Movement of a Shifty Operator[*]

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This paper argues that the Japanese Contrastive-marking introduces an operator which takes shiftable indexicals and indicates some attitude-holder's limited knowledge. I also show that the computation of the operator involves a syntactic movement, which determines the context in which the shiftable indexicals are interpreted.

1. Contrastive-marking

As noted by Kuno (1973), Japanese Contrastive-marking involves a morphological marker *-wa* and a prosodic peak in the intonation (indicated by capitals). A sentence with Contrastive-marking seems to yield a certain implicature as in (1-b).

(1)   a.   Among John and Mary, who came to the party?
        b.   JOHN-wa kita.
               John-Con came.
               'John came. (Mary didn't come, or I don't know about Mary.)'

Following the Structured Meaning Approach (c.f. von Stechow 1990, Krifka 2001), I argued in Hara (2005a) and Hara (2006, ch. 2) that the prosodic peak of Contrastive-marking creates a partition of the asserted proposition into B (background) and F (Focus). The morphological *wa*-marking then introduces the CON operator that takes the structured meaning as its argument and yields a conventional implicature. The Contrastive-marked sentence presupposes that there exists a stronger alternative to the asserted proposition (2–b), i.e. there is a scalar alternative that entails but is not entailed by the original assertion.[1] If the presupposition is met, the sentence with CON conventionally implicates that the speaker considers the possibility that the stronger alternative is false (2–c). In other words, by Contrastive-marking, the speaker indicates his/her limitation of knowledge with respect to the question under discussion (e.g. 'Who came to the party?'), i.e. the asserted proposition is his/her maximal knowledge, and as for alternative propositions, the speaker either considers them as false or unknown (see Spector 2003, van Rooij & Schulz 2004, for the notion of *order of knowledge*). The interpretation of (1-b) is depicted in (2).[2]

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[1]Logical entailment might not be the ideal tool to determine whether a proposition is stronger than the other. We might appeal to the notion of 'Horn Scale' which is formed by items that are salient and relevant in the context (Horn 1972, Gamut 1991). See Hara (2006, ch. 2) for details on this matter.

[2]This treatment of Contrastive-marking predicts that if a Contrastive-marked proposition, i.e., B(F), is the strongest among its alternatives, the sentence causes a presupposition failure. This prediction is borne out by the following example. In (i), the asserted proposition, 'everyone came.' is the strongest among its alternatives ('someone came.' 'most people came.' etc.). As a consequence, Contrastive-marking is not compatible with the asserted proposition. See Hara (2006, ch. 2) for discussions.

(2) Let w be a world variable, sp the speaker, F the focus-marked elements, B the background, R the restriction.
$\text{CON}(w)(sp)(\text{B(F)})$

    a. asserts: B(F)(w)=1
    b. presupposes: $\exists F'[[F' \in R] \ \& \ [B(F') \Rightarrow B(F)] \& \ [B(F) \not\Rightarrow B(F')]]$
    c. implicates: $\exists w'[w' \in \text{Dox}_{sp}(w)][B(F')(w') = 0]$ $(=\diamond(\neg(B(F'))))$

(3)   a. B= $\lambda x. \ x$ came. F=John F'= John and Mary
    b. assertion: John came.
    c. implicates: the speaker considers the possibility that it is false that John and Mary came.
    d. assertion+implicature: the speaker considers the possibility that it is false that Mary came.

2. Embedded Contrastive

This section presents data that suggest -*wa*-implicatures can be associated with an attitude-holder other than the speaker. I utilize Schlenker's (2003) notion of 'shiftable indexicals' to identify the agent of the implicatures in different contexts.

2.1. Relativized Implicatures

Implicature Computation by *wa*-marking interacts with attitude predicates. In (4), -*wa* can be associated to an attitude-bearer other than the speaker (i.e. John) since -*wa* is embedded within an attitude predicate. Hence, assuming we only consider Mary and Peter, (4) is ambiguous between John's local implicature (the implicature relativized to John) (4-a) and the speaker's global implicature (the implicature relativized to the speaker) (4-b).

(4) MARY-**wa** kita-to   John-ga   shinjite-iru
    Mary-Con come-Comp John-Nom believe-Prog
    'John believes at least Mary came.'   (ambiguous)

    a. Local: The speaker knows [John believes Mary came]
        Implicature: John doesn't know whether Peter came]
    b. Global: The speaker knows [John believes Mary came]
        Implicature: The speaker doesn't know [whether John knows that Peter came]

    As seen in the previous section, the use of -*wa* introduces the operator CON (2). The previous section only looked at the case where the implicature is associated with the speaker. I now claim that if the operator is embedded in an attitude report, the induced implicature can be relativized to the agent of the reported attitude.[3] To accommodate this intuition, I modify the denotation of CON so that it contains shiftable indexicals in Schlenker's (2003) sense.

(i)   #ZEN'IN-wa   kita.
      Everyone-Con came

[3]van Rooij & Schulz (2004) also modify their framework in order to generate a desired 'local' conversational implicature as observed by Chierchia (2004) and Landman (2000).

2.1.1. Schlenker (2003)

Kaplan (1989) claims that the referent of an indexical is always determined by the context of the actual utterance, which is summarized in the following thesis.

(5)   Fixity Thesis (a corollary of Direct Reference):
        The semantic value of an indexical is fixed solely by the context of the
        actual speech act, and cannot be affected by any logical operators.
                                        (Kaplan, 1989; restatement by Schlenker, 2003)

For example, in English, the indexical *I* always refers to the actual speaker of the sentence. Consequently, in order to describe the situation in (6), the subject of the reported speech act has to be referred to with the third person pronoun *he*. (6–b) is not an accurate description of the situation in (6), since English *I* can only refer to the actual speaker.

(6)   Situation to be reported: John says: 'I am a hero.'
        a.   English: John$_i$ says that he$_i$ is a hero.
        b.   English: *John$_i$ says that I$_i$ am a hero.   (Schlenker 2003)

Observing this fact, Kaplan (1989) claims that there is no operator that shifts the context that determines the value of indexicals. Kaplan (1989) says that if they existed, they would be *monsters*.

       As a reply to Kaplan's observation, Schlenker (2003) argues that "every attitude verb is a Kaplanian monster" (p.37). In Amharic, for example, the first person indexical shifts in attitude reports to the agent of the reported attitude as depicted in (7).

(7)   ǰon   ǰegna nə-ññ   yɨl   -all
        John hero   be.PRT-1sO 3M.say -AUX.3M
        (lit. John$_i$ says that I$_i$ am a hero.)   (D. Petros, p.c. to Schlenker)

Schlenker (2003) proposes the following logical structure for the Amharic sentence, in which he treats the semantics of attitude predicates as quantification over contexts. In addition, the embedded clause contains shiftable indexicals, $agent(c_i)$, $time(c_i)$, $world(c_i)$, which are functions from contexts to individuals/times/worlds.

(8)   SAY$_{<John,now,actually>}$ c_i be-a-hero $(agent(c_i), time(c_i), world(c_i))$
                                                          (Schlenker 2003)

In (8), the context of the reported speech act, c_i is bound by the attitude predicate. As a result, in Amharic, *-ññ* is interpreted as $agent(c_i)$, which refers to the speaker in the embedded context, John.[4] English *I* is not shiftable, i.e. it can only pick up the actual context ($[\![I]\!]^g = agent(c_@)$), and therefore, it can only be interpreted as the speaker in the context of the actual utterance.

2.1.2.   Wa-implicatures and Shiftable Indexicals

Following Schlenker's (2003) approach to indexicals, I reformulate my Contrastive operator as follows. It takes shiftable indexicals, $agent(c)$ and $world(c)$, as its ar-

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[4]Japanese *zibun* is also argued to be a shiftable indexical (Oshima 2004). See section 3.

guments. This allows us to have *wa*-implicatures associated to an agent other than the speaker.

(9) $\text{CON}(w(c))(agent(c))(\text{B(F)})$
   a.   asserts: B(F)(w)=1
   b.   presupposes: There exists B(F') which is stronger than B(F)
   c.   implicates: $\exists w'[w' \in \text{Dox}_{agent(c)}(w(c))][\text{B(F')}(w') = 0]$
         In some doxastic worlds accessible to the agent in context c, the stronger alternative is false.

Let us go back to the ambiguity of (4). I propose that the operator CON has a syntactic representation and the syntactic location of the operator determines which implicatures are induced. Namely, the syntactic position of the operator determines the attitude-bearer of the induced implicature (the speaker or the subject of the attitude predicate) and the contrasted proposition (matrix or the embedded clause; the size of B) as depicted in (10).

(10)   a.   Local: $c_@$ [$_{CP}$ [$_{IP}$ c_i [$_{CP}$ **CON** [$_{XP}$ Mary-wa] came Comp] John-ga believe]]
        b.   Global: $c_@$ [$_{CP}$ **CON** [$_{IP}$ c_i [$_{CP}$ [$_{XP}$ Mary-wa] came Comp] John-ga believe]]

Let us illustrate how these LF structures generate different implicatures. Recall from section 1 that background B is a question predicate in the Structured Meaning Approach (von Stechow 1990) obtained by lambda abstraction. The operator CON in (10-a) takes the embedded IP in its scope. The context of the embedded speech act picks out 'John' as the agent of knowledge of the proposition and generates a local implicature (11-b).

(11)   a. $B_l = \lambda y.\textbf{came}(y)$, $agent(c_i) = j$
        b.   local implicature: In some of the doxastic worlds compatible with **John's belief**, it is not the case that Mary and Peter came.

On the other hand, in (10-b), CON operates over the matrix sentence. As a result, the context of the actual speech act picks out the speaker as the agent/seat of knowledge and generates a global implicature (12-b).

(12)   a. $B_g = \lambda y.\textbf{think}(j)(\textbf{came}(y))$, $agent(c_@) = sp$
        b.   global implicature: In some of the doxastic worlds compatible with **the speaker's belief**, it is not the case that John believes that Mary and Peter came.

In summary, the CON operator sitting at a clause-initial position (either embedded or matrix) determines the agent and locus of *wa*-implicatures.

2.2. Island Effects

Although it is possible to Contrastive-mark an element within a local clause under attitude predicates as discussed in section 2.1, it is not possible to Contrastive-mark an element within a relative clause (13) and an adjunct clause.[5]

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[5]A parallel pattern is observed for Contrastive-marking within adjunct clauses:

(i)   *Itsumo uchi-ni   JOHN-**wa** kita toki, inu-ga   hoe-ru.
         always house-Dat John-**Con** come when, dog-Nom bark-Pres

(13)   *Itsumo CHOMSKY-**wa** kai-ta   hon-ga   shuppan-sa-re-ru.
        always Chomsky-**Con**   write-Past book-Nom publish-do-Pass-Present
        'The book which at least Chomsky wrote is always published.'

In the syntactic literature, these constructions are known to be islands for *wh*-movement. Hence, it seems that Contrastive-marking is dependent on syntactic constructions. More specifically, it seems that the association between CON and the Focus-marked element cannot be established if the association needs to cross an island construction. (See section 3 for unavailability of the local computation.) To better understand this phenomenon, I first give an overview of islands for *wh*-movement in Japanese, and then I compare the structure of Japanese *wh*-question by Nishigauchi (1990) with the distribution of Japanese Contrastive-marking.

2.2.1.   *Japanese Island Constructions for* wh-*questions*

Japanese is a *wh*-in-situ language in view of Huang's (1982a, 1982b) theory of *wh*-movement. Namely, *wh*-words move covertly to clause-peripheral positions at LF. For example, *naze* 'why' cannot appear within a complex NP as in (14). In the LF-movement approach, this is understood as the following. Even though *naze* is in the base generate position in overt syntax, it moves to the clause-initial position in covert syntax, which violates the island constraint (Ross 1967).

(14)   *[Kare-ga naze kai-ta   hon]-ga   omosiroi-desu-ka?
        he-Nom why write-Past book-Nom interesting-is-Q
        'Why$_i$ are books that he wrote t$_i$ interesting?'

In this LF-movement approach, it is difficult to understand why some of Japanese *wh*-words can appear within complex NP Islands (15) and adjunct islands (examples omitted).

(15)   kimi-wa [dare-ga   kai-ta hon-o]   yomi-masi-ta   ka?
        you-TOP who-NOM   wrote book-ACC read.POL-PAST Q
        'You read books that who wrote?'   (Nishigauchi 1990, p.40)

To save the LF-movement approach, Nishigauchi (1990) argues for LF pied-piping (see also Choe 1987, Pesetsky 1987). In Nishigauchi's (1990) approach, what actually undergoes a covert movement is not the *wh*-word, but the island that contains the *wh*-word. For example, (15) has the following LF structure.

(16)   [$_{CP}$ [who-Nom wrote book] -Acc$_i$ [$_{IP}$ [$_{VP}$ t$_i$ read]] Q]

Hence, although it appears that some Japanese *wh*-questions do not obey a general island constraint, the acceptability of the construction is due to the amelioration by LF pied piping. Hence, CNPC is active in Japanese.[6]
        On the other hand, it has been claimed that a *wh*-word inside a *wh*-island is not acceptable (Nishigauchi 1990, Watanabe 1992). For example, in (17-b),

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        'When at least John comes to our house, the dog always barks.'

The generalization also holds for other temporal clauses ('before', 'after', etc.) and *if*-clauses, while Contrastive-marking is possible within *because*-clauses. See Hara (2005b; 2006, ch. 3).

[6]According to Nishigauchi (1990), this amelioration is possible only in the case where the categories of *wh*-words and the dominating XP are identical. In (14), the island that contains the *wh*-word is NP, while *naze* 'why' is not an NP, hence the [+wh] feature cannot percolate up, which is a necessary condition for pied piping.

there seems to be a preference toward the local association of the *wh*-word *nani* with the embedded Q-morpheme *-ka* over the global association with the matrix *-ka*. This preference suggests that there is a *wh*-island effect in Japanese.

(17) John-wa [Mary-ga nani-o   katta-ka] imademo
      John-Top Mary-Nom what-Acc bought-Q still
      shiri-tagat-teiru-no?
      know-want-Prog-Q
      a.   'Does John still want to know what Mary bought?'
      b.   ?'What$_1$ is such that John still wants to know [whether Mary bought it$_1$]?'   (Deguchi & Kitagawa 2002)

According to Deguchi & Kitagawa (2002) and Ishihara (2002), this seeming *wh*-island effect in Japanese reported in earlier literature is a misinterpretation of the preference toward a non-monotonic prosody. Deguchi & Kitagawa (2002) and Ishihara (2002) propose a prosodic-sensitive association of the *wh*-word and the Q-morpheme and show that the global association in (17-b) becomes much more readily available if the post-focal reduction continues to the sentence-final Q-morpheme (Global Emphatic Prosody (Global EPD) in Deguchi and Kitagawa's terminology and Focus Intonation (FI) in Ishihara's terminology) as in (18).[7]

(18) John-wa [Mary-ga NA*ni-o katta-ka*] *imademo shiri-tagat-teiru-no*?
      'What$_1$ is such that John still wants to know [whether Mary bought it$_1$]?'   (Deguchi & Kitagawa 2002)

Deguchi & Kitagawa (2002) and Ishihara (2002) attribute the preference for local *wh*-scope observed in (17-b) to the shorter post-focal reduction (Local EPD or FI), which is preferred due to a tendency to avoid monotonic prosody.

In summary, in Japanese, a *wh*-word moves at LF, and as a consequence it obeys the island constraints. The seeming exception of a complex NP island (or an adjunct island) is shown to be the result of LF pied-piping of the whole island. On the other hand, Deguchi & Kitagawa (2002) or Ishihara (2002) show that an embedded *wh*-question does not constitute an island in Japanese since the association between the *wh*-word and the matrix Q-morpheme is easily established if the right prosody is assigned.

2.2.2.   Wa-*marking and islands*

In this section, I will show that *wa*-marking has a parallel distribution to Japanese *wh*-questions in terms of embedding under islands.

The morpheme *-wa* cannot appear within a complex NP as we have seen in (13). Interestingly, however, (13) can be improved if the Contrastive morpheme *-wa* is realized at the edge of the complex NP island. (The same pattern is observed for adjunct islands.)

(19) Itsumo [CHOMSKY-ga kai-ta   hon]-wa shuppan-sa-re-ru.
      always Chomsky-Nom write-Past book-Con publish-do-Pass-Present
      'At least the book which Chomsky wrote is always published.'

Now, let us turn to *wh*-islands. *Wa*-marking seems to be available under *wh*-islands:

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[7]I use italics to indicate the post-focal reduction. See Deguchi & Kitagawa (2002) or Ishihara (2002) for more a precise representation of the prosody patterns.

(20)   boku-wa ano-mise-de JOHN-wa nani-o   kat-ta   ka kii-ta.
           I-Top   that-shop-at John-Con what-Acc buy-Past Q ask-Past
           'I asked what at least John bought at that shop.'

As discussed by Deguchi & Kitagawa (2002) and Ishihara (2002), a Japanese embedded *wh*-question does not constitute as an island for a matrix *wh*-question if the correct prosody is assigned to the question. For this reason, I do not take (20) above as a counter-example to my generalization.

        In short, *wa*-marking is not available within complex NP (and adjunct) islands. However, most of the constructions can be improved by overt pied-piping-like structures. In other words, it is possible to Contrastive-mark an element within islands and obtain intended implicatures if the *wa* morpheme is realized at the same domain as the one which can be pied-piped for *wh*-questions. In addition, *wa*-marking is possible within *wh*-island. Overall, the distribution of Contrastive *wa*-marking is parallel to the distribution of Japanese *wh*-questions.

2.3.   Movement of CON

The data shown above suggests that the placement of the CON operator is constrained by syntactic islands.

        One might speculate that there could be some principle which simply restricts -*wa* from being embedded within complex NPs. However, a more sophisticated explanation is needed because the simple stipulation that bans -*wa* from appearing in complex NPs makes the wrong empirical prediction when -*wa* is embedded under an attitude predicate. For example, in (21), even though the *wa*-marked elements are within island constructions, the sentences are judged grammatical. This is unexpected if we assume the simple explanation for the distribution of -*wa*, i.e., -*wa* can only appear in the matrix clause. A better explanation for (21), one that correctly explains the grammatical judgement, is that a *wa*-marked element needs to be local to an attitude-bearer (the speaker or the subject of the attitude predicate).[8]

(21)   MARY-wa ki-ta-to   **omot**-teiru hito-ga   iru.
           Mary-Con come-Past-Comp **think**-Prog person-Nom exist
           'There is a person who thinks that at least Mary came.'

        Hence, observing the data shown in 2.2, I propose a syntactic movement account for this fact. Namely, I speculate that the operator is originally generated locally as in (22) and moves to yield the LF structures which determine which attitude-bearer, the speaker or the subject of the attitude predicate, is responsible for the induced implicature.[9]

(22)   XP
                 ／＼
        CON   ／＼
             [F NP]   wa

Let us go back to the ambiguity of (4). If the operator moves to the embedded clause, it induces John's local implicature 'John considers the possibility that Pe-

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[8]The same pattern observed for adjunct islands. See Hara (2005b; 2006, ch. 3) for more data and discussions.

[9]Alternatively, one can assume a feature movement of [Con] in order to avoid the problem of left-branch violation.

ter didn't come'. If it moves to the matrix IP, it induces the speaker's global implicature 'The speaker considers the possibility that John doesn't believe Peter came'.[10]

(23) $c_@$ [$_{CP}$ **Con** [$_{IP}$ c_i [$_{CP}$ **Con** [$_{XP}$ t_i Mary-wa] came Comp] John-ga believe]]

           Global Local

A movement analysis straightforwardly explains the ungrammaticality of the *wa*-marking within a relative clause (13). The operator generated under the relative clause looks for its context. There is no attitude predicate under the relative clause, hence it targets the matrix clause.[11] This movement crosses a complex NP island.

(24)   *[$_{SpeechActP}$ [speaker] [CON [$_{IP}$ ... [$_{NP}$ [$_{IP}$ t Chomsky-wa wrote] book] ...]]]

                            *   (13)

Remember that when *-wa* is further embedded under an attitude predicate, the sentence is acceptable even within an island (21). Here, the CON operator does not need to cross an island since it can find a local attitude operator that binds its context variable.

(25)   [$_{IP}$ ... [$_{NP}$ [$_{VP}$ [$_{CP}$ c_i CON [$_{IP}$ [$_{XP}$ t [$_{XP}$ Mary] -wa] come] Comp] **thought**] person] ...]   (21)

2.4. Arguments for a movement approach

The introduction of a syntactic movement to account for a semantics-pragmatics phenomenon like implicature computation may seem unconventional. In fact, semantic associations such as focus associations (Rooth 1985, Rooth 1992) and choice function binding (Reinhart 1997) are immune to islands. Moreover, Contrastive-marking an argument within an island *per se* should be acceptable on semantic grounds alone, since there are other ways to express the intended meaning. There are two ways to ameliorate the construction in (13): one is pied-piping as shown in section 2.2.2, and the other is base-generating the Contrastive-marked element at the clause-initial position. In the current section, I demonstrate how

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[10]Note that the Contrastive Operator CON does not form a constituent with the Contrastive-marked NP *Mary* at LF, where scope is computed. Consider sentence (i).

(i)   Zen'in-wa   kur-u-to   omow-anakat-ta.
        Everyone-Con come-Present-Comp think-Neg-Past
        'At least, I didn't think that everyone would come.'
        (Implicature: I thought someone would come.)

Here, the local implicature is impossible since "Everyone comes" does not satisfy the presupposition of CON as we have seen in footnote 2. On the other hand, if the operator formed a constituent with the quantifier and moved to the matrix clause along with it, the syntax would yield a LF-structure, $\forall x \neg$ **think** ([**person**(x)] [**come**(x)]), which again fails to satisfy the presupposition, since the assertion exhausts all the individuals in the domain. Hence, it fails to induce the implicatures required by *-wa*.

Nonetheless, (i) is acceptable; therefore we have to allow the global computation of a *wa*-implicature without moving the quantifier *zen'in* 'everyone'.

[11]In Hara (2005b; 2006, ch. 4) I discuss other operators that license *wa*-marking and why those options are not available for IPs under islands.

(13) is ameliorated and how the ameliorated structures are interpreted.[12]

2.4.1. Pied-piping-like structure

First, as we have seen in (19), if *-wa* is marked on an island (instead of inside an island) and the island contains an argument that bears a dissociated focus marked by a prosodic peak, it is possible to compute a global implicature.

The structure of (19) does not cause an island violation because CON is generated outside the island and the movement of CON is local. The LF structure for (19) and the subsequent movement of the CON operator is depicted in (26). The shiftable indexical $agent(c)$ is bound by the actual utterance context $c_@$, hence, the context induces an implicature associated to the actual speaker, In some of the doxastic worlds compatible with the speaker's belief, 'it is not the case that the book written by someone other than Chomsky is published'.

(26) $c_@$ CON [$_{IP}$ always [$_{XP}$ t [$_{NP}$ Chomsky-ga wrote book] -wa] published]

2.4.2. Co-indexation with pro

In addition to "pied-piping"-like constructions, (13) can be ameliorated by generating a *-wa*-marked NP overtly outside the island construction and co-indexing it with *pro*. For example, in (27), the *wa*-marked NP *CHOMSKY$_i$-wa* is co-indexed with *pro*, within a relative clause, and it induces the intended implicature.

(27)   CHOMSKY$_i$-wa itsumo *pro$_i$* kai-ta   hon-ga   shuppansareru
        Chomsky-Con   always *pro* write-Past book-Nom is.published
        'At least Chomsky is such that the book which he wrote is always published.'

Since CON is generated outside the island, it does not cross the island in order to be bound by the actual context.

(28) $c_@$ CON [$_{XP}$ t [Chomsky$_i$] -wa] always [$_{NP}$ *pro$_i$* wrote book] published]   (27)

Together with the "pied-piping" facts presented in the previous section, this possibility of amendment by co-indexation with *pro* demonstrates that the ungrammaticality of (13) is not due to semantic constraints but syntactic ones, since the intended interpretations are successfully derived by changing the syntactic structures. [13]

3. Local computation of implicatues

In the foregoing section, we have seen that the use of *-wa* triggers implicatures which are associated to the speaker or some attitude-bearer. This association is blocked by a certain syntactic configuration, namely complex NP (and adjunct)

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[12]I only discuss complex NP islands for space reasons. See Hara (2005b; 2006, ch. 3) for data and discussions on adjunct islands.

[13]Hoji (1985) provides an anaphor binding test to show that the sentence-initial *wa*-marked phrase as in (27) is not an instance of overt movement. See Hoji (1985) and Hara (2005b; 2006, ch. 3). Also, van Riemsdijk (1997) notes that left dislocation using *pro* is island-insensitive.

islands. To capture these facts, I have proposed a syntactic movement account for the positioning of the CON operator. CON moves in order to locally identify the context that saturates its shiftable indexicals.

This analysis pertains to the following question. Looking at (10), the two LF structures of (4), the CON operator seems to move to matrix or embedded clause-initial position. Then, what exactly prevents the LF in (13) from having the following structure and induce a local implicature within the complex NP?

(29) $[_{CP} [_{IP} [_{NP}$ **CON**$_j$ $[_{CP}$ (which$_i$) $[_{XP}$ t$_j$ Chomsky-**wa**] t$_i$ wrote] book]$_{...}$]
] (13)

A brief introduction to the semantics of relative clauses is in order. Following Quine (1960), Heim & Kratzer (1998) treat relative clauses as predicates. For example, in (30), 'which is empty' denotes the function $\lambda x.\ x$ is empty.

(30) The house which is empty is available. (Heim & Kratzer 1998, p.87)

In Heim & Kratzer (1998), the function meaning of a relative clause is obtained in the following way. The relative clause involves movement of a relative operator, which leaves a variable as in (31-a). The relative operator then lambda-abstracts over the embedded IP

(31) a. The house $[_{CP}$ which$_1$ $[_{IP}$ t_1 is empty]] is available.
b. $[\![$**which**$_1$ t_1 **is empty**$]\!]^{g^{1/x}} = \lambda x.g^{1\rightarrow x}(1)$ is empty $= \lambda x.x$ is empty

Assuming that the argument of the CON operator needs to be type t, it follows that the local computation of *wa*-implicatures is not possible in (13) due to a type mismatch. The embedded CP in (29) ' (which) Chomsky wrote' is a predicate (type $< e, t >$), not a proposition (type t). In contrast, as shown in section 1, Contrastive-marking indicates the limit of knowledge regarding a certain question. That means, the speaker knows of some propositions that they are true. It is not possible to have knowledge of a property/predicate, i.e., it is not possible to have truth-value of a property/predicate. Therefore, the argument of CON, i.e., B(F), cannot be a predicate of type $< e, t >$, but must be a proposition of type t.[14]

Interestingly, having an attitude predicate within a relative clause seems to improve the grammaticality of *wa*-marking under the relative clause as in (32).

(32) ?Kinou   NIHONGO-wa dekiru   to   omot-teiru hito-ni
yesterday Japanese-Con   capable Comp think-Prog person-Dat
at-ta.
meet-Past
'I met [the person]$_i$ who thinks he$_i$ can speak at least Japanese.'

I speculate that (32) has the following structure (33). More specifically, the variable created by a relative operator (which is covert in Japanese) is the subject of the attitude predicate, while the subject of the most deeply embedded clause is an empty pronoun *pro*.

(33) ?yesterday $[_{CP}$ (who$_j$) $[_{IP}$ $[_{CP}$ $[_{IP}$ **pro**$_i$ Japanese-Con capable] Comp] t_j
think-Prog]] person$_i$-Dat meet-Past

Furthermore, I propose to treat this pronoun as a shiftable indexical ('I' of the reported speech). Indeed, the overt use of the shiftable indexical *zibun* (see Oshima

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[14]Similarly, Evidentials are not possible inside relative clauses (Hara, 2005a and 2006, ch. 4).

2004) improves (32) as seen in (34).

(34)   Kinou [[**zibun**$_i$-ga NIHONGO-wa dekiru] to t_i omot-teiru] hito-ni at-ta.
      'I met [the person]$_i$ who thinks he$_i$ can speak at least Japanese.'

      As a consequence, (34) and (33) have a parallel structure to (21). In other words, the domain of the computation of *wa*-implicature does not involve a variable. Accordingly, the problem of the type mismatch disappears.

      This speculation predicts that if the variable created by the relative operator is the subject of the most deeply embedded clause, then *wa*-marking within the same clause is not possible. This prediction is attested in (35). In (35), the subject of the attitude predicate *omot* 'think' is overtly specified as *John*, who is distinct from the referent of the head noun. Therefore, the variable which is relativized to the head noun *hito* 'person' is in the domain of the computation of *wa*-implicature. As a consequence, *wa*-marking in (35) causes a type mismatch.

(35)   *Kinou [[e_i NIHONGO-wa dekiru] to **John**-ga omot-teiru] hito$_i$-ni at-ta.
      'I met [the person]$_i$ such that John thinks that he$_i$ can speak at least Japanese.'

4.   Conclusion

To conclude, I proposed that the computation of CON involves syntactic movement which determines: the size of the proposition it takes, and the context which binds the indexicals. My definition of CON is reformulated so that it contains shiftable indexicals. Another point in the paper is that the notion of shifting context is crucial. The context of the local speech act determines the agent of the implicature. Attitude predicates allow the embedding of *wa*-marking within islands.

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