverbial's meaning remains to be analyzed. It was also discussed by McCready (2004): the proposition modified by *yokumo* must be (believed by the speaker to be) common ground. To see that this proposition must indeed be common ground, note that sentences modified by *yokumo* are not felicitous as answers to questions.

(10) a. Context: A asks B 'Who did Austin marry?'(McCready, 2004)

b. *Yokumo Dallas to kekkon sita na!
YOKUMO Dallas with marry did PT
'He did an amazingly stupid and shocking thing by marrying Dallas!'

This example can be taken to indicate that *yokumo* cannot provide new information. In my earlier work I modeled this knowledge requirement via a condition on update: update is only defined if both hearer and speaker already know the content of the proposition, in conjunction with an assumption of common knowledge. There are several options regarding how this condition should be stated. On the one hand, it is possible to simply presuppose that $CG_{\{s,h\}}(\varphi)$, that φ is common ground for speaker and hearer;[10] on the other hand, taking a less interactive approach to the dynamics of information, we can simply stipulate that an update with *yokumo*(p) is only defined if update with p does not alter the information state of speaker or hearer. These two conditions amount to the same thing for present purposes.[11] I will make use of the former method in this paper.[12] We arrive at the

used a definition in terms of overlap and temporal points, saying that all points between t and t'' are either points at which $\mathsf{E}\phi$ holds or points at which $\mu(\phi) < i$ holds, together with a convexity condition. Thanks to Yasutada Sudo for discussion on this point.

[10] See van Ditmarsch et al. (2007) for the semantics of this operator.

[11] We do not need to concern ourselves with deep questions about the difference between knowledge and belief here, for instance.

[12] In McCready (2004), I took the second route. This decision was partly motivated by the fact that the particle *na* can induce felicity, which I took to mean that it can help introduce content into the common ground. Since I will not consider the action of this particle in this paper, we can avoid detailed discussion of common ground and update.

following lexical entry. I use Beaver's (2001) notation for presuppositions: $\partial[p]$ indicates that p is presupposed.[13]

(11) $[\![yokumo]\!]^c = \lambda p \partial[CG_{\{s,h\}}(p)].[E(p)(p) \wedge surprise(p)]$

This essentially restates, in a more explicit and adequate manner, the lexical content originally provided in McCready (2004). However, there is more to the story, as discussed in that paper. In (11) have, without argument, taken the common ground condition to be presupposed, and the other two parts of the meaning to be asserted. But if they are indeed asserted, it should be possible for a hearer to deny them directly, by using, for example, one of the expressions in (12).

(12) a. That's not true.

b. That's false.

c. That's a lie.

Expressions like these directly question the truth of a statement. However, such expressions cannot be used to deny the content of *yokumo*(p). Consider the following example.[14]

(13) Yokumo Dallas to kekkon sita na!
YOKUMO Dallas with marry did PT

'He did an amazingly stupid and shocking thing by marrying Dallas!'

a. # sore-wa nai (yo)
that-Top Cop.Neg (PT)
'That's not the case!'

b. # sore-wa hontoo janai
that-Top truth Cop.Neg
'That's not true.'

[13]One might think that all this is unnecessary, given that *surprise*ϕ is (roughly) factive, as noted in footnote 8. If it is presupposed that ϕ, must we take ϕ to be common knowledge? The answer is yes. First, note that what is presupposed by *surprise*ϕ is not ϕ but that the speaker (believes herself to have) learned ϕ at some past time, which is already the wrong interpretation. Further, this presupposition should be accommodatable; but it is not. This is surprising given the results of Kaufmann (2009), who shows that such presuppositions should be readily accommodatable, unlike presuppositions about the common ground. I take this to indicate that the presupposition of common ground is needed.

[14]Here we suppose that it is known that the referent of 'he' is marrying Dallas.

c. # uso da
lie Cop
'That's a lie!'

Each of the possible denials in (13) is infelicitous. One might try to explain this in terms of 'privileged content' or speaker relativity; it is known that it is difficult to make claims about the truth or falsity of claims that depend (in part) on the speaker's preferences (cf. Lasersohn 2005; Stephenson 2007). It makes some sense, given this, that the emotive content of the adverbial content is hard to deny. But this argument does not go through for the probability statement.[15]

In previous work, I analyzed these facts in Segmented Discourse Representation Theory (SDRT; Asher and Lascarides 2003), in a way related to the analysis of parentheticals of Asher (2000). Here I will explore a different approach.[16]

The analysis starts with the observation that it is not actually impossible to deny the content of the adverbial—it just cannot be done with the responses in (13). Less direct expressions are needed.

(14) Yokumo Dallas to kekkon sita na!
YOKUMO Dallas with marry did PT
'He did an amazingly stupid and shocking thing by marrying Dallas!'

a. Tigau yo!
wrong PT
'That's wrong!'

b. Sonna koto nai yo!
that-kind-of thing COP.NEG PT

[15]If probabilities are understood as subjective, the basis for assertion may indeed be hard to deny. But it seems clear that statements about likelihood become part of the public domain once made, so denial of the surprise clause in the denotation of *yokumo* is surely possible.

[16]The SDRT analysis involved assuming that each part of the lexical content of the adverbial introduced distinct speech act discourse referents which were then connected by discourse relations. This analysis has three problems, as I now see it. First, there is no clear reason why the denials in (13) are different from those in (14). There is no independently motivated reason to distinguish between these kinds of denial at the level of discourse structure (to my knowledge). Second, I had to make an assumption about possible attachment points for the denials to work out right, which also lacks independent motivation. Third, on my analysis there, *yokumo*(*p*) also was taken to assert *p*, despite the presence of *p* in the common ground already (as shown by the facts in (10)). This strikes me as highly problematic. I therefore take the new analysis presented in the main text to be preferable.

'That's not right.'

These facts are reminiscent of facts noted by Potts (2005) about conventional implicatures. Potts takes a canonical case of conventional implicature to be appositive constructions.

(15) Bill, the philanthropist, is very rich.

a. That's not true. (= Bill is not very rich.)

b. Well, yeah, he is, but that's not really right ...(= casts doubt on the appositive content)

What I will call *truth-directed denials* like those in (13) cannot target conventionally implicated content, but only asserted content. Denials like (14) can target either type of content. If we assume that the content of *yokumo* is conventionally implicated, the facts in (13) are therefore immediately explained. Note that the fact that truth-directed denial can target the asserted content in (15) and not in (13) has an immediate explanation: (15) asserts that Bill is rich, but (13) asserts nothing at all, for it is already common ground that Dallas and Austin got married. This lack of assertion will be crucial in the explanation of the distribution of *yokumo* to follow in section 3.1.1.[17]

[17] Another commonality can be found with denials. Note that there are two parts to the 'deniable' content of *yokumo* sentences, given that the proposition modified is already part of the common ground: the emotive content and the statement of surprise. For many (but not all) speakers, the denials of *yokumo*-modified sentences in (14) can only target one of these, meaning that they can deny the good/badness of the marriage, or its surprisingness, but not both. The same seems to hold for sentences in English where multiple conventional implicatures are tied to the same host NP, as in (ia). Here, the denial in (ib) seems to indicate that either a) John is not a banker, or b) that he does not own a large house. It is difficult to understand (ib) as denying both together. If this data is correct, the identification of the content introduced by *yokumo* as conventional implicature receives additional support.

(i.) a. A: John, a banker, who owns a large house, is going bankrupt.

b. B: Well, yeah, true, but ...

However, none of this follows from the analysis I am going to provide in terms of $\mathcal{L}_{CI+}$, where the adverbial simply introduces a conjunction; unless it is assumed that only a single conjunct can be targeted by a denial in the case of conventionally implicated content. Formally, we might take the adverbial to introduce several distinct conditions, for example in the form of a set of propositions. Before taking this kind of step, though, it is worth checking to see how stable the denial facts are with respect to 'multiple denials.'

One may wonder if this is really sufficient evidence to justify treating the content of *yokumo* as conventionally implicated. This is legitimate; but, for independent reasons, it is difficult to apply the other standard test for conventional implicature. It is known that conventional implicatures are scopeless with respect to semantic operators over asserted content, such as negation, conditionals and the various modalities. Ordinarily, one would test the behavior of the putative conventional implicature item in operator contexts, and then draw conclusions about whether or not it is actually asserted. Unfortunately, this proves to be impossible with *yokumo*. As indicated in the introduction, *yokumo* is resistant to appearing in nonveridical contexts.[18] Because *yokumo* is ungrammatical in these contexts, it is impossible to test its scope behavior, and, as a result, the other standard test for conventional implicature cannot be applied. The same goes for another possible test which can be applied to distinguish conventional implicature from presupposition, which makes use of the projection behavior of presuppositions in conditionals. Since *yokumo* can't appear in conditional consequents, it is hard to tell whether or not its content would be bindable. But a conceptual argument is available. Intuitively, sentences modified by *yokumo* serve to introduce new information about the speaker's mental states and attitudes. If this content was presupposed, then (on a standard picture of presupposition) the speaker would be assuming it to be in the common ground. But, intuitively, the speaker is communicating her attitudes, so the presupposition picture simply does not seem to be correct.

This argument seems reasonable, but the presupposition that the modified proposition is in the common ground is less simple to get clear about. How can we be sure that presuppositions of this sort, that have no real equivalent in non-technical natural language, are not actually conventionally implicated? I do not know of a really good way. The usual tests cannot be applied, for there is no way to test satisfaction in conditionals, for example, because of restrictions on the distribution of *yokumo*, and behavior with respect to plugs and holes cannot be tested due to other distributional restrictions, all discussed in section 3. The issue is general, and has received a bit of recent discussion by Schlenker (2008), who raises worries for his theory of presupposition involving complex presuppositions that cannot be articulated easily or at all in natural language. This is an interesting issue that I will return to in section 3, though I will not be able to do it full justice in this paper.

[18] As will be detailed below, the restrictions it shows are actually a bit more severe, but the facts about nonveridicality are enough to make the point currently at issue.

I will therefore treat the content of *yokumo* as conventionally implicated in what follows (excluding the presupposition of common ground). In the next subsection I will outline the system of Potts (2005), which I will make use of in my analysis.

2.1.2 Potts's (2005) Logic for Conventional Implicatures

Potts (2005) proposes a pair of logics called $\mathcal{L}_{CI}$ and $\mathcal{L}_{U}$ for the analysis of conventional implicature.[19] These two logics interact in sometimes complex ways. The parts of the system that concern us here involve a) what kinds of expressions are semantically well-formed, b) how these expressions are combined in the logical syntax, and c) how the resulting expressions are interpreted. These issues all relate to $\mathcal{L}_{CI}$, which is a higher-order lambda calculus. The first corresponds to a definition of admissible types in $\mathcal{L}_{CI}$ and the second to rules for how the admissible types are combined. The third issue corresponds to a rule for the interpretation of conventionally implicated expressions: effectively a mapping between expressions of $\mathcal{L}_{CI}$, the type theory used for the combinatorics, to logical forms intended for model-theoretic evaluation. I examine each in turn. As we will see, the system as set up in Potts's work cannot be used to adequately analyze *yokumo* (or, it will turn out, *sekkaku*), which will prompt some elaborations of it in later parts of the paper.

First, the types themselves. Potts defines a system of types. Here, as in the type theories standardly used in linguistic semantics (cf. Heim and Kratzer 1998), basic types are e, t, s, which are used to produce an infinite set of types via the usual kind of recursive definition. (The details of the definition are provided in Appendix A.) However, Potts's logic differs in that it makes crucial use of a distinction between *at-issue types* and *CI types* ('CI' indicating conventional implicature). The distinction is indicated via a superscript 'a' or 'c' on the type name. At-issue types are freely produced in the usual way. CI types are distinct: they are always of the form $\langle \sigma^a, \tau^c \rangle$, functions taking at-issue typed objects as input and outputting CI-typed objects. There is no mechanism for producing types that take CI-typed objects as input. This, according to Potts, is the reason that conventionally implicated content is independent of at-issue operators: there simply are no operators over CI content.

How are these objects combined? $\mathcal{L}_{CI}$ has the derivation rules for type combination shown in Table 1. Potts couches them as 'tree admissibility conditions'

[19] I will not review the full motivations for this logic here, or all the details of how it works. I will focus only on the parts that will be necessary for the analysis of the adverbials in this paper.

(*R*1) $\dfrac{\alpha : \sigma}{\alpha : \sigma}$

(*R*2) $\dfrac{\alpha : \langle \sigma^a, \tau^a \rangle, \beta : \sigma^a}{\alpha(\beta) : \tau^a}$

(*R*3) $\dfrac{\alpha : \langle \sigma^a, \tau^a \rangle, \beta : \langle \sigma^a, \tau^a \rangle}{\lambda X.\alpha(X) \wedge \beta(X) : \langle \sigma^a, \tau^a \rangle}$

(*R*4) $\dfrac{\alpha : \langle \sigma^a, \tau^c \rangle, \beta : \sigma^a}{\alpha(\beta) : \tau^c \bullet \beta : \sigma^a}$

(*R*5) $\dfrac{\alpha : t^c, \beta : \tau^a}{\beta : \tau^a}$

(*R*6) $\dfrac{\alpha : \sigma}{\beta(\alpha) : \tau}$ (where β is a designated feature term)

Figure 1: Rules of proof in $\mathcal{L}_{CI}$.

but this comes out to more or less the same thing as a derivation rule if one understands his trees as proof trees, along the lines of categorial grammar: the Table 1 notation is more compact, so I will take this perspective.[20] (R1) is just a reflexivity axiom. (R2) is ordinary application for at-issue elements; this is completely standard in formal semantics. (R3) is a rule for intersection, where we abstract over the input type of two elements. (R4) and (R5) are the rules mainly of interest to us. Given an expression of a given at-issue type and another expression mapping that type to some conventionally implicated type, use of (R4) yields the resulting conventional implicature paired with the original at-issue type, where the $\bullet$ simply indicates this pairing. The $\bullet$ is used only to conjoin at-issue and CI type objects. This means that any given node in the proof tree can be decorated with both at-issue and conventionally implicated content.[21] (R5) strips CI objects of propositional type away from a premise set (by shunting them away to another

[20] I also ignore the possible presence of additional CI conditions that he mentions, which warrant thinking of these rules as shorthand for a larger rule set. See Potts (2005:222) for details.

[21] $\bullet$ terms have some affinities to the *dot objects* of Pustejovsky (1995), and not only in form. I will say a bit more about this in footnote 33.

meaning dimension, as we will see shortly). What is absolutely crucial in rule (R4) is that the at-issue content is duplicated in the output of the derivation. This means that the logic allows, indeed requires, duplication of resources, when conventional implicatures are involved. Given that $\mathcal{L}_{CI}$ is designed for the interpretation of supplementary elements like appositives and (some) speaker-oriented adverbials, this makes perfect sense. The final rule, (R6), is highly specific to Potts's analysis of supplementary expressions; I will not discuss it here, as we will have no need to make use of designated features in the analysis I will provide.

After the semantic computation is complete, the proof tree itself is then interpreted as a semantic object via the following rule.

(16) Let $\mathcal{T}$ be a proof tree with at-issue term $\alpha : \sigma^a$ on its root node, and distinct terms $\beta_1 : t^c, \ldots, \beta_n : t^c$ on nodes in it. Then the interpretation of $\mathcal{T}$ is $\langle [\![\alpha : \sigma^a]\!], \{ [\![\beta_1 : t^c]\!], \ldots, [\![\beta_n : t^c]\!] \} \rangle$.

Here α and β are variables over lambda terms, and σ^a is a variable over semantic types. The superscripts distinguish the types as either at-issue (superscript *a*) or CI (superscript *c*). Effectively, conventionally implicated content is shunted into a separate dimension of meaning. The $\bullet$ therefore functions as a bookkeeping device in the proof.

The action of these three elements of the Potts logic, then, is as follows. First, types for conventional implicature are defined; crucially, there are no types that take conventionally implicated content as input. Second, these types are combined via the rules in (R1-6). With respect to conventional implicatures, this means the effect is to isolate conventionally implicated content from at-issue content with a $\bullet$, by rules (R4) and (R5). $\bullet$ terms are then separated into separate dimensions of meaning, by the schema in (16). In the following subsection, I will argue that this system is not appropriate for *yokumo*, and that modification is necessary.

2.1.3 *Yokumo* and $\mathcal{L}_{CI}$

Consider how an analysis of *yokumo* as introducing conventional implicature would go in the existing $\mathcal{L}_{CI}$ system. Since its content is conventionally implicated, it yields a CI output type. This means that its lexical entry looks like the following when annotated with type information: it takes an object of type t^a, a proposition[22], and yields a conventional implicature of propositional type (t^c).

[22]Here I follow Potts in ignoring intensionality. This is obviously problematic, but it allows us to simplify the present denotations. Further, there are difficulties with intensionalization in $\mathcal{L}_{CI}$, which I return to in section 4.4.

(17) $[\![yokumo]\!]^c = \lambda p \partial[CG_{\{s,h\}}(p)].[E(p)(p) \wedge surprise(p)] : \langle t^a, t^c \rangle$

The problem arises when we consider the interaction of this lexical entry and type specification with the proof rules in Figure 1. Rule (R4), as discussed above, causes duplication of the input to a CI type in the output. The result of application of the CI type to the at-issue input is then moved into a separate dimension of meaning by the rule in (16). But this means that, in the case of *yokumo*, the propositional content is duplicated, as follows (for a given ϕ):

(18) $\langle \phi, \{E(\phi)(\phi) \wedge surprise(\phi)\} \rangle$

This means that ϕ is at-issue content, which means that, given that (as will be shown in section 3) *yokumo* can appear only in declaratives, ϕ is asserted. But this is not correct. We have already seen that ϕ is not asserted—it is already presupposed to be common ground, so asserting it is not a felicitous conversational move on standard theories (cf. Stalnaker 1979); this is also shown by the data in (10). Further, it cannot be denied. The analysis as stated cannot be correct.

It is easy to see why this problem arises. The conventional implicatures analyzed by Potts are uniformly supplemental in nature: appositives, speaker-oriented adverbs, certain kinds of expressives.[23] All of these semantically comment on the content that hosts them; they do not provide main content. It is in this sense that their content is not at issue. Since $\mathcal{L}_{CI}$ is designed to deal with supplementary meanings, it is reasonable that it passes at-issue content through the proof unmodified.

But is all conventionally implicated content supplementary in nature? The facts about *yokumo* suggest that it is not. Since *yokumo* behaves in all respects that are testable as if it is conventionally implicated, and conversely does not behave as if it is asserted, presupposed, or conversationally implicated, and further since the proposition it applies to *does not* appear to be asserted when it is modified by *yokumo*, we are left with the conclusion that not all conventional implicatures are supplemental. I discuss additional cases like this in section 4.

I propose altering $\mathcal{L}_{CI}$ so that it can handle cases where CI content is primary. There are two obvious ways to do this. The first involves adding an additional rule of the following form.

(R7′) $$\frac{\alpha : \langle \sigma^a, \tau^c \rangle, \beta : \sigma^a}{\alpha(\beta) : \tau^c}$$

[23] The latter category is argued by Potts (2007) to need a different kind of treatment, however.

Adding this rule, though, causes significant problems in the system. Namely, in any case where there is application of a CI type to an at-issue type, (R7′) can be used. This of course includes the case of supplements; the prediction is that even when conventional implicatures serve as supplements, the at-issue content they apply to need not be passed up the tree unchanged. But this is simply wrong. Another solution is needed.

The second, better, solution is to complicate the type system. The idea is that the CI types in $\mathcal{L}_{CI}$ actually model the behavior of supplementary conventional implicatures. It is therefore reasonable to define a new type for those conventional implicatures that are not supplementary in nature. This is what I will do. I will use a superscript s to distinguish what I will call *shunting types*, types for those semantic objects that 'shunt' information from one dimension to another, without leaving anything behind for further modification. The type system obtained by adding these types to $\mathcal{L}_{CI}$ is called $\mathcal{L}_{CI+S}$ and is defined in Appendix B.1. With this type classification, it becomes possible to define a rule specific to nonsupplementary conventional implicatures, which is essentially just like (R7′) except that it involves shunting types instead of CI types.

$$\text{(R7)}\quad \frac{\alpha : \langle \sigma^a, \tau^s \rangle, \beta : \sigma^a}{\alpha(\beta) : \tau^s}$$

We can then modify the rule in (16) to handle information from shunting types as well. $\sigma^{\{x,sy\}}$ indicates that σ is a type of sort x or sort y.[24]

(19) Let $\mathcal{T}$ be a proof tree with at-issue term $\alpha : \sigma^{\{a,s\}}$ on its root node, and distinct terms $\beta_1 : t^{\{c,s\}}, \ldots, \beta_n : t^{\{c,s\}}$ on nodes in it. Then the interpretation of $\mathcal{T}$ is $\langle [\![\alpha : \sigma^a]\!], \{ [\![\beta_1 : t^{\{c,s\}}]\!], \ldots, [\![\beta_n : t^{\{c,s\}}]\!] \} \rangle$.

The combination of (R7) and the new interpretation rule in (19) serves to maintain the original generalizations about supplementary meanings provided by $\mathcal{L}_{CI}$ while expanding the system's coverage to conventional implicatures that introduce the primary meaning of the sentence they appear in.

A simple revision of the semantics provided for *yokumo* suffices. We need only change the output type from t^c to t^s.

(20) $[\![yokumo]\!]^c = \lambda p \partial [CG_{\{s,h\}}(p)].[E(p)(p) \wedge surprise(p)] : \langle t^a, t^s \rangle$

[24] I thank Yasutada Sudo for helping me to correct an infelicity in an earlier version of this definition.

Here is a sample derivation for a sentence modified by *yokumo* using this new lexical entry, to give a sense of how the revised definitions work. The meaning of (21) is derived as in (22); here $\phi = ch(y)$, the proposition that you came here.

(21) omae yokumo kita na!
you-Antihon YOKUMO came PT

'You really had a lot of guts to come here!'

(22) $$\frac{\phi : t^a \qquad yokumo : \langle t^a, t^s \rangle}{yokumo\phi : t^s}$$

The resulting content of type t^s on the root node is shunted to the conventional implicature dimension by the rule (R7). After application of the schema (19), the following meaning will be obtained:

$$\langle \varnothing, \{yokumo\phi\} \rangle.$$

As desired, no content is asserted by the sentence; the at-issue dimension is empty, and the sentence only carries conventional implicatures. This relatively simple modification of the Potts logic has therefore yielded an adequate semantics for nonsupplementary conventional implicatures, and an empirically adequate semantics for the adverbial *yokumo*.

2.2 Sekkaku

We now turn to a different adverbial, Japanese *sekkaku*. This adverbial also (I will argue) introduces conventionally implicated content, but it differs from *yokumo* in also making an at-issue contribution. It thus exemplifies a class of lexical items I will call *mixed*; these are objects that contribute meaning to both the conventional implicated and at-issue dimensions of meaning. Some further examples will be discussed in section 4. The discussion will proceed as follows. I first consider the basic meaning of the adverbial, and argue that some of this meaning is asserted and some conventionally implicated. In section 2.2.2 I then return to the $\mathcal{L}_{CI}$ type system and extend it further to handle cases of mixed content. Unlike the prior modification, cases of mixed content do not require us to add additional types; instead we need to add product types where the conjoined types relate to different meaning dimensions. 2.2.3 shows how this extension can adequately account for the meaning of *sekkaku*.

2.2.1 Lexical content

Sekkaku, like *yokumo*, has a complex meaning. I will argue that it has three components to its meaning. The first is a statement of volitionality: the event described by the modified proposition was done intentionally, when the proposition describes an agentive eventuality. The second involves a statement about expectations: given that the modified proposition *p* holds, the speaker expects that ordinarily some other proposition *r* holds as well. The third bit of the lexical meaning states that the consequence *r* is something the speaker takes to be positive. The discussion here diverges substantially from that of McCready (2007), who observed most of the facts I will discuss but who came to somewhat different conclusions about them.

The investigation of this adverbial is complicated by the fact that it cannot appear in root contexts, but only in subordinate clauses of various sorts.[25] It can therefore be hard to distinguish the contribution of the adverbial from the contribution of the subordinator, but it is of course possible. In addition, the necessity for embedding *sekkaku* under subordinating operators makes available another test that helps determine what level of meaning the adverbial contributes to, as I will show.

The first and most obvious component of *sekkaku*'s meaning involves volitionality. The following example indicates that the food preparation was done purposefully (with an eye toward the food being eaten).

(23) sekkaku gohan-o tsukutta noni tabete-kure-na-katta
SEKKAKU food-Acc made although eat-receive-neg-Pst

'Even though I took the trouble to make food, (he/they) didn't eat any.' (McCready 2007)

(24) sekkaku gohan-o tsukutta kara tabete-kara iku
SEKKAKU food-Acc made so eat-after go

'Since I took the trouble to make food, we'll go after we eat.' (McCready 2007)

But this volitional component is not always present. In particular, *sekkaku* can be used to modify agentless eventualities such as natural phenomena.

[25] Koyano (1997) provides a survey.

(25) sekkaku kuri-ga ochiteiru kara hiroo yo
SEKKAKU chestnuts-NOM fallen-down because pick.up-HORT PT

'Since fortunately some chestnuts have fallen down here let's pick them up.' (McCready 2007)

The difference here is that making food is an agentive action, but chestnuts having fallen down is not. In my earlier work, I therefore proposed that *sekkaku* means in part that, if the proposition it modifies describes an agentive event, the event was volitional. This seems correct. We can therefore take this as a starting point. Here $Desc(\phi, e)$ should be read 'ϕ describes the eventuality e'.[26]

(26) $[\![sekkaku]\!] = \lambda p[\forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))]]]$

The second component involves the consequence of the modified proposition. In the world, actions have consequences; if certain things happen, we can expect that certain other things will result. If I make dinner, I expect that it will be eaten. If I buy tickets, I expect that someone will go to the game. The adverbial indicates that the speaker holds such expectations: given *p*, some *q* will follow. These expectations are obviously nonmonotonic. If I make dinner and if, when everyone comes home, it turns out that they have just eaten, I don't expect any longer that they will eat. If I buy tickets and it turns out the game is cancelled, I don't expect that anyone will attend. I suggest therefore (as in McCready 2007) that a nonmonotonic conditional be used to characterize the relation between modified proposition and its result. In particular, I make use of a nonmonotonic conditional '>'. There are various versions of this conditional that have been used in linguistic applications: one is the conditional '$>_a$' of Halpern (2003), a first-order version of which was used by McCready and Ogata (2007a) for adjectives of stereotypical comparison in Japanese.[27] I will employ this conditional here as well, as what is expected depends on the information and beliefs of the speaker, though I will suppress the subscript for agent since it is always the speaker. In what follows, therefore, '$\varphi > \psi$' should be read 'given φ, usually ψ, according to the speaker.' The result of adding a clause incorporating this conditional is the following:

(27) $[\![sekkaku]\!] = \lambda p[\forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))] \wedge \exists q[p > q]]$

[26] It is difficult to give a precise definition of this predicate. What counts as describing something else? The situation seems vague and perhaps even context-dependent. I will not go deep into this issue here.

[27] An axiomatisation and some details of the model theory can also be found there.

However, there is more to be said about these consequences. Notice that the following is out.

(28) # sekkaku ashi-o otta kara hana-o motte-itte-ageta
SEKKAKU leg-Acc broke so flower-Acc take-go-gave
'Since he luckily broke his leg, I took him some flowers.'

This example is highly bizarre. Intuitively, the reason is that breaking one's leg is not a good thing but a bad one. In my earlier work I treated this as indicating a condition on the modified proposition: that it be something the speaker take to be positive, so that $good(p)$. There are two problems with this approach. First, sentences like this one are actually fine in special contexts. Suppose that the speaker knows that the person who broke his leg was supposed to appear in some event, but really didn't want to do so. In this situation, breaking one's leg is a good thing. This indicates that the correct clause is not $good(p)$ but instead $E(c)(p) = good$, which introduces the right kind of dependency on context. Second, is it really justified to say that p must be something good? Consider (23), where *sekkaku* modifies the proposition that I made food. Surely there isn't anything especially positive about my cooking, qua my cooking. The positive thing is the fact that my cooking results in food which someone can eat. Similarly, there isn't anything especially positive about chestnuts having fallen as such, but instead about the fact that the chestnuts can be gathered and used for something. It is therefore only the (nonmonotonic) consequence of p that is taken to be positive. These two observations necessitate the following revision.

(29) $[\![sekkaku]\!]^c = \lambda p[\forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))] \wedge \exists q[p > q \wedge E(q) = good]]$

One aspect of the adverbial's basic lexical meaning remains to be analyzed. What is the relationship between the content of the main clause and the content of the subordinate clause, in terms of the adverbial? Intuitively, there are two aspects to this relation. The first is that the connection between the main clause content and that of the subordinate clause as modified by *sekkaku*. This is indicated by the clausal subordinator itself. Second is a relation between the main clause content and the nonmonotonic consequence (q in the lexical entry above). This relation is relatively underspecified, but is always present. For the present, I indicate it as an underspecified relation R in the lexical entry of *sekkaku*, which is modified to include an argument slot for the main clause proposition. (None of this, however, entails the truth of p, which is also required; I add this as well.)

(30) $[\![sekkaku]\!]^c = \lambda p \lambda r[p \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))] \wedge \exists q[p > q \wedge E(q) = good \wedge R(q, r)]]$

What is the content of R in the entry above? There are a number of possible realizations. In the examples in this paper, we find denial of expectation (23) and explanation (24), where the content of the main clause is declarative. In (25), the main clause is hortative, inviting the hearer to join the speaker in realizing q. It is easy to find similar cases with imperatives.

(31) sekkaku gohan-o tsukutta kara tabe-te yo
SEKKAKU food-Acc made so eat-Imp PT

'I went to the trouble of cooking, so eat!'

When the main clause is interrogative, the question it denotes concerns the realization of q.

(32) sekkaku gohan-o tsukutta noni tabe-nai no?
SEKKAKU food-Acc made although eat-Neg Q

'Even though I went to the trouble of cooking, aren't you going to eat?'

R is thus various and its exact realization appears highly context-dependent; indeed, the problem of determining R is reminiscent of the problem of inferring the correct relation between speech acts in discourse structure (cf. Asher and Lascarides 2003). It certainly appears to have a similar complexity, though the scale of the domain is different.[28] In this paper I will not be able to address it fully. I only note that, in each case, R concerns the relation between the main clause denotation, r, and the realization of q, or its lack of realization. This in turn is perhaps related to the characterization of q as positive by the adverbial. I will not pursue the analysis further here, instead leaving R underspecified.

This entry captures nearly all the lexical content of *sekkaku*; what remains, a presupposition of actuality, will be addressed in section 3.2. For the present, we might ask what the status of all this content is. Is it all asserted, as the above lexical entry would have it? Or is some of it presupposed or conventionally implicated? To answer this question, we can consider the behavior of *sekkaku* sentences with respect to semantic modifiers and denials. Let us begin by considering the subordinators themselves. What is the intuitive meaning of the subordinate clause in,

[28]The SDRT glue logic (or a related form of nonmonotonic reasoning over a knowledge base) might therefore be a suitable system in which to analyze the realization of R.

for example, (24)? It indicates not (as the lexical entry above would indicate) that the speaker will go after eating because he has purposefully cooked, and because he expects some good results to follow from this cooking, but only the former. The statement about expectations does not enter into the causal relation introduced by the subordinator; only the statement about intentionality does. The case of (23) is similar, though the relation denoted is obviously different, as is (25), though here, since intentionality is not possible, only the fact of *p* is relevant. This fact already indicates that not all the content of the adverbial is asserted.

What happens when *sekkaku* sentences are denied? The results here are slightly less useful for present purposes. Suppose we deny (24) by means of truth-directed denials like those used in (13) above.

(33) a. # sore-wa hontoo janai
that-Top truth Cop.Neg
'That's not true.'

b. # uso da
lie Cop
'That's a lie!'

These denials indicate that it is false that the reason you are coming after you ate is that you intentionally cooked. Notice that, again, the expectational content does not play a role in what is denied; but the notion of intentionality cannot be denied either in the present context. The reason is that the content of *because*-clauses is presupposed, and so denial cannot apply.

The test for what content participates in subordinating relations indicates that some of *sekkaku*'s content is not truth-conditional. What about other semantic operators? Unfortunately, like *yokumo*, *sekkaku* can only appear in veridical environments.[29] This means that the ordinary tests for projection cannot easily be applied. Again, this is like the *yokumo* case; here also we cannot directly apply projection tests for presupposition. As with *yokumo*, though, a conceptual argument can be made that the nonasserted content of *sekkaku* is not presuppositional.[30] A speaker's use of a presupposition trigger indicates a belief on the part of the speaker that the hearer is already aware (or, at least, could be aware) of the presuppositional content. As far as I know, there are no presuppositions that

[29] Again, the condition is actually slightly stronger, as will be discussed in section 3.2.

[30] In my earlier work I took it to be presuppositional, but I now believe that this was an error. I did not seriously consider the possibility of conventional implicature at that time in the context of *sekkaku*.

always must be accommodated—presuppositions whose function is to introduce new information.

A counterargument might go as follows. "But couldn't this content be assumed to be common to both speaker and hearer? After all, what is taken to be positive, and what normally follows from what, is usually common to everyone in a conversation. It could even be part of the common ground. If so, it might just be presupposed." This argument seems initially plausible, but rests on some dubious assumptions about commonality of information. The question is whether or not one can use a sentence modified by *sekkaku* in cases where the speaker and hearer have distinct beliefs about what is positive and what normally follows from what. As far as I can tell, this is possible, which indicates that one function of *sekkaku* can be to communicate the speaker's beliefs about these things, in the same way that one function of vague expressions can be to communicate information about contextual standards (cf. Barker 2002). It seems that the above argument does not really go through.

I conclude, therefore, that parts of the content of *sekkaku* are conventionally implicated. But there is a problem in formalizing this conclusion: some parts of its content are asserted, as could be seen from their participation in the causal relations introduced by *kara*, and the denial of expectation indicated by *noni*. The Potts logic $\mathcal{L}_{CI}$ allows one to produce objects of at-issue type or CI type; the extension I proposed above, $\mathcal{L}_{CI+S}$, allows also for shunting types. In neither type system can one produce objects of *mixed* at-issue and CI type. But this is plainly what is needed for the current case. In the next section I propose a further extension of the type system that is capable of producing objects of mixed type.

2.2.2 Mixed content and $\mathcal{L}_{CI+}$

I have argued in the previous subsection that *sekkaku* introduces the following content:

(34) a. At-issue: $\lambda p[p \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))]]$

b. Conventionally implicated: $\lambda p \lambda r \exists q[p > q \wedge E(c)(q) = good \wedge R(q, r)]$

In $\mathcal{L}_{CI}$, there is no typing for such a lexical entry.[31] It is in principle possible to stipulate that *sekkaku* introduces a pair of separate expressions, one of at-issue type $\langle t^a, t^a \rangle$ and one of CI type $\langle t^a, \langle t^a, t^c \rangle \rangle$; but this seems to me a highly unnatural

[31] Potts himself claims that there are no lexical items of mixed type.

kind of lexical entry to have in that the two expressions are of necessity entirely separate.[32] I thus reject this option. The extension to $\mathcal{L}_{CI+S}$ does not help.

However, the resources to create the needed kind of entry are obviously already present in $\mathcal{L}_{CI+S}$. We already have what we need: at-issue types and CI types. We need only a way to produce product types across the two dimensions, and then an application rule telling us what to do with such types when we have them. In this subsection I will provide these tools; the resulting type system is called $\mathcal{L}_{CI+}$. The next subsection applies it to *sekkaku*; section 4.2 applies it to a range of other items as well.

It is rather simple to add the relevant types. We need only a single typing rule producing mixed types. This rule is provided in Appendix B.2. It produces types of the following form:

$$\langle \sigma, \tau \rangle^a \blacklozenge \langle \sigma, \upsilon \rangle^s$$

This object is comprised of three parts: an at-issue type, a connective '$\blacklozenge$' for mixed types, and a shunting type.[33] Note that the input to both the at-issue type and the shunting type is of the same semantic type; this is always a feature of mixed types, and ensures that there are no types for objects that are already undefined at the input stage.[34] We now need a rule for interpreting these types. I propose the following.

$$\text{(R8)} \quad \frac{\alpha : \langle \sigma^a, \tau^a \rangle \blacklozenge \beta : \langle \sigma^a, \upsilon^s \rangle, \gamma : \sigma^a}{\alpha(\gamma) : \tau^a \bullet \beta(\gamma) : \upsilon^s}$$

Given as input a mixed type and an object of the at-issue type that is input to both conjoined elements in the mixed type, (R8) outputs the result of applying each element of the mixed type to the input, where both objects are conjoined with $\bullet$. We will need one further rule telling us what to do with $\bullet$ terms where both conjuncts are functional types; this is provided in the next subsection.

The reader may wonder why we need to use shunting types on the CI side of $\blacklozenge$. The reason becomes clear when one considers how the CI types in $\mathcal{L}_{CI}$

[32] The case of presupposition may seem formally similar on a superficial level, but it is rather different in that presuppositions (on some perspectives at least) simply indicate definedness conditions for the at-issue content, whereas here the two bits of content are entirely separate and indeed of different semantic types.

[33] These objects are rather similar to the *dot objects* of Pustejovsky (1995), as already mentioned in footnote 21. The difference is that, in GL, trying to make use of both 'sides' of the dot object results in zeugmatic infelicity, so there is no rule like (R8) even in the extended system (Asher and Pustejovsky, 2005).

[34] This means that mixed types could have been defined to be of the form $\langle \sigma^a, \tau^a \blacklozenge \upsilon^s \rangle$. I take it that the difference is not really substantial.

work. Recall that such types are not resource sensitive; they always return their at-issue input as well as the result of applying the CI type to this input. (R4) yields an object of the type $\sigma^a \bullet \tau^c$ when an object of the form $\langle \sigma^a, \tau^c \rangle$ is applied to something of type σ^a. But this means that, in the terms of the form $\alpha(\gamma) : \tau^a \bullet \beta(\gamma) : \upsilon^s$ yielded by (R8), the object to the right of the $\bullet$ will be of the form $\gamma : \sigma^a \bullet \beta(\gamma) : \upsilon^c$ itself, meaning that the whole term is of the form $\alpha(\gamma) : \tau^a \bullet \gamma : \sigma^a \bullet \beta(\gamma) : \upsilon^c$. This means that there is an 'unused' term of type σ^a floating around in the derivation, which will result in ill-formedness. We do not want this, and we can avoid it by using shunting types on the right-hand side instead. Such types remove the terms they apply to from the at-issue dimension completely, which clearly is what is needed in this case.[35]

With this rule and the type system in Appendix B.2, we are able to provide an adequate semantics for lexical items that introduce simultaneously at-issue and conventionally implicated content, by defining objects of mixed at-issue and CI types. The next section shows in detail how this can be done for *sekkaku*, and in less detail, how it might be applied to other words that arguably have similar characteristics.

2.2.3 Application

In the system $\mathcal{L}_{CI+M}$, we can define a lexical entry for *sekkaku* as follows.

(35) $[\![sekkaku]\!]^c =$
$\lambda p[p \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))]] : \langle t^a, t^a \rangle \blacklozenge$
$\lambda p \lambda r \exists q[p > q \wedge E(q) = good \wedge R(q, r)] : \langle t^a, \langle t^a, t^s \rangle \rangle$

Let us assume the following lexical entry for *kara* 'because'.[36]

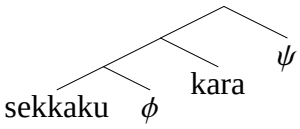
(36) $[\![kara]\!] = \lambda p \lambda q[Cause(p, q)] : \langle t^a, \langle t^a, t^a \rangle \rangle$

An example will show how the system works. I will give an analysis of (24). Let $\phi = cooked(s, food)$ and $\psi = \tau(eat(s)) \prec \tau(go(s))$ and assign the following structure to the sentence:

[35] If one takes the intuitive interpretation of shunting types to be 'main conventionally implicated content,' then the definition of mixed types indicates that there are two kinds of 'main content' in mixed-type sentences. I myself do not find this very counterintuitive.

[36] I leave the predicate *Cause* completely undefined here as I do not want to enter into questions about causation.

(37)



This means that, at the initial stage of the derivation, we apply $[\![sekkaku]\!]$ to ϕ. By (R8) this yields

$$\phi \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))] : t^a$$
$$\bullet$$
$$\lambda r \exists q[\phi > q \wedge E(q) = good \wedge R(q, r)] : \langle t^a, t^s \rangle$$

The denotation of *kara* then applies to this object. Since it is of at-issue type, this application takes place only on the first conjunct of $\bullet$ via (R2), yielding

$$\lambda q[Cause(\phi \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))], q)] : \langle t^a, t^a \rangle$$
$$\bullet$$
$$\lambda r \exists q[\phi > q \wedge E(q) = good \wedge R(q, r)] : \langle t^a, t^s \rangle.$$

At the next point of the derivation $\psi : t^a$ is introduced. At this point we have a minor complication; both conjuncts of the $\bullet$ term must apply to $\psi : t^a$. The types themselves are unproblematic: $\mathcal{L}_{CI}$ in principle allows $\bullet$-objects where both conjuncts are of complex type. However, in Potts (2005), one does not find any use made of this resource. Because Potts considered only supplementary conventional implicatures which take only a single argument, the CI type in the $\bullet$-term was always of type t^c. As a result, there is no rule of inference instructing us how to apply a $\bullet$-term to an argument that is the input to both conjoined types.

The solution is to simply create a new rule of inference. The necessary rule is easy to formulate, though, and looks nearly identical to (R8): the only change is that the $\blacklozenge$ in the premises of (R8) has been substituted with a $\bullet$ in (R9).

(R9) $$\frac{\alpha : \langle \sigma^a, \tau^a \rangle \bullet \beta : \langle \sigma^a, \upsilon^s \rangle, \gamma : \sigma^a}{\alpha(\gamma) : \tau^a \bullet \beta(\gamma) : \upsilon^s}$$

Application of (R9) yields the following at the root of the derivation tree for (24).

$$Cause(\phi \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))], \psi) : t^a$$
$$\bullet$$
$$\exists q[\phi > q \wedge E(q) = good \wedge R(q, \psi)] : t^s$$

This formula is of a familiar type and is interpreted via the rule in (19). The result is the desired pair of meanings, where the causal statement is at-issue and the statement about expectations is conventionally implicated.

(38) $[\![(23)]\!]^c =$
$\langle Cause(\phi \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))], \psi),$
$\{\exists q[\phi > q \wedge E(q) = good \wedge R(q, \psi)]\}\rangle$

Here is the full derivation, where I show only the types. This proof tree fails to fully reflect the two-dimensionality of the type system, in particular at step 2, where the split in the application of *kara* is not reflected in the notation.

$$\dfrac{\dfrac{\dfrac{sekkaku : \langle t^a, t^a\rangle \blacklozenge \langle t^a, \langle t^a, t^s\rangle\rangle \qquad \phi : t^a}{sekkaku(\phi) : t^a \bullet \langle t^a, t^s\rangle} \qquad kara : \langle t^a, \langle t^a, t^a\rangle\rangle}{kara(sekkaku(\phi)) : \langle t^a, t^a\rangle \bullet \langle t^a, t^s\rangle}\,2 \qquad \psi : t^a}{kara(sekkaku(\phi))(\psi) : t^a \bullet t^s}$$

2.3 Summary

In this section I have done three things. I have shown a range of complex data relating to the meaning of the adverbials *yokumo* and *sekkaku*, and argued that both involve conventional implicature. The first was argued to introduce exclusively content of this type, and the second to be of mixed type. I then extended the system $\mathcal{L}_{CI}$ of Potts (2005) to handle these facts, calling the resulting system $\mathcal{L}_{CI+}$.

In the next section I turn to other facts about the distribution of the adverbials. As we will see, the facts there relate quite directly to the previous discussion.

3 Distribution

This section considers facts about the distribution of the adverbials. There are two main classes of facts to be discussed. The first involves the adverbials in root vs. subordinate clauses, and is addressed in 3.1. In 3.1.1 it is shown that *yokumo* can appear only in root clauses, a fact which proves to follow directly from the analysis given in section 2.1. *Sekkaku*, conversely, can appear only in subordinate clauses, which, again, follows from the analysis in 2.2, as is shown in 3.1.2.

Section 3.2 turns to another set of facts that are common to both *yokumo* and *sekkaku*: they can only modify sentences that describe eventualities that (the speaker takes to) have actually occurred. This means that content introduced in nonveridical environments is not available for modification; it also means that (given suitable assumptions about what it means for something to occur) sentences

that describe the information of a speaker rather than describing a fact about the world are not available either. I argue that this distribution is the result of a restriction on the kind of evidence the speaker has for the propositions that the adverbial denotations target. A complex point here is how to determine whether the restriction is introduced by a presupposition or by a conventional implicature. Trying to apply the usual tests fails in this case, just as it did in section 2.1 with *yokumo*. I suggest that the reason the tests fail to be useful is the nature of the content itself and, in the end, conclude that it is presuppositional.

3.1 Rootedness

This section considers the distribution of the adverbials in root and subordinate clauses. It is shown in 3.1.1 that *yokumo* cannot appear in subordinate clauses. Given the analysis in section 2.1, this follows directly: since *yokumo* is of shunting type, it pushes all content it modifies to a separate dimension of meaning, resulting in type mismatches in these environments. 3.1.2 addresses *sekkaku*, which cannot appear in root clauses. This is also shown to follow from the analysis in 2.2 for type reasons; in root clauses, *sekkaku* is not saturated, resulting in ungrammaticality.

3.1.1 *Yokumo*

All examples of *yokumo* shown so far have had *yokumo* in root clauses. The reason is simple: *yokumo* is simply ungrammatical in non-root environments. (Translations represent the intended readings of the sentences.)[37]

(39) a. * Taro-ga yokumo kita kara mecha okotta
Taro-Nom YOKUMO came so really got.angry
'Because Taro had the gall to come, I got really mad.'

b. * mazu Taro-ga yokumo ki-te sosite Jiro-ga kita
first Taro-Nom YOKUMO come-SUB then Jiro-Nom came
'First Taro had the gall to come, then Jiro came.'

c. * Taro-ga yokumo kita noni dare-mo okora-nakatta
Taro-Nom YOKUMO came although who-∀ get.angry-Neg
'Although Taro had the gall to come, no one got mad.'

[37] I gloss *-te* as 'SUB,' a subordinator. It functions to coordinate clauses. Also, the indeterminate quantificational element *-mo* is glossed as ∀, following Shimoyama (1999, 2006).

Other subordinators are similar; they are just ungrammatical. What is the reason for this fact?

At first glance, it is puzzling. There is no obvious reason that *yokumo* should be incompatible with subordinate clauses, at least if one only considers its content; there is nothing in principle wrong with statements of unexpectedness and emotive attitude entering into causal relations, etc. On the other hand, if one considers the behavior of Pottsian conventional implicatures, ungrammaticality here is unexpected: supplementary CIs are scopeless with respect to subordinate clauses, but they do not induce ungrammaticality.

But these facts make sense when considered in terms of the analysis proposed here. Since *yokumo* is of shunting type, the content it modifies is no longer available for further combinatory processes in the at-issue dimension. This means that its output is of the wrong type to serve as input to at-issue operators. Intuitively, conventionally implicated content cannot be modified by at-issue operators; this is just as inn the discussion of supplementary CIs in Potts (2005). The situation will be as follows, using (39a) as an example and assuming again the lexical entry for *kara* in (36):

$$\dfrac{\dfrac{\dfrac{yokumo : \langle t^a, t^s\rangle \quad \phi : t^a}{yokumo(\phi) : t^s} \qquad kara : \langle t^a, \langle t^a, t^a\rangle\rangle}{?} \qquad \psi : t^a}{?}$$

The derivation fails when *kara* is applied to *yokumo*(ϕ), because the latter is of type t^s while the former requires an object of type t^a. The other cases are similar. I take this to be a nice prediction of the analysis.

3.1.2 *Sekkaku*

Sekkaku exhibits precisely the opposite behavior. It is completely ungrammatical in root clauses. (The translations below represent the intended readings.)

(40) a. * sekkaku gohan-o tsukutta
SEKKAKU food-Acc made
'I took the trouble to make food.'

b. * Taro-ga sekkaku hayaku okita
Taro-Nom SEKKAKU early woke.up
'Taro took the trouble to wake up early.'

This fact also follows from the analysis presented in section 2. There I claimed that *sekkaku* has the mixed type $\langle t^a, t^a\rangle \blacklozenge \langle t^a, \langle t^a, t^s\rangle\rangle$. This means that, in the at-issue dimension, it is a propositional modifier, but in the CI dimension it actually behaves as a kind of connective. But this dual nature puts requirements on the semantic contexts in which it can appear. The CI part of the adverbial meaning requires two arguments; this means that two objects of propositional denotation must be made available for semantic combination. As a result, if *sekkaku* appears in a root sentence, its CI denotation will remain unsaturated, resulting in a nonpropositional meaning, and so an incomplete derivation.

$$\frac{\textit{sekkaku} : \langle t^a, t^a\rangle \blacklozenge \langle t^a, \langle t^a, t^s\rangle\rangle \qquad \phi : t^a}{\textit{sekkaku}(\phi) : t^a \bullet \langle t^a, t^s\rangle}$$

We thus derive the ungrammaticality of *sekkaku* in root sentences.

It is interesting to note that the at-issue part of the denotation only takes a single propositional argument, so trying to saturate the denotation of *sekkaku* by simply providing an additional proposition will fail, but this time in the at-issue dimension:

$$\frac{\dfrac{\textit{sekkaku} : \langle t^a, t^a\rangle \blacklozenge \langle t^a, \langle t^a, t^s\rangle\rangle \qquad \phi : t^a}{\textit{sekkaku}(\phi) : t^a \bullet \langle t^a, t^s\rangle} \qquad \psi : t^a}{?}$$

Since the at-issue content of $\textit{sekkaku}(\phi)$ is not functional, it cannot take ψ as argument, and the derivation cannot proceed. This, again, is a nice result.

3.2 Actuality

The final aspect of the meaning of these adverbials we will consider is their restriction to propositions that describe 'actual' eventualities. This has already been pointed out by McCready (2004, 2007), who analyzed this restriction as a presupposition. After presenting data related to these restrictions (in 3.2.1 for *yokumo* and 3.2.2 for *sekkaku*), I provide an analysis stated in terms of evidential relations. The main question here is whether the restriction is actually presuppositional in nature or if it is better thought of as a conventional implicature. I ultimately conclude that, like the common ground presupposition of *yokumo*, it is a presupposition.

3.2.1 *Yokumo*

So far we have seen exclusively data in which *yokumo* modifies simple sentences that do not contain semantic operators. This was intentional. The reason is that—bar a very few exceptional cases—*yokumo* cannot modify other sentence types. I will now show that *yokumo* is ungrammatical in modal sentences, in conditionals, and in futurate and negated sentences, where these are understood as purely predictive or indicating nonexistence, respectively.[38]

Yokumo is ungrammatical in modal sentences, on either of the scopings in (41): $\Diamond$*yokumo*ϕ and *yokumo*$\Diamond\phi$ are both out.

(41) a. *[Yokumo koko ni kita] kamosirenai na!
YOKUMO here to came might PT
'Maybe you have a lot of guts to come here!'

b. *Yokumo [koko ni kita kamosirenai] na!
YOKUMO here to came might PT
'Maybe you have a lot of guts to come here!'

Similar facts hold for other sorts of modals, though there is a reading of ability modals on which *yokumo* is fine. Here the ability modal sentence is understood as talking about the speaker's propensities and capabilities based on his having actually done something, rather than as the result of an inference about what he is capable of.

(42) Yokumo Makiko-ni sonna koto-o i-e-ta na!
YOKUMO Makiko-to that.kind.of thing-Acc say-Abil-Pst PT
'I can't believe you had the gall to be able to say that kind of thing to Makiko!'

It also cannot be used in conditionals, as shown by (43). Here an interpretation of (43a) on which the adverbial scopes over the whole conditional is also unavailable.

(43) a. *Yokumo koko ni kitara, shachoo ga okoru daroo
YOKU here to came-if, boss NOM get-angry probably
'If you have a lot of guts to come here, the boss will probably get angry.'

[38] Most of this data comes from McCready (2004).

b. *Taro ga sake o nomitakattara, yokumo koko ni kuru
Taro NOM alcohol ACC want-drink-if, YOKU here to come
daroo
probably

'If Taro wants to drink, he will probably have a lot of guts to come here.'

Futurate sentences are also out. The following sentence has a purely futurate interpretation made available by the Japanese nonpast tense *-u* (cf. Ogihara 1996); a present tense interpretation is ruled out by the temporal adverbial *raigetsu* 'next month'. On this interpretation, it is out. However, there is an interpretation of this sentence on which it talks about Taro's having made the decision to go to Tokyo next month, so that this is *settled* (Copley, 2008); on this interpretation, the sentence is fine.

(44) (*)Taro-ga yoku(mo) raigetsu Tokyo ni iku na
Taro-NOM YOKU(MO) next.month Tokyo to go PT

*'Taro will have a lot of gall to go to Tokyo next month.'
'Taro has a lot of gall to have decided to go to Tokyo next month.'

Negated sentences are also bad with *yokumo* when they are understood as simply indicating that some event did not happen, or that some proposition does not hold. They can also be understood, though, as describing some true proposition or actual event in a negative manner, as in (46). If understood in this way, the negated sentences are fine.

(45) a. *Yokumo koko ni konakatta na!
YOKUMO here to came-not PT

'You have a lot of guts to not come here!'

b. *Yokumo ore o damasanakatta na!
YOKUMO me ACC not-tricked PT

'I can't believe you had the gall to not trick me.'

(46) a. John saw Mary not leave. (cf. Miller 2007)

b. John's not doing his homework caused him to fail. (cf. Varzi 2008)

McCready (2004) shows that *yokumo* is also bad in attitude sentences (when the modified proposition is the object of the attitude), and in indirect quotation, though direct quotes of *yokumo*-sentences are unproblematic.

Summing up, *yokumo* cannot appear in modal or conditional sentences, or in futurate and negated sentences when these are understood literally.

3.2.2 *Sekkaku*

Sekkaku exhibits a very similar distribution, excluding the fact that it cannot appear in root clauses. It is bad with epistemic modals, as seen in (47).[39]

(47) a. * ashita mochi-o sekkaku tsukuru kamoshirenai
tomorrow ricecake-ACC SEKKAKU make might
kara kite yo
because come-IMP YO
'Tomorrow I might go to the trouble of making a ricecake, so come over.'

b. * kinoo mochi-o sekkaku tsukutta kamoshirenai kara
yesterday ricecake-ACC SEKKAKU made might kara
kite yo
kite yo
'Yesterday I might have gone to the trouble of making a ricecake so come over.'

Like *yokumo*, *sekkaku* is fine when its complement denotes a proposition that is settled.

(48) a. Scenario: Nozomi has a marriage proposal, but her father is opposed, so she is thinking about declining. Her friend says:

b. sekkaku kekkon dekiru noni yameru no?
SEKKAKU marriage can.do although stop Q
'Even though you have the chance to get married, you're not going to do it?'

Futurates are also fine when they are understood as settled, again like *yokumo*.

(49) sekkaku raigetsu Tokyo-ni iku kara umai mono ippai tabete
SEKKAKU next.month Tokyo-to go so good thing a.lot eat-Sub
kaeru yo
come.home PT

[39] I show cases where the modal complement has nonpast and past tense, to alleviate possible worries about the cause of the infelicity.

'Since I'm going all the way to Tokyo next month, I'm going to eat a lot of nice food there.'

Conditional sentences are completely out with *sekkaku*, just as with *yokumo*. Here an interpretation where *sekkaku* scopes over the conditional is not even available, for the reasons discussed in section 3.1.

(50) a. * [omae-ga sekkaku keeki-o tukuttara] mochiron taberu
you-NOM SEKKAKU cake-ACC make-COND of-course eat
'If you go to the trouble of making a cake, of course I'll eat it.'

b. * taberu no dattara [sekkaku gohan-o tukuru yo]
eat NO COP-COND SEKKAKU food-ACC make YO
'If you'll eat it, I'll go to the trouble of making some food.'

c. * sekkaku [omae-ga cake-o tukuttara] mochiron taberu
SEKKAKU you-NOM cake-ACC make-COND of-course eat

Negated sentences also must be interpreted as negative descriptions to be targets for modification, again just as with *yokumo*.

(51) a. Scenario: The night before the big test.

b. sekkaku kurabu-ni ik-ana-katta noni ne-rare-na-katta
SEKKAKU club-to go-Neg-Pst although sleep-Abil-Neg-Pst
'Even though I made sure not to go to the club, I couldn't sleep.'

We therefore see that *sekkaku* is bad in just those contexts where *yokumo* is. The generalization is roughly that it cannot modify propositions that describe things that have not actually occurred—or, even stronger, that describe things for which the speaker lacks adequate external evidence. This is the line that I will pursue in the analysis.[40]

[40]McCready (2005) claims that the distributions of the adverbials do differ in one more area: *yokumo* must modify 'atomic' propositions, those that arise from nonconjoined sentences, while *sekkaku* purportedly lacks this restriction. It now seems to me that this judgement was too hasty, in that *yokumo* actually can apply to conjoined sentences.

(i.) yokumo gohan-o tabete koko-ni kita na
YOKUMO food-Acc eat-Sub here-to came PT
'You have a lot of gall to come here after eating.'

This sentence is fine. I think the apparent restrictions stem from a requirement for pragmatic coherence between the (here, two) conjoined propositions; the conjunction must be of the right kind to cause *yokumo*-style emotional reactions. I therefore will not treat this in the formal semantic analysis.

3.2.3 Analysis

In previous work (McCready, 2004, 2007), I analyzed these facts as following from a presupposition of actuality, stated as follows, where p is the input to the adverbial:[41]

$$\exists e[\tau(e) = t \wedge t \leq n] \wedge Desc(e, p) \wedge p(w_0)]$$

Here the idea was that the input proposition p described an event with a runtime in the past (possibly continuing into the present), and that p holds in the actual world. This seems adequate for most cases, but, without further assumptions, it fails to rule out cases where one of the adverbials scopes over a modal sentence (e.g. $\Diamond\phi$) or a conditional, for such sentences certainly can hold in the actual world for some runtime. One would need an additional assumption to the effect that such sentences do not count as introducing eventualities. But this makes them unlike other stative sentences, such as, for instance, the subordinate clause in (25), which certainly can be modified by *sekkaku*.[42]

The first thing to note is that, e.g., the reading in (41a) where the modal scopes over the content of the adverbial ($\Diamond$*yokumo*φ) is already disallowed by the type system. Since *yokumo*ϕ is of type t^s, and modal operators (presumably) are of type $\langle t^a, t^a\rangle$,[43] the modal will be unable to take *yokumo*ϕ as argument for type reasons, and so the reading is unavailable. Similar remarks hold for the conditional case. The case of *sekkaku* is more complex, though, because it also has at-issue content, so it is not obvious why it should be out in the case of conditionals; it should also be fine with modals, if nothing more is said. I will therefore go for a solution that can account for all the cases.

The obvious way to distinguish between 'ordinary' statives and conditional, modal, futurate and negated sentences seems to be that the former can be observed directly, while the latter cannot. Conditional sentences describe regularities and tendencies, often obtained by inferential means; modal sentences in effect say something about the information possessed by the speaker (cf. Veltman

[41] The first input, in the case of *sekkaku*. I should also note that McCready (2007) contains a fatal typo: the clause $p(w_0)$ somehow got left out there.

[42] *Yokumo* is often resistant to statives, while *sekkaku* generally allows them. Even *yokumo* is possible with sentences in the progressive, however, which are often analyzed as stative (e.g. de Swart 1998). I therefore will not introduce a restriction here; if one wanted to do so, it would only involve putting a restriction on volitionality into the presuppositions of *yokumo*, along the lines of that for *sekkaku* but nonconditional.

[43] Again disregarding intensionality. Also, those who believe that modals are two-place relations (cf. Kratzer 1981) may take them to be of type $\langle t^a, \langle t^a, t^a\rangle\rangle$ instead. None of this significantly changes the argument in the main text.

1996); futurate sentences express expectations, which are internal states; negated sentences literally construed simply state a lack. None of these things are externally observable—unless the futurate sentence describes something settled or the negated sentence provides a negative description, as discussed above. I will therefore take the restriction in question to be one about the means by which the modified proposition comes to be assertable; the means by which the speaker takes herself to have come to know (or believe) it.

This distinction is easily modeled in the evidential semantics of McCready and Ogata (2007b). As discussed in section 2.1.1, their logical system includes an evidential operator E. As noted there, this operator was relativized to an agent, so $\mathsf{E}_a\phi$ indicated that a had learned that ϕ. The effect of this is that ϕ is integrated into the information state of a, and the probabilities that a assigns to all remaining propositions are conditionalized over ϕ. The logic admits an additional relativization, however; $\mathsf{E}^i_a\phi$ indicates that a learned ϕ via an evidence source i. The logic makes a variety of evidence sources available; for a given sentence, the type of source picked out by i is determined by application of a function *Sort* from indices to sources. The possible evidence sources in the logic are: $\{tactile, auditory, internal\_sensory, hearsay, visual, judgemental, unknown\}$. Here, if $Sort(i) \in \{tactile, auditory, internal\_sensory, visual\}$, E^i_a is an *occasion sentence* in the sense of Quine (1960), i.e., a direct description of a situation directly observed or perceived by agent a. Plainly information acquired via such sources comprises a reasonable target for modification by *sekkaku* or *yokumo*.

We have already seen that information acquired via inferential or other mind-internal methods cannot be targeted by the adverbials. Is content obtained by hearsay available? It turns out that the answer is no.

(52) a. A: The boys put a dead fish in his bed as a warning.

b. B: * yokumo anna koto shita na!
YOKUMO that.kind.of thing did PT
'They had a lot of gall to do that!'

Here, the propositional content of B's utterance is common ground, given that it is anaphoric on the content of A's utterance, which after update is common ground, so *yokumo*'s presupposition is satisfied; still, the sentence is out. The reason seems to be just that B does not have the right kind of justification for his statement. This is remarkably similar to what is found with the English particle *man*, which carries conventional implicatures with respect to the degree of some gradable predicate in the sentence it modifies, on one kind of intonational contour.

(53) thus expresses that it is raining hard. (54) looks very similar to (52): A's utterance provides information to B, but it is infelicitous for B to intensify based on it, even if inference from the learned information would justify the conclusion that it is in fact raining hard.

(53) Man it's raining out there! (=it's raining hard out there)

(54) a. A: It's really pouring out there.

b. B: * Man it's raining out there!

McCready (to appearb) argues that this infelicity is also the result of an evidential restriction, to the effect that the speaker must have (more or less) direct experience of the content he wishes to modify. The requirement for directness is looser than we find with the adverbials, because *man* can modify modal sentences in certain cases. Still, given that we find the same kind of restrictions in both places, this notion of direct experience seems to be characteristic of many conventionally implicating expressions; while further research is needed to see how far the generalization can be taken, these facts are certainly suggestive.

Consequently I will give an evidential analysis of the restrictions on the adverbials. The idea will be to limit the application of *sekkaku* and *yokumo* to propositions which the speaker learned directly, that is, propositions φ where $\mathsf{E}^i_a\varphi$ holds of some past time and is an occasion sentence in Quine's sense, so

(E) $\mathsf{E}^i_a\varphi \wedge \tau(\mathsf{E}^i_a\varphi) = t \wedge t \prec n$, where $Sort(i) \in \{tactile, auditory, internal\_sensory, visual\}$

We now have a question to answer: is (E) presuppositional, or is it conventionally implicated? This question is difficult, for reasons already discussed in section 2.1. The simplest test for determining whether something is a presupposition or a conventional involves checking its behavior in contexts that are plugs for presuppositions. For example, can it be satisfied in conditionals? Does it always project from attitudes? As with the common ground presupposition of *yokumo*, these tests are not easily available, for neither context is usable given (E) itself.

Assuming a conditional of the form (where $(E)_\varphi$ indicates (E) instantiated with the proposition φ)

$$(E)_\varphi \Rightarrow yokumo\varphi$$

will not do to test the behavior of (E), because such conditionals are blocked due to the type of *yokumo*, as we have seen. However, this does not mean that we have no recourse, in principle. We could try to use modal subordination contexts; these

are discourses involving a sequence of sentences, each containing a compatible modal, where each sentence produces a hypothetical context in which the next is interpreted. The classical example is due to Roberts (1989).

(55) A wolf might come in. It would eat you first.

We thus might produce a discourse of the form

$$\Diamond(E)_\varphi; \Box \textit{yokumo}\varphi.$$

The problem with this strategy is that Japanese modal subordination requires that sentences following the first contain a conditional clause anaphoric to the scope of the first modal (McCready and Asher, 2006), which again causes type problems for *yokumo*.

This issue can be resolved by making use of *sekkaku* instead. We can use an ordinary conditional in this case, for simplicity. Here the conditional needs to be of the form $(E)_\varphi \Rightarrow \textit{Sub}(\textit{sekkaku}\varphi, \psi)$, for some subordinator *Sub*. This is rather complex but still ought to possible. But instantiating this schema presents a serious challenge. How should (E) be expressed at all?

The problem is that (E), like the common ground presupposition of *yokumo,* doesn't really have any natural counterpart in the object language. It is extremely difficult to see how to make it serve as a conditional antecedent. But here is a possibility. One can pick a single realization of *Sort*(*i*) in (E), say *visual,* and use a conditional that takes the statement $\mathsf{E}^i_a\varphi$ as antecedent:

(56) If I see that φ, then, although *sekkaku* φ, ψ.

But this is peculiar. There is no reason to assume that 'I see that φ' has the same meaning as $\mathsf{E}^i_a\varphi$, even if $\textit{Sort}(i) = \textit{visual}$. The first is an expression of English, but the second an expression in the metalanguage. I want to suggest that applying the satisfaction test to this kind of content rests on a confusion in the first place: the metalanguage is intruding into the object language. I think that this is the (or at least 'a') reason that Schlenker (2008) and others have had difficulty in testing theories of presupposition with respect to presuppositions like these, when such testing requires translation into the object language. They are just not the kinds of things that are easily or naturally expressed in natural language.[44]

[44] I am not able to prove this claim at present. Doing so involves proving results about a) expressivity of natural language, $L_{\mathsf{E},\triangle,\mathsf{F}}$, and dynamic epistemic logic (for the common ground presupposition) and b) translatability between these languages. All of these tasks are very complex and only the initial stage of the necessary theoretical framework is in place (Peters and Westerstahl, 2006). I leave the issue here for now.

The upshot of the above is that we are left, again, with conceptual arguments. As before, the hallmark of presuppositions is taken to be that their main function is not to introduce new information but to tie the new information being introduced to things the speaker already takes to be known. On the other hand, conventional implicatures do (or can) introduce new information, though this information is not asserted. Given this picture, it seems reasonable to assume (with McCready to appearb for the particle *man*) that (E) is in fact presuppositional. This leaves us with the following, final, lexical entries for *sekkaku* and *yokumo*. I define a predicate O (for 'occasion') to make the definitions compact.

(57) $O\varphi \longleftrightarrow \mathsf{E}^i_a\varphi \wedge \tau(\mathsf{E}^i_a\varphi) = t \wedge t \prec n$, where $Sort(i) \in \{tactile, auditory, internal\_sensory, visual\}$

(58) $[\![sekkaku]\!]^c =$
$\lambda p \partial[O(p)].[p \wedge \forall x, e[Desc(\phi, e) \wedge Agent(x, e) \rightarrow Intend(x, realize(e))]]\blacklozenge$
$\lambda p \lambda r \exists q[p > q \wedge E(q) = good \wedge R(q, r)] : \langle t^a, t^a\rangle\blacklozenge\langle t^a, \langle t^a, t^c\rangle\rangle$

(59) $[\![yokumo]\!]^c = \lambda p \partial[CG_{\{s,h\}}(p) \wedge O(p)].[E(p)(p) \wedge surprise(p)] : \langle t^a, t^s\rangle$

4 Related Phenomena

One may find the system $\mathcal{L}_{CI+}$ proposed in the present paper somewhat baroque for the analysis of two advebials, no matter how complex their meaning. But the system in fact has broader applications. In this final section I will present a number of cases of what I take to be conventionally implicated expressions, but ones which the original Potts system cannot analyze effectively, due to its effective restriction to supplementary content. I first consider, in section 4.1, cases where the main contribution of an utterance is conventionally implicated, thereby showing that $\mathcal{L}_{CI+S}$ has uses beyond the primary one in this paper. . I then, in 4.2, turn to cases of mixed content, which have been discussed by a number of authors. I point out some additional cases as well. $\mathcal{L}_{CI+}$ is thereby shown to have broad uses as well. Section 4.3 turns to the system of Quechua evidentials, where all three types of conventionally implicated content can be found. I show that, in this system, the evidential system can be given an adequate analysis. Finally, section 4.4 shows that the extension to $\mathcal{L}_{CI+}$ has useful applications within the original Potts system, in that it allows for intensionalization of conventionally implicated content, which appears impossible in $\mathcal{L}_{CI}$, and for the elimination of the original (R6), the $\mathcal{L}_{CI}$ rule (R6) for 'designated feature expressions,' which serves to change the content

of a subtree from at-issue to CI content. $\mathcal{L}_{CI+}$ thereby can simplify parts of the original system in addition to enabling analyses of other empirical facts.

4.1 Conventional Implicature as Main Content

This section discusses other cases where the main content conveyed by an utterance is conventionally implicated. In general, this situation is somewhat special; the uses of language most often analyzed in linguistic and philosophical work serve to convey information about the world, rather to express aspects of the speaker's mental state or metainformation about the conversation, which (arguably) is the function of conventional implicature. Information about the world is thus conveyed mostly by default here, or in ways other than via the conventional implicature itself, e.g. when the 'primary' content is present in the context, or entered into it, by other means. This observation suggests a division in content type which we will find to be borne out, at least at the level of inspection that I can provide in the present context.

Three cases related to *yokumo* immediately come to mind. First, we can consider the case of particles that do not modify any sentences, such as *man*.

(60) Man!

This kind of case is discussed briefly by McCready (to appearb). There *man* was taken to be a conventional implicature-introducing propositional modifier that applies to a proposition made available by context. I think this analysis is right, but (if one follows the analysis of proposition-modifying sentence-initial *man* offered in that paper) one ends up with an undesirable situation where both *man*(ϕ) and ϕ are directly communicated. Intuitively, though, the latter is not. To see this, consider cases where a question is answered with the particle:

(61) a. A: What's the weather like outside?

b. B: Man!

B's response is understood roughly as follows: B has some sort of strong feeling about the weather outside. It is not clear what the weather outside is actually like. In this kind of case, A is likely to infer that the weather is extreme in some way, but exactly what way this is depends entirely on A's prior knowledge about the weather. We can therefore see clearly that the proposition *man* modifies is not asserted by B's utterance—if it were, it should be recoverable, but it is not. Still, we

should not take this to mean that nothing about this proposition is communicated, only that this communication cannot be 'literal.'

Stand-alone particles thus provide another case where the conventionally implicated content is the primary content of the utterance. In this case, $[\![man]\!]$ can be typed as

$$\lambda p.man(p) : \langle t^a, t^s \rangle$$

ignoring the actual content of the particle, which is discussed in detail in McCready (to appearb). This analysis disallows the assertion of p itself, as desired. The question of how extensively we should take particle meanings to be analyzable in terms of shunting types is left for another occasion; it turns on the empirical question of whether or not the propositional content of sentences modified by particles can serve as answers to questions. In many cases it is clear that they can, in others, perhaps not.

A second case, Japanese *sae*, is discussed by (Hara and McCready, 2009). *Sae* is a focus particle related in meaning to English *even* but differing in various respects.

(62) Taroo-ga suwahirigo-sae benkyoo-shita.
Taroo-NOM Swahili-ACC study-did.

'Taroo studied even Swahili.'

Hara and McCready argue that sentences like (62) do not introduce asserted content, and that the proposition *sae* modifies is introduced into the context via a presupposition present in the conventionally implicated content itself. They cite various pieces of evidence for this claim primarily relating to its discourse behavior—denial and answers to questions, as we have seen above—and its behavior in various kinds of embedded environments, notably relative clauses, the restrictor of universal quantification, and in the scope of semantic operators. I will not review the data here due to its complexity, but if *sae* indeed introduces a conventional implicature, it must also be of shunting type.

In a sense, these conventional implicatures remain supplementary; the difference is that they supplement content that is already present, and not asserted by the sentence providing the supplementary information.[45] The analysis of the Japanese modal particle *daroo* provided by Hara (2008) looks somewhat different.

[45] In the case of *sae*, this content must be introduced via accommodation, if it is not already present; but this presents no special difficulties, unlike presuppositions of some kinds of expressive content (e.g. Kaufmann (2009)).

According to this analysis, *daroo*φ conventionally implicates that $\mu(\varphi) > 50\%$, but does not assert anything. Hara notes that $\mathcal{L}_{CI}$ is not appropriate for analyzing this case, in that, given that this type system returns φ itself in the at-issue dimension, Gricean maxims would be violated by any use of *daroo* to modify a proposition. $\mathcal{L}_{C+S}$, however, makes the right predictions (assuming that the Hara analysis is correct.) What these cases have in common is that the conventionally implicated content is, in some sense, primary to the intent behind the utterance.

Another kind of even more obvious case is that of expressives that do not perform any modification, such as salutations or fully expressive exclamations (cf. Kaplan 1999; Kratzer 1999).

(63) a. Thanks!

b. Good morning.

c. Ouch!

Expressions like these lack truth conditions, though they can be expressively correct (appropriate) or not. They plainly do not assert anything. They can be analyzed as objects of type t^c (or t^s), which simply express something about the speaker's mental states or what she takes the situation to be like. Here the extension to $\mathcal{L}_{CI+S}$ is not necessary, as type t^c is sufficient; I include them because it is clear that, in cases like these, the expressive (or conventionally implicated) content is the main content of the utterance. We thus have a division between cases of 'primary' CIs: one, modeled via shunting types, where the CI content is functional, and another, modellable either via shunting types or CI types, where the content is not functional and expresses a constant.

4.2 Mixed Terms

We have seen in the previous section that sentences modified by *yokumo* are not the only examples of main content being conventionally implicated in the world's languages. Cases of mixed content are even easier to find; there are many instances of such content scattered around the languages of the world. To see this, it suffices to consider the characteristics of mixed expressions. They are associated with conventional implicatures, but, since they also denote at-issue content, they can serve as main predicates and are affected (in part) by various semantic operators. It does not seem difficult to find such expressions; many gradable adjectives in fact have this quality.

(64) a. Those shoes are cool.

b. That guy is hot.

c. This gruel is nasty.

Japanese, for example, also has many adjectives of this general form.[46]

(65) ano uta yabai yo na
that song crazy PT PT

'That song is crazy!'

Suppose that one tries to deny utterances including predicates like these with a truth-oriented denial.

(66) That's not true!

Plainly, what is denied is not the full contribution of the adjective. In the case of (64a), it is denied that the shoes are stylish; but it is not denied that the speaker finds them appealing and worthy of excitement. In the case of (64b) it is denied that the guy in question is goodlooking, but not that the speaker finds him so, and worthy of an emotive attitude. This suggests that not all the content introduced by the adjectives is at-issue.

An obvious way in which to analyze these expressions is as being of mixed type. I propose lexical entries of the following sort, though these entries are simplified and should not be taken as a full proposal.[47]

(67) a. $[\![cool]\!] = \lambda x[stylish(x)] : \langle e^a, t^a\rangle \blacklozenge \lambda x[good(x)] : \langle e^a, t^s\rangle$

b. $[\![hot]\!] = \lambda x[goodlooking(x)] : \langle e^a, t^a\rangle \blacklozenge \lambda x[good(x)] : \langle e^a, t^s\rangle$

It is not hard to find other examples in recent work in the semantics-pragmatics literature. Kubota and Uegaki (2009) analyze the Japanese benefactive, which simultaneously indicates that the subject has caused the dative argument to do some action and conventionally implicates that the action was beneficial for the dative argument.[48]

[46] There is no sense in which *yabai* literally means 'crazy;' but, expressively, it has some similar characteristics, notably the possibility of polarity switching (good/bad).

[47] Presumably the notion of goodness employed in (67) is different from that used in the definition of *sekkaku*. It may be that this is a place we would want to employ the system of Potts (2007), in which finer distinctions of emotional attitude can be expressed. In any case, we still need a way to express mixed content in our type system, which is my focus here.

[48] I follow Kubota and Uegaki's glosses and morphological analysis.

(68) Taroo-ga Hanako-ni piano-o hii-te morat-ta.
Taro-Nom Hanako-Dat piano-Acc play Benef-Pst

at-issue: 'Taro made Hanako play the piano.'
CI: 'Hanako's playing the piano was beneficial to Taro.' (K&U; their glosses)

The crucial point here is that the benefactive introduces both a causative at-issue meaning and a conventionally implicature to the effect that the caused event benefited the causer. This is plainly an instance of mixed content.

In our system $\mathcal{L}_{CI+M}$, we can represent this object as a term of the following type (I do not provide a semantics):[49]

(69) $\alpha : \langle\langle e, t\rangle, \langle e, \langle e, t\rangle\rangle\rangle^{a} \blacklozenge \beta : \langle\langle e, t\rangle, \langle e, \langle e, t\rangle\rangle\rangle^{s}$

This lexical entry is of mixed type; derivations with it will proceed via the rules (R8), for the initial combination, and (R9), for the later steps.

Another case is provided by McCready and Schwager (2009), who discuss the Viennese German intensifier *ur* in this system. One use of *ur* is to intensify the meaning of a noun or adjective:

(70) a. Das ist ur interessant.
that is ur interesting
'That is totally interesting.'

b. Er ist ein ur Idiot.
he is a ur idiot
'He is a total idiot.'

Here the intensification takes place in the at-issue dimension, but the speaker also indicates that she holds some emotive attitude toward the sentential content; this latter part is expressive or conventionally implicated, as these authors show. McCready and Schwager further provide a formal semantics for the intensifier in $\mathcal{L}_{CI+}$.

Formal and informal pronouns in various European languages such as *tu/vous* in French or *tu/usted* in Spanish also carry mixed content, as discussed by Horn (2007). These objects carry the conventional implicature that the speaker feels (as

[49] I make use of the type superscript abbreviators defined in the Appendix here, as the types are cumbersome otherwise.

if he should be) formal (informal) toward the addressee, while having the at-issue indexical denotation of a normal second person pronoun, on which they pick out the addressee of the context (Kaplan, 1989). This means they can be assigned the following denotation:[50]

(71) $[\![you]\!]^c : e^a \blacklozenge honor(s, [\![you]\!]^c) : t^s$

I make use of just an honorific relation here, following Potts and Kawahara (2004). I do not want to take a position on its content here because mere use of a pronoun need not indicate that the addressee is actually honored. It is difficult to decide exactly what should be made of insincere uses of such pronouns. Potts and Kawahara (2004) analyze Japanese subject honorifics as performative,[51] so their use already causes the 'honoring' relation to hold; it is not so clear to me that this is the right analysis, for there is a merely normative or polite use. Perhaps we should understand $honor(x, y)$ in this way. I put these delicate issues aside here.

A final case is that of pejoratives (Williamson, t.a.). Williamson discusses an example from Dummett (1973), the (extinct) pejorative *Boche*, which according to Wiliamson was in use in Britain and France in the initial stages of WW1 in anti-German propaganda.[52] *Boche* is a pejorative term for Germans on its nominal use. By saying (72) I assert that he is German, and express that I have negative feelings about him.[53]

(72) He is a Boche.

This is plainly an instance of mixed content: it is predicative, yet introduces a conventional implicature.[54] In $\mathcal{L}_{CI+}$ we can give *Boche* the following analysis:

(73) $[\![Boche]\!] = \lambda x[German(x)]\langle e^a, t^a\rangle \blacklozenge \lambda x[cruel(x)]\langle e^a, t^s\rangle$

[50] Again, this is not intended as a full proposal.

[51] They can do this without a need for mixed content because the honorifics they look at are separate morphemes. Japanese also has morphemes such as *meshiagaru* 'eat [HON]' that are not; these cannot be dealt with in $\mathcal{L}_{CI}$, as was pointed out to me by Wataru Uegaki (p.c.).

[52] As Williamson notes, more current pejoratives sting quite a bit more than this one does, thanks to its "air of anachronism," allowing for a more objective consideration.

[53] Williamson takes the expressed content to be that he is cruel, noting that it is not clear that this really captures the non-asserted part of the meaning. Here he is abstracting from Dummett, who writes 'barbarous and more prone to cruelty than other Europeans' (Dummett 1973:454). I take Williamson's dissatisfaction with his paraphrase to follow from the 'ineffability' of expressive meanings (Potts, 2007). I will not try to do better.

[54] Williamson comes to the same conclusion about pejorative items, indeed noting that Potts must allow for mixed content to analyze them (note 16).

The same kind of analysis can easily be given to other pejorative and derogatory terms, even down to pairs like Frege's *steed* and *nag*, where the extensions are identical but the attitudes conveyed distinct (Horn, 2007).

There is much more work to be done on the range of conventionally implicating and expressive items in the world's languages, but I hope that the small sample given here and in the previous section show that the type-theoretic tools proposed here have useful application in their analysis.

4.3 Quechua Evidentials: a Case Study

A case where the present proposal seems immediately applicable is the case of Quechua evidentials, where it can provide an alternate analysis to the proposal of Faller (2002), on which these evidentials modify speech acts. I will begin by giving the basic background and facts that a theory of the evidentials should explain. I then briefly present Faller's speech act-based analysis and show (following McCready 2008) that, despite the conventional implicature-like behavior of the evidentials, an adequate analysis cannot be given in $\mathcal{L}_{CI}$. I then show that such an analysis is available in $\mathcal{L}_{CI+}$.

Cuzco Quechua has several enclitic suffixes that mark evidentiality: roughly, the nature of the speaker's justification for the claim made by the utterance. Faller analyzes three suffixes in detail. The first is the direct evidential *-mi*, which indicates that the speaker has direct (usually perceptual) evidence for the claim. The second, *-si*, is a hearsay evidential which indicates that the speaker heard the information expressed in the claim from someone else. Finally, *-chá*, an inferential evidential, indicates that the speaker's background knowledge, plus inferencing, provides evidence for the proposition the modified sentence denotes, and asserts that the sentence might be true.

(74) a. Para-sha-n-mi
rain-PROG-3-MI
'It is raining. + speaker sees that it is raining'

b. para-sha-n-si
rain-PROG-3-SI
'It is raining. + speaker was told that it is raining'

c. para-sha-n-chá
rain-PROG-3-CHÁ

‘It may be raining. + speaker conjectures that it is raining based on some sort of inferential evidence’

Cuzco Quechua evidentials do not embed semantically; even when they appear in the surface scope of semantic operators, they always take widest scope (or are scopeless with respect to such operators). The negation in the following example cannot take scope over the evidential, for instance.

(75) Ines-qa **mana-n/-chá/-s** qaynunchaw ñaña-n-ta-chu watuku-rqa-n
Ines-Top not-MI/CHÁ/SI yesterday sister-3-Acc-CHU visit-Pst1-3

‘Ines didn’t visit her sister yesterday.’ (and speaker has evidence for this)
NOT ‘Ines visited her sister yesterday’ (and speaker doesn’t have evidence for this)

A final basic fact that a theory of evidentials in this language must explain is that use of the hearsay evidential with a sentence does not commit the speaker to the content of the sentence. For instance, the first clause of the following sentence does not commit the speaker to the proposition that a lot of money was left for the speaker, as the continuation shows.

(76) Pay-kuna-s ñoqa-man-qa qulqi-ta muntu-ntin-pi saqiy-wa-n, mana-má
(s)he-PL-**si** I-Illa-Top money-Acc lot-Incl-Loc leave-1o-3 not-Surp
riki riku-sqa-yki i un sol-ta centavo-ta-pis saqi-sha-wa-n-chu
right see-PP-2 not one Sol-Acc cent-Acc-Add leave-Prog-1o-3-Neg

‘They left me a lot of money (they said/it was said), but as you have seen, they didn’t leave me one *sol*, not one cent.’ (Faller 2002:191)

Thus, roughly, what is needed is the following result, where the evidential content is not asserted:

(77) a. $mi\phi \models \phi \wedge$ speaker has direct evidence for ϕ

b. $si\phi \models$ speaker has hearsay evidence for ϕ

c. $cha\phi \models \Diamond\phi \wedge$ speaker has inferential evidence for ϕ

Faller uses Vanderveken’s (1990) speech act theory for her analysis. This theory, like other theories of speech acts, assigns them preconditions for successful performance. Faller takes evidentials to introduce additional content into the set of preconditions. For the cases under consideration, we need only be concerned

with one kind of precondition: sincerity conditions on successful performance of the speech act. For assertions, Vanderveken takes it to be necessary that $Bel(s, p)$ holds—that the speaker believes the content of the assertion.[55]

Most of the action in Faller's analysis of *-mi* and *chá* is in the sincerity conditions for the assertion. On her analysis, *-mi* adds an additional sincerity condition to the assertion, that $Bpg(s, \phi)$. The formula $Bpg(s, \phi)$ means that the speaker has the best possible grounds for believing ϕ. It is very difficult to make this condition precise. Faller notes that what counts as best possible grounds is dependent on the content in the scope of *-mi*: for externally visible events *Bpg* will ordinarily be sensory evidence, while for reports of people's intentions or attitudes even hearsay evidence will often be enough.

Faller analyzes *-chá* as being simultaneously modal and evidential. The asserted content is therefore $\Diamond\phi$ when ϕ is modified by *-chá*; the corresponding sincerity condition also involves $\Diamond\phi$ instead of ϕ. A sincerity condition indicating that the speaker's reasoning has led him to believe that ϕ might be possible is also introduced. The hearsay evidential *-si* is also complex; the propositional content p is not asserted when this hearsay evidential is used, as we saw, which means that the propositional content of the utterance cannot be asserted. Faller posits a special speech act PRESENT for this situation, on which the speaker simply presents a proposition without making claims about its truth. In addition, the sincerity condition requiring that the speaker believe ϕ is eliminated, and a condition stating that the speaker learned ϕ by hearsay is added.

While considering the degree to which the semantics of evidentials can be viewed as homogeneous, McCready (2008) attempted to provide a conventional implicature-based analysis of the Quechua system. It seems plain that the evidentials of this language behave in a way similar to conventional implicatures: they are scopeless, do not participate in denial,[56] and so on. However, an adequate semantics cannot be provided in $\mathcal{L}_{CI}$. To see this, it suffices to consider *-si*: although $si\phi$ does not entail ϕ, taking *si* to introduce a conventional implicature causes ϕ to be asserted, given a $\mathcal{L}_{CI}$ analysis where *si* is an object of type $\langle t^a, t^c\rangle$. As we have already seen, the combinatorics, together with (16), yield $\langle\phi, \{si\phi\}\rangle$ in this situation; this means that ϕ is asserted, so the analysis fails.

However, with the extension of $\mathcal{L}_{CI}$ to $\mathcal{L}_{CI+}$, we have more options available. In fact, when one examines the conditions in (77), it seems plain that they cor-

[55]This is only a very rough approximation of the normative conditions on assertion. See e.g. Searle (1969); Siebel (2003) for discussion.

[56]See Faller (2002) for details.

respond to the three kinds of content we have discussed. The direct evidential appears to provide the 'ordinary' supplementary content of Pottsian conventional implicatures; the hearsay evidential, given that it makes no claims about the truth of the content it applies to, acts to provide the conventionally implicated main content of its utterance, and the inferential evidential, given that it has effects in both the at-issue and CI dimensions, is of mixed type. With this observation an analysis becomes available. Here I do not delve deeply into the content of the evidentials, instead making use of predicates *Bpg* 'there are best possible grounds for', *Hearsay* 'there is an event of hearsay of', and Inf, a relation between individuals and propositions indicating that the first element has inferential evidence for the second.

(78) a. $[\![mi]\!] = \lambda p[Bpg(p)] : \langle t^a, t^c \rangle$

b. $[\![si]\!] = \lambda p[Hearsay(p)] : \langle t^a, t^s \rangle$

c. $[\![cha]\!] = \lambda p[\Diamond p] : \langle t^a, t^a \rangle \blacklozenge \lambda p[Inf(s, p)] : \langle t^a, t^s \rangle$

It is possible to spell at least some of this out in McCready and Ogata's (2007b) evidential logic. McCready (2008) gives a first attempt. The idea is that $Hearsay(p)$ can be defined by making use of a test over $\mathsf{E}^i_a p$-events where $Sort(i) = hearsay$ and $Inf(s, p)$ can be defined via a test over $\mathsf{E}^i_a p$-events where $Sort(i) = judgemental$. It is a bit harder to define $Bpg(s, p)$, because its satisfaction conditions are dependent on the content of p itself; but it should be possible. I will not go further into this issue here.

Applied to a proposition ϕ, these lexical entries will, respectively, yield the following:

(79) a. $\langle \phi, \{Bpg(\phi)\} \rangle$

b. $\langle \varnothing, \{Hearsay(\phi)\} \rangle$

c. $\langle \Diamond \phi, \{Inf(s, \phi)\} \rangle$

These are precisely the desired results. This sketch of an analysis for the Quechua evidential case thus provides an example of a situation in which the full power of $\mathcal{L}_{CI+}$ is needed to analyze a single linguistic phenomenon. Of course, the question of whether this analysis or Faller's speech act-based one is to be preferred for this case is separate, and depends on working out the details of the conventional implicature story: but, at minimum, the discussion here shows that a speech act analysis is not the only possibility for the phenomena in question.

4.4 Intensionalizing $\mathcal{L}_{CI(+)}$

In this final section I would like to point out a difficulty that arises with $\mathcal{L}_{CI}$ involving intensionalization, which can be solved in the approach proposed here.

In my previous discussion, I followed Potts in not making use of the intensional part of type theory, so propositions were taken to be of type t rather than type $\langle s, t\rangle$. This is obviously inadequate, for all the usual reasons. Here I would like to point out that it actually appears to be *impossible* to make use of intensional entities in the non-at-issue part of $\mathcal{L}_{CI}$, despite the presence of types for worlds/indices ('s') in the set of basic CI types.

Consider what would happen if we tried to do so. We would have an object of type $\langle s, t\rangle^c$, which is fine. The problem arises when we try to get a truth value for this object. After application of a conventionally implicated proposition to an object (a possible world or index) of type s, we would get a $\bullet$-object of type $s^a \bullet t^c$. This is not a sentence denotation! What this means is that conventionally implicated propositions, in this system, could not sensibly be assigned a truth value at all. This seems bad.

One might think that this problem is not too important, based on the observation that this worry will only arise in cases of conventionally implicated content, and perhaps we need not take such content to be intensionalized at all. Perhaps this is correct; $\mathcal{L}_{CI}$ certainly makes this prediction. If one was to go this route, however, this would mean that CI content is of a fundamentally different semantic type than at-issue content (t as opposed to $\langle s, t\rangle$), which seems highly implausible and not in keeping with the methodological principles that dictate that e.g. the objects of attitudes and nonembedded sentences should be of the same semantic type (e.g. Crimmins and Perry 1989, among many others); it also raises thorny issues involving how one should take the intensional portion of semantic denotations to be 'stripped off' during the shift to conventionally implicated meanings. I take it that, all in all, an analysis which allows conventionally implicated content and at-issue content to behave identically in this respect is preferable. Alternatively we might take propositions to be uniformly intensional, and never associated with a truth value at all; but this just seems wrong.

Note that the issue with intensionalization is actually a symptom of a larger problem. $\mathcal{L}_{CI}$ does not allow for *any* conventionally implicated content that takes more than a single argument because of the way its proof theory works. In such situations the non-resource-sensitivity of the logic will leave us with a proliferation of unused semantic objects, which is not usually what is wanted.[57] We thus

[57]Only cases in which CI derivations and at-issue derivations run in parallel will be allowed;

get two predictions in $\mathcal{L}_{CI}$: first, that conventional implicatures are uniformly intensional or not intensional, depending on what one takes their type to be; and, second, that conventional implicatures always take only one argument. For reasons outlined earlier (e.g. the meaning of *sekkaku*), I doubt these predictions are right.

However, it is unproblematic to intensionalize or to have conventionally implicated objects taking multiple arguments in $\mathcal{L}_{CI+}$. All that must be done is to take content of shunting type—σ^s—instead of the standard Pottsian CI type—σ^c. Content of this sort can take multiple arguments, for the simple reason that shunting types are, again, resource sensitive. As a result, in the extended system, problems with intensionality do not arise.

The extended system thus makes a set of predictions somewhat different from those of $\mathcal{L}_{CI}$. Since the supplementary c-types are retained, the predictions discussed above are as well—but only for supplementary conventional implicatures. It is thus predicted that there are no supplementary CIs that take multiple arguments; this of course includes supplementary CIs that are intensional in nature but whose value depends on the facts in the actual world. A new set of predictions is added, however. If the conventionally implicated content is of shunting type, or mixed type (since mixed types are built on shunting types), cases where intensionality behaves as usual and multi-argument CIs should be possible. As far as I know, these predictions are correct, but they should be investigated in greater detail.

5 Conclusion

This paper has made two major contributions. It has distinguished and provided a logical system for the analysis of three distinct types of conventional implicature: supplementary implicatures as modeled in Potts (2005), implicatures that provide main content, analyzed in $\mathcal{L}_{CI+S}$ as being of shunting type, and mixed implicatures, analyzed in $\mathcal{L}_{CI+}$. I believe that these systems will be useful for researchers working to understand the range of conventional implicature in the world's languages; the content of section 4 I hope provided some support for this belief. In the process, it has given a detailed analysis of the Japanese adverbials *yokumo* and *sekkaku*, which respectively exemplify the second and third types of conventional implicature. As we have seen, these adverbials have an extremely complex

but $\mathcal{L}_{CI}$ lacks a rule for these, as noted above in the motivation for rule (R9).

content, involving emotive attitudes, expectations and even evidential restrictions.

An issue that arose many times in this paper is the nature of the divide between presupposition and conventional implicature. I suggested that (in part at least) it comes down to a difference in function. Presuppositions aim to 'match' old information with new; conventional implicatures instead work to introduce new information, but information that is not 'open to question' in the way that asserted content is, instead serving to indicate the speaker's attitudes and commitments. This distinction is useful in cases where the standard tests break down due to the complexity of a given piece of content or the lack of a way to express it in a given (formal or natural) language, as we saw. The particular examples provided here also raise questions about the degree of translatability one can find for non-at-issue domains in natural languages. It seems likely to me that Katz (1978) was right in his thesis that any piece of content in a natural language $\mathcal{L}$ can be translated into any other language $\mathcal{L}'$—if one restricts attention to at-issue content. Whether this thesis holds for presupposition or for conventional implicature strikes me as more problematic. The data in this paper suggests that in certain complex cases, translation of these kinds of non-truth-conditional content might be difficult or impossible, if there is no term in the target language with the same semantics. More research is needed to determine whether this is correct, and, if it is, to clarify how the argument should go.

A Formal System of Potts (2005)

Here is the type system of $\mathcal{L}_{CI}$.

1. The type system itself is as follows.
   (a) e^a, t^a, s^a are basic at-issue types for$\mathcal{L}_{CI}$.
   (b) e^c, t^c, s^c are basic CI types for $\mathcal{L}_{CI}$.
   (c) If σ and τ are at-issue types for $\mathcal{L}_{CI}$, then $\langle\sigma, \tau\rangle$ is an at-issue type for $\mathcal{L}_{CI}$.
   (d) If σ is an at-issue type for $\mathcal{L}_{CI}$ and τ is a CI type for $\mathcal{L}_{CI}$, then $\langle\sigma, \tau\rangle$ is a CI type for $\mathcal{L}_{CI}$.
   (e) If σ and τ are at-issue types for $\mathcal{L}_{CI}$, then $\langle\sigma \times \tau\rangle$ is a product type for $\mathcal{L}_{CI}$.

(f) The full set of types for $\mathcal{L}_{CI}$ is the union of the at-issue types and CI types for $\mathcal{L}_{CI}$.

2. Further, let x serve as a variable over $\{e, t, s\}$ and let σ and τ serve as variables over well-formed types with their superscripts stripped off. The type-superscript abbreviator $\leftrightsquigarrow$ is defined as follows:

$$x^a \leftrightsquigarrow x^a$$
$$x^c \leftrightsquigarrow x^c$$
$$\langle \sigma^a, \tau^a \rangle \leftrightsquigarrow \langle \sigma, \tau \rangle^a$$
$$\langle \sigma^a, \tau^c \rangle \leftrightsquigarrow \langle \sigma, \tau \rangle^c$$

B Modified Type System: $\mathcal{L}_{CI+}$

I define two type systems here. The first, $\mathcal{L}_{CI+S}$, introduces shunting types. The second, $\mathcal{L}_{CI+}$, builds on $\mathcal{L}_{CI+S}$ to allow for the use of mixed content terms as well. The reason for defining the two systems independently is that the full power of the extended system will not be needed for all applications, and it may be convenient for users of the types proposed here to have a subsystem at hand that fits their needs.

B.1 Shunting types: $\mathcal{L}_{CI+S}$

Here is the type system of $\mathcal{L}_{CI+S}$, which is just that of $\mathcal{L}_{CI}$ supplemented with additional shunting types. I follow Potts in my definition, which means that many shunting types are produced that do not get used (just as with the CI types of $\mathcal{L}_{CI}$).

- The type system itself is identical to that of $\mathcal{L}_{CI}$ except that:

  1. The following clauses are added to the $\mathcal{L}_{CI}$ type specification:

     (g) e^s, t^s, s^s are basic shunting types for $\mathcal{L}_{CI+S}$.

     (h) If σ is an at-issue type for $\mathcal{L}_{CI+S}$ and τ is a shunting type for $\mathcal{L}_{CI+S}$, then $\langle \sigma, \tau \rangle$ is a shunting type for $\mathcal{L}_{CI+S}$.

  2. Clause (f) of the $\mathcal{L}_{CI}$ type specification is replaced with

     f'. The full set of types for $\mathcal{L}_{CI+S}$ is the union of the at-issue types, the CI types and the shunting types for $\mathcal{L}_{CI+S}$.

3. All instances of '$\mathcal{L}_{CI}$' in the $\mathcal{L}_{CI}$ type specification are replaced with '$\mathcal{L}_{CI+S}$'.
4. The following two clauses are added to the definition of the type-superscript abbreviator $\leftrightsquigarrow$:

$$x^s \leftrightsquigarrow x^s$$
$$\langle \sigma^a, \tau^s \rangle \leftrightsquigarrow \langle \sigma, \tau \rangle^s$$

- This type definition, bundled with the $\mathcal{L}_{CI}$ rules (R1-6), the newly defined rule (R7), and the revised interpretation mechanism in (19), comprises $\mathcal{L}_{CI+S}$.

B.2 The full system: $\mathcal{L}_{CI+}$

The full system adds some rules to $\mathcal{L}_{CI+S}$.

- The type system is identical to that of $\mathcal{L}_{CI+S}$ except that:
  1. The following clause is added to the $\mathcal{L}_{CI+S}$ type specification.
     (i) If σ and τ are at-issue types for $\mathcal{L}_{CI+}$ and υ is a shunting type for $\mathcal{L}_{CI+}$, then $\langle \sigma, \tau \rangle \blacklozenge \langle \sigma, \upsilon \rangle$ is a mixed type for $\mathcal{L}_{CI+}$.
  2. All instances of '$\mathcal{L}_{CI+S}$' in the $\mathcal{L}_{CI+S}$ type specification are replaced with '$\mathcal{L}_{CI+}$'.
- This type definition, together with the $\mathcal{L}_{CI}$ rules (R1-7) and the new rules (R8,9) comprise $\mathcal{L}_{CI+M}$.

I showed in section 4.4.1 that (R6) is not really needed in either $\mathcal{L}_{CI+S}$ or $\mathcal{L}_{CI+}$, but I will leave them as part of the official system.

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