Semantic Universals of Intonation and Particles *

Yurie Hara[1] and Mengxi Yuan[2]

[1] Hokkaido University, Sapporo, Hokkaido, Japan
hara@imc.hokkaido.ac.jp
[2] Jinan University, Guangzhou,Guangdong, China
mengxiyuan49@hotmail.com

Abstract

This paper proposes a new composition rule for discourse particles and prosodic morphemes that paratactically-associate with the main text. Furthermore, the data and analyses support the framework of inquisitive semantics since the morphemes in question can often embed both declarative and interrogative clauses.

1 Introduction

Discourse particles and prosodic morphemes often give rise to secondary meanings in addition to the meanings computed from the main text that they attach to. For instance, in Osaka Japanese, when a *wh*-question is uttered with a sentence-final particle *nen* with final fall '↓' as in (1), the sentence seems to express two meanings. One is a plain question 'What are you going to eat?' and the other is the speaker's irritation:

(1) nani taberu nen↓
what eat NEN
'What are you going to eat?!' (You have to decide now!)

In the literature on the interpretation of prosodic morphemes (Bartels, 1999; Gunlogson, 2003) and discourse particles, it has been tacitly assumed that the morpheme/particle is somehow attached to the entire sentence and projects an expressive meaning independent of the meaning of the host sentence. This paper offers a more concrete compositional analysis of prosody and particles by introducing a new composition rule that instructs how to interpret paratactically-associated expressive morphemes.

Another hallmark of prosodic morphemes and particles is that they can often attach to both declarative and interrogative clauses. As an illustration, the same Osaka Japanese *nen*↓ can be attached to a declarative as in (2).

(2) konban furansu ryoori taberu nen↓.
tonight France cuisine eat NEN
'I'll eat French cuisine tonight.'

The linguistic data and analyses offered in the current paper provide new evidence for the framework of inquisitive semantics (Ciardelli et al., 2019), which can deal with declaratives and interrogatives uniformly as a set of propositions.

*This project is supported by JSPS Kiban (C) "Semantic-Pragmatic Interfaces at Left Periphery: a neuroscientific approach" (18K00589) awarded to the first author.

2 Proposal and Theoretical Background

This section presents two theoretical frameworks that are crucial to the semantic analysis of particles and intonation in question. First, we present a new type system for expressives, namely $\mathcal{L}_{CI}^{+S,PA}$, which enables us to compute paratactically associated expressions. Second, the framework of inquisitive semantics is briefly introduced to see how declaratives and interrogatives are given the same semantic type as a set of propositions.

2.1 Syntax and Composition of Paratactic Association, $\mathcal{L}_{CI}^{+S,PA}$

We propose that discourse particles and intonational morphemes are paratactically associated (Lyons, 1977; Bartels, 1999) to the main sentence. Syntactically, a prosodic morpheme or particle β is paratactically associated (indicated by '$\otimes$') to the head α of the root clause, as depicted in (3).

(3) Syntactic representation of paratactic association

$$\begin{array}{c} \text{C}_{\text{ROOT}} \\ | \\ \alpha \otimes \beta \end{array}$$

Meanings that arise from intonation and particles are often analyzed as expressives or conventional implicatures (Potts, 2005b,a; Hara, 2006; Potts, 2012; McCready, 2008, among others). To assign a composition rule that corresponds to the structure in (3), this paper augments McCready's (2010) $\mathcal{L}_{CI}^{+S}$ type system for conventional implicatures, since the behaviors of linguistic items discussed in the current paper are different from that of expressive expressions discussed in Potts (2005b) in several respects. For example, the Japanese sentence-final auxiliary *daroo* only projects the expressive content but no at-issue content. The composition rule for expressives/conventional implicatures proposed by Potts' (2005b), CI Application, consists of two functional applications, one which returns an expressive meaning $\alpha(\beta) : \tau^c$ and the other which is an identity function that returns at-issue content $\beta : \sigma^a$:

(4) CI Application

$$\begin{array}{c} \beta : \sigma^a \bullet \alpha(\beta) : \tau^c \\ \diagup \quad \diagdown \\ \alpha : \langle \sigma^a, \tau^c \rangle \quad \beta : \sigma^a \end{array}$$

If we employed CI Application to *daroo* and a sentence it attaches to, it would return an illicit interpretation where the expressive content expresses a weaker meaning of the at-issue content, i.e., 'p and probably p'.[1]

Thus, we adopt and modify McCready's (2010) $\mathcal{L}_{CI}^{+S}$ to give semantics to the structure proposed in (3). $\mathcal{L}_{CI}^{+S}$ is an extension of Potts' (2005b) $\mathcal{L}_{CI}$ obtained by adding *shunting types* to the system. Expressions with shunting types shunt the meaning tier from at-issue to expressive, thereby generate expressive contents only without yielding at-issue ones. More concretely, when the function is of shunting type then the following rule is used instead of CI application.

[1] See Hara (2006) for more discussions.

(5) Shunting-type Functional Application (McCready's (2010) R7)

$$\alpha(\beta) : \tau^s$$
$$\alpha : \langle \sigma^a, \tau^s \rangle \quad \beta : \sigma^a$$

Now, we propose a new system $\mathcal{L}_{CI}^{+S,PA}$, which is obtained by adding the following type specification (6) and composition rule (7), Paratactic Association, to $\mathcal{L}_{CI}^{+S}$.[2]

(6) A shunting product type
If σ and τ are shunting types for $\mathcal{L}_{CI}^{+S,PA}$, then $\sigma \times \tau$ is a shunting product type for $\mathcal{L}_{CI}^{+S,PA}$.

(7) Paratactic Association

$$\lambda\chi.\alpha(\chi)\blacklozenge\beta(\chi) : \langle \sigma, \tau \times \upsilon \rangle$$
$$\lambda\chi.\alpha(\chi) : \langle \sigma, \tau \rangle \quad \lambda\chi.\beta(\chi) : \langle \sigma, \upsilon \rangle$$

The Paratactic Association (7) merges two functions into one by abstracting over the argument type of the two functions ($\blacklozenge$ is a metalogical operator that combines expressions of different types). The resulting function, $\lambda\chi.\alpha(\chi)\blacklozenge\beta(\chi)$, is combined with an at-issue expression χ of type σ^a by McCready's Shunting-type Functional Application (5) and outputs a pair of shunting-type expressions $\alpha(\chi)\blacklozenge\beta(\chi)$ of type $\tau^s \times \upsilon^s$.

In summary, discourse particles and intonational morphemes that are paratactically associated to the main sentence are semantically composed by the Paratactic Association (7). The expression that results from the composition is a pair of shunting-type expressions.

2.2 Uniform treatment of declaratives and interrogatives

As we will see in section 3, many particles and prosodic morphemes can attach to both declarative and interrogative sentences. Inquisitive semantics is a suitable framework to analyze these items because if declaratives and interrogatives have the same semantic type, these items that embed them do not need to be ambiguously defined.

In inquisitive semantics, both declarative and interrogative sentences are treated as issues, which are downward closed sets of propositions, which in turn are sets of possible worlds:

(8) a. A proposition p is a set of possible worlds, i.e., $p \subseteq \mathcal{W}$.
b. An *issue* $I \subseteq \wp(\mathcal{W})$ is a non-empty, downward closed set of propositions.

In other words, whether it is a declarative or an interrogative, a sentence is a set of sets of possible worlds of type $\langle\langle s,t\rangle,t\rangle$ (abbreviated as T in the following to avoid clutter).

To semantically distinguish declaratives and interrogatives, the notion of possibilities is introduced. The possibilities for a sentence φ are the maximal propositions in $[\![\varphi]\!]$:

(9) $\textsc{possibility}(\varphi) := \{p | p \in [\![\varphi]\!]$ and there is no $q \in [\![\varphi]\!]$ such that $p \subset q\}$.

In case of a declarative clause, the set only contains a single maximal element, i.e., it is a singleton set, $|\textsc{possibility}(\varphi)| = 1$, while in case of an interrogative, $|\textsc{possibility}(\varphi)| \geq 2$.

[2]See McCready (2010, 51-53) for the full type system of $\mathcal{L}_{CI}^{+S}$.

To illustrate, let us see how a disjunction, a polar interrogative and a *wh*-interrogative are semantically composed.[3] First of all, a simple declarative sentence such as *Marie drinks* is a downward closed set of propositions, written $\{|\text{Marie drinks}|\}^{\downarrow}$.

(10) $[\![\textbf{Marie drinks}]\!] = \{p|\ \text{Marie drinks in every } w \in p\} = \{|\text{Marie drinks}|\}^{\downarrow} = [\![\alpha]\!]$

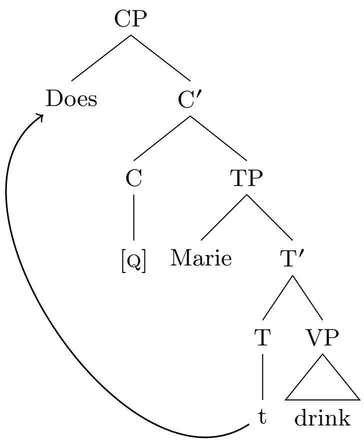
In the following illustrations, we use $[\![\alpha]\!]$ for a denotation of *Marie drinks*.

Second, to compose a disjunction sentence like *Marie drinks or Bill eats*, we take union of two downward closed sets of propositions. Thus, the disjunction sentence is also a downward closed set of propositions. The set has two maximal propositions, 'Marie drinks' and 'Bill eats'.

(11) $[\![\textbf{Marie drinks or Bill eats}]\!] = [\![\alpha]\!] \cup [\![\beta]\!]$

Third, a polar interrogative is obtained by combining a declarative sentence with the question feature [Q]. In English, [Q] is realized by the auxiliary at Spec CP moved by the Subject-Aux inversion as in (12).

(12)



We assume that [Q] is an interrogative operator ⟨?⟩ proposed by Roelofsen & Farkas (2015). In order to define the semantics of ⟨?⟩, the semantics of sentential negation needs to be defined as follows:

(13) $[\![\neg\varphi]\!] := \{p|p \cap q = \emptyset \text{ for all } q \in [\![\varphi]\!]\}$

Following Roelofsen & Farkas (2015), ⟨?⟩ is defined conditional on the status of its sister sentence. If its sister sentence φ is a declarative, that is, it is a singleton set of propositions, ⟨?⟩ takes a union of $[\![\varphi]\!]$ and $[\![\neg\varphi]\!]$. If φ is already an interrogative sentence, i.e., contains multiple maximal propositions, it returns the same interrogative sentence.

(14) a. $[\![\langle ? \rangle]\!] \in D_{\langle T,T \rangle}$

b. $[\![\langle ? \rangle\varphi]\!] := \begin{cases} [\![\varphi]\!] \cup [\![\neg\varphi]\!], & \text{if } |\textsc{possibility}(\varphi)| = 1 \\ [\![\varphi]\!], & \text{if } |\textsc{possibility}(\varphi)| \geq 2 \end{cases}$

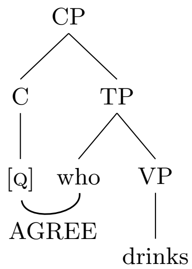
[3] See Ciardelli et al. (2017) for the fully compositional system for inquisitive semantics.

Thus, the polar interrogative, *Does Mary drink?* is also a union of two downward closed sets of propositions:

(15) $[\![\textbf{Does Mary drink}]\!] = [\![\alpha]\!] \cup [\![\neg\alpha]\!]$

Finally, we assume that a *wh*-interrogative has the following structure in (16). The *wh*-pronoun agrees with [Q] at C.

(16)



The *wh*-clause denotes a downward closed set of propositions as in (17-a). This set then combines with ⟨?⟩ but it is not a singleton set so it returns the same set as in (17-b).

(17) a. $[\![\textbf{who drinks}]\!] = \{p | \exists x \in D_e.x \text{ is human \& x drinks in every } w \in p\}$
b. $[\![\langle ? \rangle\textbf{who drinks}]\!] = \{p | \exists x \in D_e.x \text{ is human \& x drinks in every } w \in p\}$

In short, in inquisitive semantics, both declarative and interrogative clauses are issues, i.e., downward closed sets of propositions of type $\langle\langle s,t\rangle,t\rangle = T$.

2.3 Interim Summary

We have presented two frameworks necessary to analyze the semantics of discourse particles and prosodic morphemes. We first have proposed a new type system $\mathcal{L}_{CI}^{+S,PA}$ which enables the semantic composition to output a pair of shunting-type expressives. Second, we have sketched how declaratives and interrogatives are uniformly treated as downward closed sets of propositions in inquisitive semantics. In other words, both have the same semantic type, $\langle\langle s,t\rangle,t\rangle = T$.

3 Deriving the interpretations

This section shows how the two systems introduced in the previous section can derive the meanings that arise from particles and prosodic morphemes.

3.1 Osaka Japanese *nen*↓

Osaka Japanese has a sentence-final particle *nen*↓ which has to be uttered with falling tone L%[4] (There is a phonological variant *en* after the past-tense morpheme *d/t* as in (21).). Hara & Kinuhata (2012) claim that *(n)en*↓ is an assertion marker since the implicit subject of (2), repeated here as (18) has to be the speaker and rendering (18) into a *yes-no* question by attaching a rising intonation (↑/LH%) results in ungrammaticality as in (19).

[4]See Ikeda (2001) for ToBI labelling of prosody in Osaka Japanese.

(18) konban furansu ryoori taberu nen↓.
tonight France cuisine eat NEN
'I'll eat French cuisine tonight.'

(19) *konban furansu ryoori taberu nen↑.
tonight France cuisine eat NEN
Intended: 'Will you eat French cuisine tonight?'

Interestingly, however, *nen↓* can be attached to *wh*-interrogatives (though they still need to be uttered with falling intonation) and the constructions have emotive/discourse effects. In uttering (1), repeated here as (20), the speaker sounds irritated after waiting for the addressee to decide for a long time (n.b., it is still an information-seeking question). (21) can only be interpreted as a rhetorical question.

(20) nani taberu nen↓
what eat NEN
'What are you going to eat?!' (I've waited enough!)

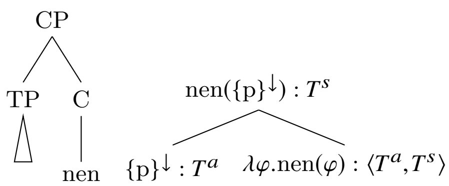
(21) dare-ga anta sodate-t-en↓
who-NOM you raise-PAST-NEN
'Who raised you up?!' (Obviously, I did.)

To account for the data, we make two proposals: 1. *Nen↓* is a complex lexical entry which is composed of phonemic segments /nen/ and prosodic segment (L%/↓). (In other words, *nen↑* does not exist in the Osaka Japanese lexicon, hence (19) is ungrammatical.) 2. *Nen↓* is an expressive morpheme which takes an at-issue set of propositions (T^a) and returns an expressive set of propositions (T^s), which denotes that one of the propositions in the set is true:

(22) a. $[\![\textbf{nen}\downarrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\varphi\ \textbf{nen}\downarrow]\!] := \{p |\ \text{for some } q \in [\![\varphi]\!] : w \in q \text{ for every } w \in p\}$

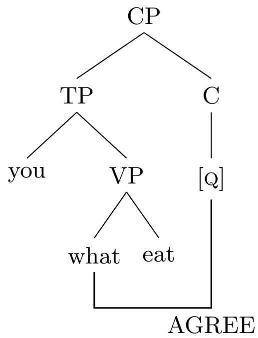
Thus, when *(n)en↓* attaches to a declarative as in (2), its argument is a downward closed set which contains a single maximal proposition p, $\{p\}^{\downarrow}$. Thus, it simply asserts that the embedded proposition is true as depicted in (23).

(23)



Turning to *wh*-interrogatives with *(n)en↓*, as discussed above, a *wh*-pronoun agrees with a question feature [Q] at C:

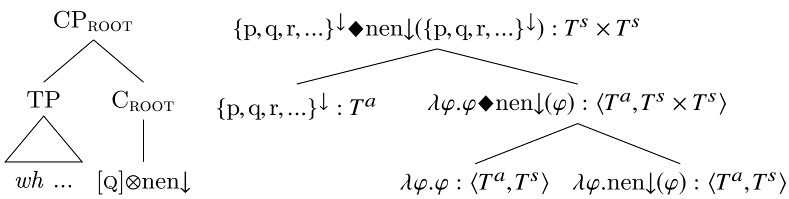
(24)



Furthermore, when [Q] occupies the root C, it renders an at-issue interrogative to an expressive one (25). The syntactic and composition trees of (20) are given in (26). *(N)en*↓ paratactically associates with this [Q], therefore the two expressive morphemes are combined by PARATACTIC ASSOCIATION (7), which yields a function that takes an at-issue meaning and returns a pair of expressive meanings, $\{p,q,r,...\}^{\downarrow}\blacklozenge \text{nen}\!\downarrow\!(\{p,q,r,...\}^{\downarrow})$ Thus, it projects a question meaning and at the same time asserts that at least one of the propositions denoted by the interrogative clause is true. In (20), therefore, the speaker is urging the addressee to answer the question by asserting that one of the answers is true. In (21), the speaker knows which answer is true.

(25) a. $[\![[\text{Q}_{\text{ROOT}}]]\!] \in D_{\langle T^a, T^s\rangle}$
b. $[\![[\text{Q}_{\text{ROOT}}]]\!] = \lambda\varphi.\varphi$

(26)



3.2 Japanese rising *daroo*

Hara (2018) observed that a Japanese sentence-final auxiliary modal *daroo* has an intricate interaction patter with clause types and prosody. In particluar, a declarative that ends with a modal auxiliary *daroo* and a rising contour LH%/↑ yields an interpretation similar to a tag question as in (27).[5]

(27) Marie-wa nomu daroo↑
Marie-TOP drink DAROO
'Marie drinks, right?'

Hara (2018, 2019) analyzes *daroo* as an expressive entertain modality E_{SP} in inquisitive epistemic logic (Ciardelli & Roelofsen, 2015). When it is attached to a declarative, it indicates the speaker's bias (28).

(28) a. $[\![\textbf{daroo}]\!] \in D_{\langle T^a, T^s\rangle}$

[5]See Venditti (2005) for the ToBI labelling for standard Japanese.

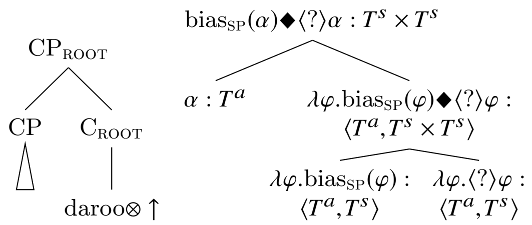
b. $[\![\varphi\ \textbf{daroo}]\!] = E_{\text{SP}}(\varphi)$
If $|\text{POSSIBILITY}(\varphi)| = 1$, $[\![\varphi\ \textbf{daroo}]\!] = \text{bias}_{\text{SP}}(\varphi)$

Furthermore, ↑ is analyzed as an expressive polar question marker which denotes the interrogative operator defined above in (14).

(29) a. $[\![\uparrow]\!] \in D_{\langle T^a, T^s \rangle}$
b. $[\![\uparrow]\!] = \lambda\varphi.\langle ? \rangle \varphi$

The syntactic and composition trees are given in (30). The two shunting-type morphemes are combined by Paratactic Association (7), which yields a function that takes an at-issue meaning and returns a pair of expressive meanings. As a result, (27) has two independent meanings, the speaker's bias toward the single maximal proposition in $[\![\alpha]\!]$ and her question $[\![\langle ? \rangle \alpha]\!] = [\![\alpha]\!] \cup [\![\neg\alpha]\!]$.

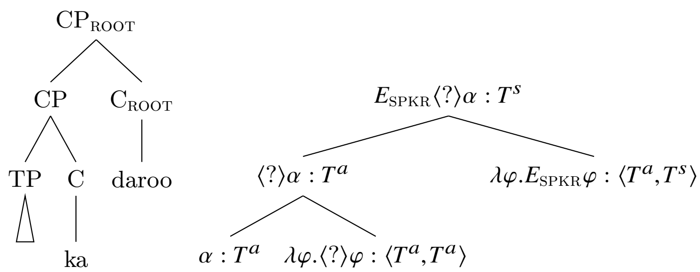
(30)



Furthermore, *daroo* can embed morphologically marked interrogatives, which supports the uniform approach for declaratives and interrogatives (see Hara, 2018, 2019).[6]

(31) Marie-wa nomu daroo ka
Marie-TOP drink DAROO Q
'I wonder if Marie drinks.'

(32)



3.3 Final Fall in English and Mandarin

Zimmermann (2000) treats English Final Fall (H*L-L%/↓) in disjunction declaratives like (33) as a closure operator which applies to a list in that it indicates that all and only items in the list have the "property in question".

(33) A: Which tube stations are one stop from Oxford Circus?

[6] Uegaki & Roelofsen (2018) give a similar analysis *daroo* using inquisitive epistemic logic, which makes different predictions. See Hara (2019) for the comparison.

B: Piccadilly Circus, Bond Street, Tottenham Court Road, Green Park, Warren Street, Regent's Park ↓

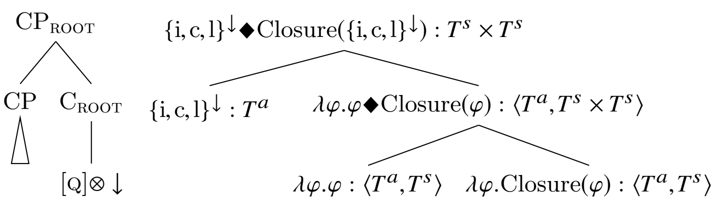
Biezma & Rawlins (2012) claim that the falling contour that accompanies alternative questions like (34) is the same closure operator as the one in (33), since they "offer unbiased choices" between the alternatives. We can derive the same interpretation by treating ↓ as an expressive closure operator defined in (35) based on Biezma & Rawlins (2012).

(34) Do you want iced tea, coffee, or lemonade↓

(35) $[\![\downarrow]\!] = [\![\text{Closure}]\!] \in D_{\langle T^a, T^s \rangle}$,
$[\![\varphi \downarrow]\!] = [\![\text{Closure}(\varphi)]\!] := \{p | (\text{SalAlts} = \varphi) \text{ or } (\text{SalAlts} = \emptyset) \text{ in every } w \in p\}$,
where SalAlts is the set of propositional alternatives that are salient in the context of interpretation.

The [Q] (defined in (25)) and ↓/Closure are paratactically-associated as shown in (36). (34) raises a question $\{i, c, l\}^{\downarrow}$ and expresses that all the alternatives are salient.

(36)



Mandarin A-not-A questions like (37) that end with Final Fall (L%/↓) seem to express a similar meaning, since they can be used only when the context is unbiased, i.e., both alternatives (p and ¬p) are equally salient (see also Yuan & Hara, 2013).

(37) Ni he-bu-he jiu↓
you drink-not-drink wine
'Do you drink wine or not?

4 Conclusion

We have proposed a new type system $\mathcal{L}_{CI}^{+S,PA}$ that includes the PARATACTIC ASSOCIATION rule. $\mathcal{L}_{CI}^{+S,PA}$ can provide compositional analyses of expressive meanings that arise from prosodic morphemes and particles. Moreover, a wide range of cross-linguistic data show that prosodic morphemes and particles can embed both declaratives and interrogatives, which calls for a semantic platform that can uniformly deal with different clause types.

References

Bartels, Christine. 1999. *The intonations of English statements and questions*. Garland Publishing.

Biezma, María & Kyle Rawlins. 2012. Responding to alternative and polar questions. *Linguistics and Philosophy* 35. 361–406.

Ciardelli, Ivano, Jeroen Groenendijk & Floris Roelofsen. 2019. *Inquisitive Semantics* Oxford Surveys in Semantics and Pragmatics. OUP Oxford. https://books.google.co.jp/books?id=a8d-DwAAQBAJ.

Ciardelli, Ivano, Floris Roelofsen & Nadine Theiler. 2017. Composing alternatives. *Linguistics and Philosophy* 40. 1–36.

Ciardelli, Ivano A. & Floris Roelofsen. 2015. Inquisitive dynamic epistemic logic. *Synthese* 192(6). 1643–1687.

Gunlogson, Christine. 2003. *True to Form: Rising and Falling Declaratives as Questions in English*. New York: Routledge.

Hara, Yurie. 2006. *Japanese Discourse Items at Interfaces*. Newark, DE: University of Delaware dissertation.

Hara, Yurie. 2018. *Daroo* as an entertain modal: an inquisitive approach. In Shinichiro Fukuda, Mary Shin Kim, Mee-Jeong Park & Haruko Minegishi Cook (eds.), *Japanese/Korean Linguistics*, vol. 25, CSLI Publications.

Hara, Yurie. 2019. *Daroo ka*↑: The interplay of deictic modality, sentence type, prosody and tier of meaning. Semantics Archive. https://semanticsarchive.net/Archive/jA5ZWZhN/.

Hara, Yurie & Tomohide Kinuhata. 2012. Osaka Japanese *nen*: One-sided public belief and paratactic association. *Sprache und Datenverarbeitung: International Journal for Language Data Processing* 49–70.

Ikeda, Youhei. 2001. *A proposal for ToBI labelling of Osaka dialect*. Nara Institute of Science and Technology MA thesis.

Lyons, John. 1977. *Semantics*. Cambridge University Press.

McCready, E. 2008. What man does. *Linguistics and Philosophy* 31(6). 671–724.

McCready, E. 2010. Varieties of conventional implicature. *Semantics and Pragmatics* 3(8). 1–57. doi:10.3765/sp.3.8.

Potts, Christopher. 2005a. Lexicalized intonational meaning. In Shigeto Kawahara (ed.), *UMOP 30: Papers on Prosody*, 129–146. Amherst, MA: GLSA.

Potts, Christopher. 2005b. *The Logic of Conventional Implicatures* Oxford Studies in Theoretical Linguistics. Oxford: Oxford University Press. [Revised 2003 UC Santa Cruz PhD thesis].

Potts, Christopher. 2012. Conventional implicature and expressive content. In Claudia Maienborn, Klaus von Heusinger & Paul Portner (eds.), *Semantics: An International Handbook of Natural Language Meaning*, vol. 3, 2516–2536. Berlin: Mouton de Gruyter. This article was written in 2008.

Roelofsen, Floris & Donka F. Farkas. 2015. Polarity particle responses as a window onto the interpretation of questions and assertions. *Language* 91(2). 359–414.

Uegaki, Wataru & Floris Roelofsen. 2018. Do modals take propositions or sets of propositions? evidence from japanese *darou*. In *Proceedings of SALT 28*, .

Venditti, J., Jennifer. 2005. The J-ToBI model of Japanese intonation. In Sun-Ah Jun (ed.), *Prosodic Typology*, 172–200. Oxford University Press.

Yuan, Mengxi & Yurie Hara. 2013. Questioning and asserting at the same time: the L% tone in A-not-A questions. In Maria Aloni, Michael Franke & Floris Roelofsen (eds.), *Proceedings of the 19th Amsterdam Colloquium*, 265–272.

Zimmermann, Thomas Ede. 2000. Free choice disjunction and epistemic possibility. *Natural Language Semantics* 8. 255–290.