

**LEXICAL INTEGRITY, HEAD SHARING,  
AND CASE MARKING  
IN JAPANESE TEMPORAL AFFIX CONSTRUCTIONS**

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# 1. Introduction<sup>1</sup>

Case-marking in Japanese is, in general, correlated to the category of the case assigner and its projection. Verbal cases (VCs) such as Nominative and Accusative seem to be assigned by a verbal head such as V/I under the projection such as VP/IP, as in (1a). Nominal cases (NCs) such as Genitive appear to be assigned by a nominal head such as N under the projection such as NP, as in (1b). In contrast, NCs and VCs cannot appear under a VP/IP and a NP, respectively.

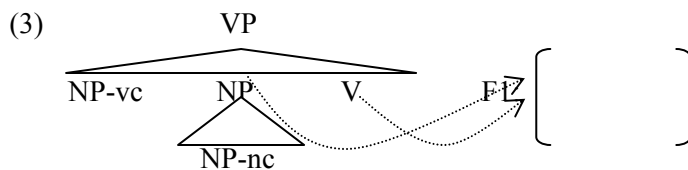
- (1)a. [<sub>IP</sub> John-ga/\*-no [<sub>VP</sub> ainugo-o/\*-no [<sub>V</sub> kenkyuu-si]]-ta]  
 John-NOM/\*-GEN Ainu-ACC/\*-GEN research-do-PAST  
 ‘John studied Ainu.’
- b. [<sub>NP</sub> John-no/\*-ga ainugo-no/\*-o kenkyuu](-ga itiban sugureteita).  
 John-GEN/\*-NOM Ainu-GEN/\*-ACC research(-NOM most was.excellent)  
 ‘John’s research on Ainu (was most excellent).’

However, the Temporal Affix Construction (TAC), which is headed by a temporal affix that immediately follows an argument-taking noun, allows either NC (*no*) or VC (*o*) marking as in (2a, b)<sup>2</sup>. It also allows a mixture of both VC- and NC-marking (i.e. mixed case: MC) under the same projection, as in (2c).

- (2)a. [John-no ainugo-no kenkyuu tyuu] <NC>  
 John-GEN Ainu-GEN research mid  
 ‘during John’s research on Ainu’
- b. [John-ga ainugo-o kenkyuu-tyuu] <VC>  
 John-NOM Ainu-ACC research-mid
- c. [John-ga ainugo-no kenkyuu-tyuu] <MC>  
 John-NOM Ainu-GEN research-mid

The NC- and VC-marking in (2a, b) do not pose a serious problem for the general case-marking pattern as in (1), if we assume that the head (or the case assigner) of these TACs can assign either NCs as a noun or VCs as a verb. However, the serious problem is that we cannot handle the MC-marking in (2c), because it suggests that, whatever the category is, the single head assigns both a VC and a NC in the same domain, against the general case-marking pattern.

The goal of this paper is to solve the problem of MC-marking and explain all of the case-marking patterns in TAC as in (2) as well as the general case-marking pattern as in (1) within a LFG framework. In particular, to solve the problem of MC-marking, we will defend Bresnan (1997)’s head sharing analysis, which allows the case-assigning verbal head and its NC-marked (i.e. genitive-marked) sister NP to map to the same f-structure, as in (3).



<sup>1</sup> My special thanks are due to Stephen Wechsler for suggesting a LFG implementation of the head sharing analysis and for valuable comments on my linguistic argumentation. My thanks are due to Peter Sells, Jonas Kuhn, Chiyo Nishida, and Junko Shimoyama for helpful comments on my earlier draft of this paper. I also wish to thank the audience in LFG04, anonymous reviewers, two editors (Tracy Holloway King and Miriam Butt), and Canterbury students in Linguistics, especially, Aaron Nolan, who helped me stay in Christchurch. Eric McCready helped me in proofreading the draft for this paper.

<sup>2</sup> Following the literature (Sells 1990, Hoshi 1997, Sato 1998) I will use the name, temporal affix construction, for convenience. However, the name is misleading, since the affix-like element does not always behave like an affix but can behave like a full-fledged word, as we discuss later.

Assigning a VC under its projection, the case-assigning verbal head can share the headness with its sister NP, so that it is an extended head. Since the verbal head can serve as an extended head of the sister NP at f-structure, it can license a NC in the sister NP under the verbal projection.

We examine every type of TAC in Japanese. They can be classified into subclasses, according to the kind of argument-taking noun and the kind of temporal affix. The argument-taking noun includes Sino-Japanese verbal nouns (e.g. *kenkyuu* ‘research’), nominalized V-V compounds (e.g. *uke-tori* ‘receipt’), western loanwords (e.g. *doraibu* ‘drive’), etc. As for the temporal affix, we include not only typical affixes which are directly concatenated with a preceding argument-taking noun (e.g. *-tyuu* ‘during’) but also periphrastic types of affixes which require an intervening morpheme *no* between the affix itself and the preceding argument-taking noun (e.g. *-no-sai/ori* ‘on the occasion of’). In spite of the superficial difference in TAC types, our goal is to give a unified account for case-marking in every type of TAC<sup>3</sup>.

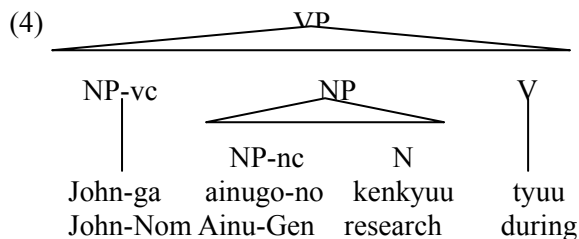
Our discussion is organized in the following order: properties of mixed case marking in TAC [Section 2], our proposals and head sharing analysis [Section 3], empirical preferences for the head sharing analysis [Section 4], residual issues [Section 5], and conclusion [Section 6].

## 2. Properties of Mixed Case Marking in Temporal Affix Constructions

In this section, we discuss some structural properties associated with TACs which allow MC-marking (hereafter, MC-TAC). A theory that can handle MC-marking should capture the properties.

### 2.1 Wordhood of a Case-assigning Head

In (1), we observed a general case-marking pattern such that a verbal head or its cohead assigns VCs under VP/IP and a nominal head assigns NCs under NP. Those who assume such a general case-marking pattern might wonder if a MC-TAC involves two heads, each of which licenses VC- or NC-marking. That is, they might assume the following bi-clausal structure for a MC-TAC such as (2c).



In (4), two heads, N and V, can assign a NC and a VC, respectively, in each domain of case assignment, conforming to the general case-marking pattern. If (4) is a correct analysis, then we do not have the problem of MC-marking any longer. But, in fact, it is not a correct analysis. There is evidence that a MC-TAC involves only a single word as a head. The evidence is given on the basis of criteria for lexical integrity (Bresnan and Mchombo 1995), as follows. It suggests that a head is one word if a TAC allows VC-marking (hereafter, VC-TAC), while it is formed by two words if a TAC allows NC-marking (hereafter, NC-TAC). The MC-TAC behaves in the same way as the VC-TAC does, so that we can conclude that the MC-TAC has a single word as a head.

<sup>3</sup> Our treatment of a temporal affix seems to be controversial, since it has, traditionally, been limited to the typical type of affix such as *-tyuu* ‘during’ (Sells 1990, Kageyama 1993). Nevertheless, our uniform treatment of the two types of temporal affix is supported by their similar behavior with respect to wordhood (cf. Section 2.1) as well as their parallel case-marking patterns, although they differ in phonological wordhood (cf. Appendix). We will discuss our treatment of the intervening morpheme *no* preceding a periphrastic temporal affix in Section 5.1, in spite of the fact that the morpheme is superficially identical to a genitive case-marker, which suggests a nominal property of the subsequent element (Peter Sells, p.c.).

### 2.1.1 Inbound Anaphoric Island

This criterion is used to show that part of a word does not allow an anaphoric use (e.g. *McCarthyism*, *\*himism*). NC-TACs as in (5a, 6a) allow an argument-taking noun to be replaced by a pronoun which is co-referential with the antecedent argument-taking noun, while VC-/MC-TACs as in (5b, c) and (6b, c) do not<sup>4</sup>. This suggests that an argument-taking noun in a NC-TAC behaves like a full-fledged word, while the one in a VC- or MC-TAC does not.

- (5) Mary-wa iroirona gengo-no kenkyuu<sub>i</sub>-o sita.  
 Mary-TOP various language-GEN research-ACC did  
 ‘Mary studied various languages.’
- a. (?)John-wa [kanojo-no ainugo-no sore<sub>i</sub> tyuu/izen(-ni)], ronbun-o happyoo-sita. <NC>  
 John-TOP her-GEN Ainu-GEN it mid/before(-at) paper-ACC presentation-did  
 ‘During/Before her research (lit. it) of Ainu, John presented his paper.’
- b. \*John-wa [kanojo-ga ainugo-o sore<sub>i</sub>-tyuu/izen(-ni)], ronbun-o happyoo-sita <VC>  
 John-TOP she-NOM Ainu-ACC it-mid/before(-at) paper-ACC presentation-did
- c. \*John-wa [kanojo-ga ainugo-no sore<sub>i</sub>-tyuu/izen(-ni)], ronbun-o happyoo-sita <MC>  
 John-TOP she-NOM Ainu-GEN it-mid/before(-at) paper-ACC presentation-did
- (6) Mary-wa iroirona gengo-no kenkyuu<sub>i</sub>-o sita.  
 Mary-TOP various language-GEN research-ACC did  
 ‘Mary studied various languages.’
- a. (?)John-wa [kanojo-no ainugo-no sore<sub>i</sub> no-ori/-sai(-ni)], ronbun-o happyoo-sita. <NC>  
 John-TOP her-GEN Ainu-GEN it on.the.occasion.of (-at) paper-ACC presentation-did  
 ‘On the occasion of her research (lit. it) of Ainu, John presented his paper.’
- b. \*John-wa [kanojo-ga ainugo-o sore<sub>i</sub>-no-ori/-sai(-ni)], ronbun-o happyoo-sita <VC>  
 John-TOP she-NOM Ainu-ACC it-on.the.occasion.of(-at) paper-ACC presentation-did
- c. \*John-wa [kanojo-ga ainugo-no sore<sub>i</sub>-no-ori/-sai(-ni)], ronbun-o happyoo-sita <MC>  
 John-TOP she-NOM Ainu-GEN it-on.the.occasion.of(-at) paper-ACC presentation-did

Moreover, the parallel between (5a) and (6a) and between (5b, c) and (6b, c) suggests the similarity of the two types of temporal affixes.

### 2.1.2 Phrasal Recursivity

This criterion is used to show that word-internal constituents disallow the arbitrarily deep embedding of syntactic phrasal modifiers (e.g. *\*quite happiness*, *\*more happy than sadness*). An adjective can modify only an argument-taking noun in NC-TACs as in (7a, b), while it cannot in VC-/MC-TACs as in (8a, b) and (9a, b).

- (7)a. John-no sono ronbun-no kibisii hihan go(-ni),  
 John-GEN the paper-GEN severe criticism after(-at),  
 Mary-ga syohyoo-o kaita. [NC]  
 Mary-NOM review-ACC wrote  
 ‘Mary wrote a review after John’s severe criticism of the paper.’

<sup>4</sup> There are informants who do not allow (5a). It seems to me that the unacceptability comes from a reason other than the wordhood of the head element. For example, one informant does not allow a replacement of an argument-taking noun by a pronoun even in an NP headed by an argument-taking noun which takes NC-marked arguments (i.e. *John-no ainugo-no sore* ‘\*John’s that of Ainu (lit.)’), which sounds good to me. Another informant is suspicious when only a verb is replaced by a pro-form, but it is important to notice that the head in (5a) is a noun, which can be replaced by a pro-form (i.e. John’s one on anaphora = John’s article on anaphora).

- b. John-no sono ronbun-no kibisii hihan no sai,  
 John-GEN the paper-GEN severe criticism NO occasion,  
 Mary-ga syohyoo-o kaita. [NC]  
 Mary-NOM review-ACC wrote  
 ‘Mary wrote a review on the occasion of John’s severe criticism of the paper.’
- (8)a. \*John-ga sono ronbun-o kibisii hihan-go(-ni),  
 John-NOM the paper-ACC severe criticism-after(-at),  
 Mary-ga syohyoo-o kaita. [VC]  
 Mary-NOM review-ACC wrote
- b. \*John-ga sono ronbun-no kibisii hihan-go(-ni),  
 John-NOM the paper-GEN severe criticism-after(-at),  
 Mary-ga syohyoo-o kaita. [MC]  
 Mary-NOM review-ACC wrote  
 ‘Mary wrote a review after John’s severe criticism of the paper.’
- (9)a. \*John-ga sono ronbun-o kibishii hihan-no-sai,  
 John-NOM the paper-ACC severe criticism-NO-occasion,  
 Mary-ga syohyoo-o kaita. [VC]  
 Mary-NOM review-ACC wrote
- b. ?John-ga sono ronbun-no kibishii hihan-no-sai,  
 John-NOM the paper-GEN severe criticism-NO-occasion,  
 Mary-ga syohyoo-o kaita. [MC]  
 Mary-NOM review-ACC wrote  
 ‘Mary wrote a review on the occasion of John’s severe criticism of the paper.’

Moreover, the parallel between (7a) and (7b), between (8a) and (9a), and between (8b) and (9b) suggests the similarity of the two types of temporal affixes.

### 2.1.3 Other Criteria

Other criteria such as extraction, conjoinability, and gapping are irrelevant to our discussion, due to other factors than wordhood. In general, extraction does not apply to predicative elements in Japanese. Instead, some researchers use a test of intervention by focus particle to a predicate (Kageyama 1999, Sells 1995). Generally, verbs allow a focus particle to occur between their nominal form and the tense-conveying pro-verb *suru* ‘do’, as in (10). In contrast, intervention by a focus particle is disallowed in TACs as in (11).

- (10) kenkyuu-wa/-mo/-sae suru  
 study-TOP/also/even do  
 ‘(to) study’
- (11)a. \*kenkyuu-wa/-mo/-sae tyuu  
 study-TOP/also/even mid  
 ‘during a study’
- b. \*kenkyuu-wa/-mo/-sae (-no) sai/ori  
 study-TOP/also/even -NO occasion  
 ‘on the occasion of a study’

The following argument can explain the impossibility of the focus particle in (11). In NC-TACs, since focus particles behave like VC-particles, they do not appear in a nominal environment such as a head

element which consists of two nouns. As for VC/MC-TACs, their head element, an argument-taking noun followed by a temporal affix, forms a single verb, so that it has no room to allow an intervening particle. In contrast, the VN-*suru* form as in (10) allows an intervening particle, since the VN behaves like a full-fledged word which serves as a complement of the verb *suru* ‘do’ (Sells 2003)<sup>5</sup>.

The other two criteria, conjoinability and gapping, are sensitive to phonological wordhood, as Bresnan and Mchombo pointed out, so that the result of applying them to TAC suggests that a periphrastic temporal affix is a phonological word, while a typical temporal affix is not. Since the phonological wordhood is not relevant to our discussion, we do not take this result as important. For reference, the data are shown in the Appendix.

## 2.2 Categorical Consistency: Verbal Head and Projection

### 2.2.1 Distribution of MC-TAC

A MC-TAC shows distributional properties associated with verbal projections. In general, verbs and their projections cannot appear in pre-particle positions (e.g., *\*(John-ga) aruku-ga/o/ni...* ‘\*(John) walks-NOM/ACC/DAT...’), but nouns and their projections can (e.g., (sono) *gakusei-ga/o/ni...* ‘(the) student-NOM/ACC/DAT...’). Likewise, a MC- or VC-TAC cannot appear in pre-particle positions as in (12b, c), but a NC-TAC can as in (12a). Thus, a MC-TAC is a verbal projection rather than a nominal projection<sup>6</sup>.

- (12)a. Mary-wa [<sub>NP</sub> John-no ainugo-no kenkyuu tyuu]-o omoidasita.  
 Mary-TOP John-GEN Ainu-GEN research mid-ACC remembered  
 ‘Mary remembered the middle of John’s study of Ainu.’
- b. \*Mary-wa [<sub>VP</sub> John-ga ainugo-no kenkyuu-tyuu]-o omoidasita.  
 Mary-TOP John-NOM Ainu-GEN research-mid-ACC remembered
- c. \*Mary-wa [<sub>VP</sub> John-ga ainugo-o kenkyuu-tyuu]-o omoidasita.  
 Mary-TOP John-NOM Ainu-ACC research-mid-ACC remembered

### 2.2.2 Nominative-licensing property

A MC-TAC must have a head which licenses a Nominative case to its external argument similar to a VC-TAC or other verbal projections in general, so that (13a) is well-formed. The Nominative-licensing property can generally be associated with a verbal head and its cohead, while it cannot be associated with a nominal head<sup>7</sup>. The same property is commonly taken as a subject-taking/licensing property (cf. Extended Projection Principle in GB, Subject Condition in LFG, and Baker (2003)’s definition of verbs), but we do not take it as unique to verbs, since we will assume both verbs and nouns subcategorize for a subject (cf. Section 3). Moreover, because of the Nominative-licensing property, a verbal head in (13b) does not allow a mixed case pattern such that an external argument is NC-marked and an internal argument is VC-marked. Such a mixed case pattern is allowed in some types of nominalization constructions (e.g. *Pat’s watching television*) cross-linguistically (Malouf 2000), because a head is nominal and lacks the Nominative-licensing property.

<sup>5</sup> VN stands for verbal noun (Martin 1975).

<sup>6</sup> As to the distribution of TAC, Sells (1990) claims that the head elements of TAC are nouns, based on his examples showing that even a VC-TAC appears in pre-particle positions. Horiuchi (2004) argues against his claim, pointing out that his examples involve a syntactic environment which allows a non-nominal element.

<sup>7</sup> Nominal projections which allow Nominative-Genitive conversion are exceptions. If it is true that the Nominative-marking property is limited to a verbal head, the head of such nominal projections should be taken as a mixed category which inherits both verbal and nominal properties (Malouf 2000). See Kikuta (2000) for the mixed category analysis of Nominative-Genitive conversion constructions.

- (13)a. John-ga ainugo-no kenkyuu-tyuu (=2c)  
 John-NOM Ainu-GEN research-mid  
 ‘during John’s research on Ainu’  
 b. \*John-no ainugo-o kenkyuu-tyuu  
 John-GEN Ainu-ACC research-mid

### 2.2.3 Modification by Adjectives and Adverbs

Modification by adjectives and adverbs also supports our argument that a MC-TAC has a verbal head. We have already seen that an adjective can modify (part of) the head of NC-TAC but cannot modify (part of) the head of VC- or MC-TAC as in (7, 8, 9), partially repeated in (14). In contrast, adverbs can modify the head of MC-TAC as well as VC-TAC but cannot modify the head of NC-TAC, so that we can argue that a MC-TAC has a verbal head, again. The datum (15c) appears to be an exception, since the adverb *kinoo* ‘yesterday’ does not modify the head *hihan-go* ‘after criticism’. However, adverbs can modify a head of MC-TAC in a position other than the one immediately preceding the head, as in (17a, b). Moreover, adjectives cannot modify the head of MC-TAC, regardless of where they occur, as in (14c) and (16a, b). We have no definite answer to explain the exception (15c), but it might suggest a structural difference between VC-TAC and MC-TAC or be related to an extra-linguistic factor such as psychological processability. We leave this matter open.

- |      |    |           |  |                |                           |
|------|----|-----------|--|----------------|---------------------------|
| (14) | a. | John-no   | sono ronbun-no                               | kibisii        | hihan go(-ni), <NC> (=7a) |
|      |    | John-GEN  | the paper-GEN                                | severe         | criticism after(-at),     |
|      | b. | *John-ga  | sono ronbun-o                                | kibisii        | hihan-go(-ni), <VC> (=8a) |
|      |    | John-NOM  | the paper-ACC                                | severe         | criticism-after(-at),     |
|      | c. | *John-ga  | sono ronbun-no                               | kibisii        | hihan-go(-ni), <MC> (=8b) |
|      |    | John-NOM  | the paper-GEN                                | severe         | criticism-after(-at),     |
|      |    |           | ‘after John’s severe criticism of the paper’ |                |                           |
| (15) | a. | *John-no  | sono ronbun-no                               | kinoo          | hihan go(-ni), <NC>       |
|      |    | John-GEN  | the paper-GEN                                | yesterday      | criticism after(-at),     |
|      | b. | John-ga   | sono ronbun-o                                | kinoo          | hihan-go(-ni), <VC>       |
|      |    | John-NOM  | the paper-ACC                                | yesterday      | criticism-after(-at),     |
|      | c. | *John-ga  | sono ronbun-no                               | kinoo          | hihan-go(-ni), <MC>       |
|      |    | John-NOM  | the paper-GEN                                | yesterday      | criticism-after(-at),     |
|      |    |           | ‘after John criticized the paper yesterday’  |                |                           |
| (16) | a. | #John-ga  | kibisii                                      | sono ronbun-no | hihan-go(-ni), <MC>       |
|      |    | John-NOM  | severe                                       | the paper-GEN  | criticism after(-at),     |
|      | b. | #kibisii  | John-ga                                      | sono ronbun-no | hihan-go(-ni), <MC>       |
|      |    | severe    | John-NOM                                     | the paper-ACC  | criticism-after(-at),     |
| (17) | a. | John-ga   | kinoo  | sono ronbun-no | hihan-go(-ni), <MC>       |
|      |    | John-NOM  | yesterday                                    | the paper-GEN  | criticism after(-at),     |
|      | b. | Kinoo     | John-ga                                      | sono ronbun-no | hihan-go(-ni), <MC>       |
|      |    | Yesterday | John-NOM                                     | the paper-ACC  | criticism-after(-at),     |

### 2.3 Summary

In sum, the properties associated with a MC-TAC include 1) the wordhood of the head element and 2) the categorial consistency as a verbal head and projection. These properties of MC-TAC can be captured by Bresnan (1997)’s head sharing analysis. The basic idea is that a single head and its sister XP can be mapped to the same f-structure. In a MC-TAC, a verbal head and its sister (i.e. a Genitive-marked

NP) are mapped to the same f-structure, so that the verbal head can license a NC for the sister NP as an extended head at f-structure. The resultant TAC is a verbal projection headed by the verbal head at c-structure.

### 3. A Head Sharing Analysis

In this section, we present our proposals, explaining not only MC-marking but also NC- and VC-marking in TAC. Our proposals are based on the following assumption about case assignment. We do not assume that a head assigns a case. The correlation between category and case marking, which we observed in (1), is brought about by phrase structure. Case morphology associated with a particular kind of case such as Nom and Acc carries information about a grammatical function such as SUBJ and OBJ, which is unified with a grammatical function that a head subcategorizes for. The alleged MC-marking in TAC is a consequence of a variation in phrase structure, which is allowed by the head sharing analysis.

The structural relevance of case to category is reflected in the following assumption.

(18) **Structural Case Licensing:** A NP is licensed to have a VC (e.g. Nom(inative), Acc(usative)) under a VP/IP, while a NP is licensed to have a NC (e.g. Gen(itive)) under a NP/DP.

The result of our study on lexical integrity of the head element of TAC is reflected as the following lexical entries for an argument-taking noun, *kenkyuu* ‘research’, in (19a), temporal affixes, *-tyuu* ‘during’, and *-nosai* ‘occasion-of’, in (19b) and (19d), respectively, and their combinations, *kenkyuu-tyuu* ‘during research’ and *kenkyuu-nosai* ‘occasion of research’, in (19c) and (19e), respectively<sup>8</sup>.

- (19)a. *kenkyuu*: N, (↑PRED) = ‘research <SUBJ, OBJ>’  
 b. *-tyuu*: Af, (↑PRED) = ‘during<PRED>’  
 c. *kenkyuu-tyuu*: V, (↑PRED) = ‘during<research <SUBJ, OBJ>>’  
 d. *-nosai*: Af, (↑PRED) = ‘occasion-of<PRED>’  
 e. *kenkyuu-nosai*: V, (↑PRED) = ‘occasion-of<research <SUBJ, OBJ>>’

The lexical entries for a noun, *tyuu* ‘mid’ or *sai* ‘occasion’, are shown later.

Among case-markings, MC-marking is largely explained by the Extended Head Theory, which is defined as follows.

(20) **Extended Head Theory** (Bresnan 1997: 11).

- (i) A functional category F0 and its sister correspond to the same f-structure.  
 (ii) Every lexical category has a(n extended) head.  
 (X is an extended head of Y if X corresponds to the same f-structure as Y, X is of the same/nondistinct category type as Y, and every node other than Y that dominates X also dominates Y.)

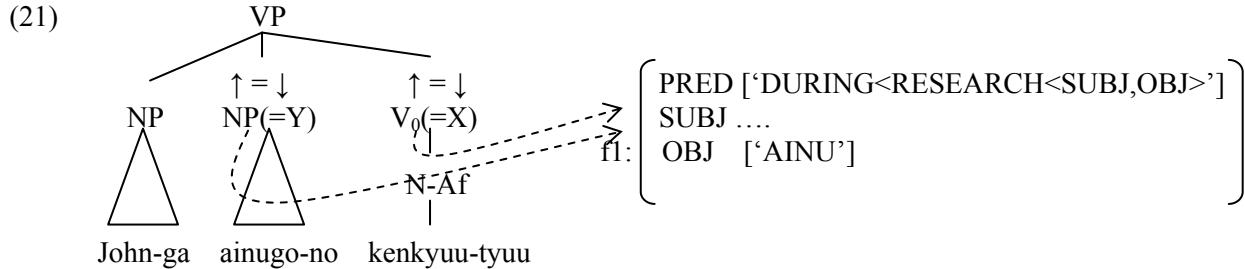
We need the following modifications, which are indicated by underlining, to define an extended head which appears in mixed category constructions (Morimoto 1996, Bresnan 1997, 2001).

- (i’) A functional/lexical category F0/L0 and its sister correspond to the same f-structure.  
 (ii’) Every lexical category has a(n extended) head.  
 (X is an extended head of Y if X corresponds to the same f-structure as Y, X is of the same/nondistinct category type as Y, or X is a morphological derivative of a category identical/nondistinct from the phrase Y, and every node other than Y that dominates X also dominates Y.)

<sup>8</sup> Here, the morphological structure of the affix *-nosai* is not analyzed as *-no-sai*. We will consider the morphology in Section 5.



For instance, the modified Extended Head Theory (20i',ii') applies to a MC-TAC (2c) as in (21). In (21), by (20i'), a lexical category  $V_0$  and its sister NP correspond to the same f-structure fl. By (20ii'), the  $V_0$  is an extended head of the sister NP because the  $V_0$  corresponds to the same f-structure as the sister NP, the  $V_0$  is a morphological derivative of a category identical/nondistinct from the sister NP, and every node other than the sister NP that dominates the  $V_0$  also dominates the sister NP.



The Structural Case Licensing (18) and the modified Extended Head Theory (20i', ii') can be implemented by the following PS rules<sup>9</sup>.

(22) **PS-rules**

- |         |                  |      |     |
|---------|------------------|------|-----|
| a. VP → | NP*              | (NP) | V   |
|         | (↑GF) = ↓        | ↑=↓  | ↑=↓ |
|         | (↓CASE) = V-CASE |      |     |
| b. NP → | NP*              | (N)  |     |
|         | (↑GF) = ↓        | ↑=↓  |     |
|         | (↓CASE) = GEN    |      |     |

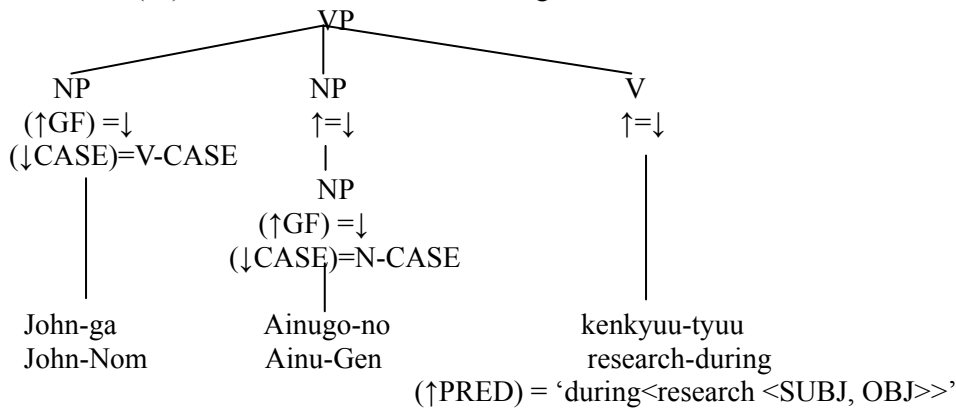
The general case-marking pattern as in (1) can be captured by the PS rules (22a, b) in the following manner: by the VP rule (22a), a VC (i.e. V-CASE) is licensed under a VP, while by the NP rule (22b), a NC (i.e. GEN) is licensed under a NP. Given the assumption that a head element of NC-TAC is formed by a sequence of two nouns and that of VC-TAC is a verb, the PS rules (22a, b) can also explain NC- and VC-marking in TAC as in (2a, b), because each TAC is generated by a different PS rule, (22b) or (22a), which serves to generate either a nominal or verbal projection.

The PS-rules (22a, b) can handle even the MC-marking observed in (2c) in the same way as they handle the general case-marking pattern. A MC-TAC can be generated by plugging the NP rule (22b) into the second NP in the VP rule (22a). The functional annotation,  $\uparrow=\downarrow$ , under the second NP in the VP rule (22a) suggests that the NP is mapped to the same f-structure as a head verb, so that it reflects the modified Extended Head Theory. For example, the phrase structure for (2c) can be represented in (23). Here, a NC and a VC are licensed by PS-rules (22b, a) under a nominal and a verbal projection, respectively. MC-marking in (23) is different from NC- or VC-marking in that there appears no superficial NC-licensing head in (23). The lack of c-structure head does not matter in the LFG framework, and we assume that a verbal head licenses a NC-marking on the sister NP as an extended head.

Incidentally, the PS-rules (22a, b) predict the Nominative-licensing property of MC-TAC (cf. 2.2.2). That is, they allow (13a = 2c), *John-ga ainugo-no kenkyuu-tyuu* [John-NOM Ainu-GEN research-mid], but do not allow (13b), \**John-no ainugo-o kenkyuu-tyuu* [John-GEN Ainu-ACC research-mid]. A NC-marked NP, which is generated by the NP rule (22b), cannot be plugged into the first NP in the VP rule (22a), since two conflicting CASE values are attributed to the first NP.

<sup>9</sup> In (22), GF is an abbreviation of SUBJ/OBJ etc. Likewise, V-CASE in (22a) is an abbreviation of NOM/ACC/DAT. Thus, the V-CASE does not conflict with a particular CASE such as NOM, ACC, or DAT, which is introduced by constructive case specifications (cf. (24)).

(23) c-structure for (2c) without lexical insertion of argument NPs



The PS-rules (22a, b) serve to license a VC and a GEN, but they do not specify a particular kind of VC such as Nom, Acc, or Dat. The specification of individual cases is made by the **Constructive Case Theory** (Nordlinger 1997)<sup>10</sup>, which is an application of inside-out function application to lexical entries for case particles in order “to enable case markers to carry information about the larger syntactic context in which they appear, especially information about grammatical relations (Nordlinger 1997: 6)”. For example, the major VC particles have the following lexical entries.

- (24)a. *-ga*: (↑ CASE) = NOM  
 (SUBJ ↑)  
 b. *-o*: (↑ CASE) = ACC  
 (OBJ ↑)  
 c. *-ni*: (↑ CASE) = DAT  
 (OBJ<sub>θ</sub> ↑)  
 d. *-ni*: (↑ CASE) = DAT  
 (OBLgoal ↑)

The inside-out function application makes it possible that an inner f-structure carrying information about a CASE value also carries information about a GF value. This technology reflects an insight in which case morphology in Japanese serves to determine a GF for the host noun.

Then, how about NC-particles? Do they also carry information about GFs? Yes, they do. Here, we follow the so-called **Functional Consistency Hypothesis** advocated by Saiki (1987), which predicts that argument-taking nouns share not only thematic structure but also functional structure of the corresponding verbs<sup>11</sup>. Accordingly, we assume that, even in a nominal domain, case morphology carries information about GFs. In particular, genitive *-no* carries information about SUBJ and OBJ as in (25b). Each GF is carried by a nominative *-ga* and an accusative *-o*, respectively, under a VP/IP, as in (25a). Another genitive *-eno* carries information about OBJ<sub>θ</sub> and OBL<sub>goal</sub> as in (26b) and (27b)<sup>12</sup>. Each GF is carried by a dative *-ni* (or a directional *-e*), under a VP/IP, as in (26a) and (27a). Though the information carried by a genitive morpheme is not specific enough to determine a particular GF, it is specific enough to distinguish a **semantically unrestricted** GF (i.e. SUBJ or OBJ) from a **semantically restricted** GF (i.e. OBJ<sub>θ</sub> or

<sup>10</sup> Ohara (2000) also applies the Constructive Case Theory to her studies of light verb constructions or other constructions related to verbal nouns, including TACs.

<sup>11</sup> Functional Consistency is proposed to argue against Rappaport (1983)’s Thematic Consistency, which claims that a derived noun and its corresponding verb share thematic structure but do not share grammatical function. In this article, we will take a position similar to Morimoto (1999)’s OT analysis such that the facts supporting the Functional Consistency in Japanese and the facts supporting the Thematic Consistency in English emerge through a difference in constraint ranking, so that each hypothesis is valid for each language.

<sup>12</sup> We do not analyze *-eno* as *-e-no* until the analysis is required.

OBL<sub>θ</sub>).

- |   |   |
|---|---|
| <p>(25)a. John-ga ainugo-o kenkyuu-suru.<br/>John-NOM Ainu-ACC research-do<br/>'John studies Ainu.'</p> <p>(26)a. John-ga gakkoo-ni/e hon-o kihusuru.<br/>John-NOM school-DAT/DIR book-ACC donation-do<br/>'John donates his book to a school'</p> <p>(27)a. John-ga pari-ni/e syuttyoo-suru<br/>John-NOM Paris-DAT/DIR business.trip-do<br/>'John goes on business to Paris'</p> | <p>b. John-no ainugo-no kenkyuu<br/>John-GEN Ainu-GEN research<br/>'John's research on Ainu'</p> <p>b. John-no gakkoo-eno hon-no kihusuru.<br/>John-GEN school-GEN book-GEN donation<br/>'John's donation of his book to a school'</p> <p>b. John-no pari-eno syuttyoo<br/>John-GEN Paris-GEN business.trip<br/>'John's business trip to Paris'</p> |
|---|---|

Another property associated with genitive morphemes is their obligatory occurrences. As the phenomena of case-drop suggests, GFs like SUBJ or OBJ can be associated with a NP which lacks a Nominative or an Accusative case particle, but cannot be associated with a NP which lacks a Genitive case particle.

- |  |   |
|--|---|
| <p>(25)a'. John-(ga) ainugo-(o) kenkyuu-suru.<br/>John-NOM Ainu-ACC research-do<br/>'John studies Ainu'</p> <p>(26)a'. John-(ga) gakkoo-*(ni/e) hon-(o) kihusuru.<br/>John-NOM school-DAT/DIR book-ACC donation-do<br/>'John donates his book to a school'</p> | <p>b'. John-*(no) ainugo-*(no) kenkyuu<br/>John-GEN Ainu-GEN research<br/>'John's research on Ainu'</p> <p>b'. John-*(no) gakkoo-*(eno) hon-*(no) kihusuru.<br/>John-GEN school-GEN book-GEN donation<br/>'John's donation of his book to a school'</p> |
|--|---|

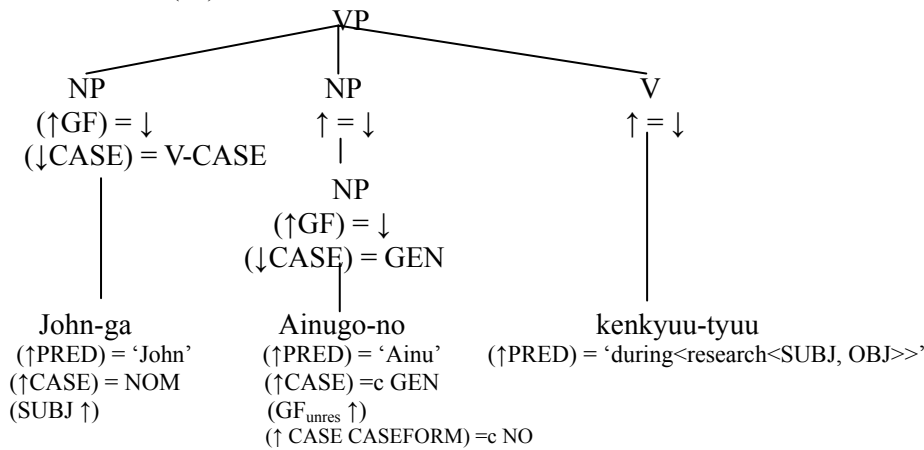
The contrast between the obligatory and optional occurrence of case particles can be captured by a constraining and defining equation for their morphological forms, respectively. Here, we assume that the major NC-particles have the following lexical entries.

- (28)a. -no: (↑ CASE) = GEN  
(GF<sub>unres</sub> ↑)  
(↑ CASE CASEFORM) =c NO
- b. -eno: (↑ CASE) = GEN  
(GF<sub>res</sub> ↑)  
(↑ CASE CASEFORM) =c ENO

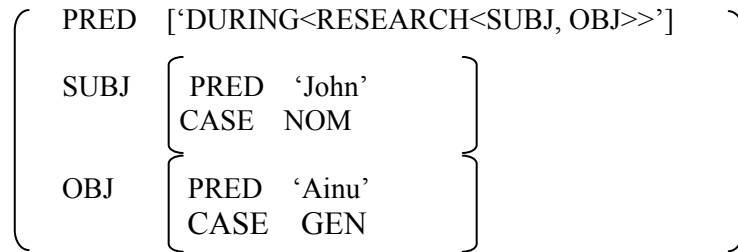
Now, let us go back to a MC-TAC such as (2c). In the MC-TAC, a genitive-marked NP, *ainugo-no* 'of Ainu', carries information about a GF<sub>unres</sub>, which can be unified with either SUBJ or OBJ associated with a verb, *kenkyuu-tyuu* 'during research'<sup>13</sup>. The c-structure (23) can be fully represented as (29a) after lexical insertion of their arguments. The corresponding f-structure is shown in (29b).

<sup>13</sup> The genitive-marked NP, *ainugo-no*, can serve as an OBJ as well as a SUBJ. Only pragmatics can determine which is selected.

(29)a. c-structure for (2c) with lexical insertion



b. f-structure for (2c)



Lastly, let us move on to our account for NC- and VC-TACs. Our analysis of NC-TAC should reflect our morphological analysis of the head element, which consists of two nouns. We assume that a noun that has a corresponding temporal affix takes an argument-taking noun as its argument. However, the problem is that the argument NP has no case morphology if a noun like *tyuu* ‘during’ follows it (i.e. *kenkyuu tyuu* vs *\*kenkyuu-no tyuu* ‘during research’), while it has a genitive *-no* if a noun like *-sai* ‘occasion’ follows it (i.e. *kenkyuu-no sai* vs *\*kenkyuu sai* ‘on the occasion of research’). Here, we assume that a noun like *tyuu* ‘during’ does not require the complement NP to have case morphology, while a noun like *-sai* requires the complement NP to have a genitive morpheme *-no*. To capture the selectional restriction on case morphology of argument NPs, we adopt a constraining equation and a negative existential constraint for the entries of *sai* and *tyuu*. The lexical entries for items relevant to NC-TAC are shown below<sup>14</sup>.

(30)a. *kenkyuu*: N, (↑ PRED) = 'research<SUBJ, OBJ>'

(↑ STEMFORM) = KENKYUU

b. *-no*: Af, (↑ CASE) = GEN

(GF<sub>unres</sub> ↑)

(↑ CASE CASEFORM) =c NO

c. *kenkyuu-no*: N, (↑ PRED) = 'research<SUBJ, OBJ>'

(↑ STEMFORM) = KENKYUU

(↑ CASE) = GEN

(GF<sub>unres</sub> ↑)

(↑ CASE CASEFORM) =c NO

d. *tyuu*: N, (↑ PRED) = 'during<OBJ>'

-(↑ OBJ CASE CASEFORM)

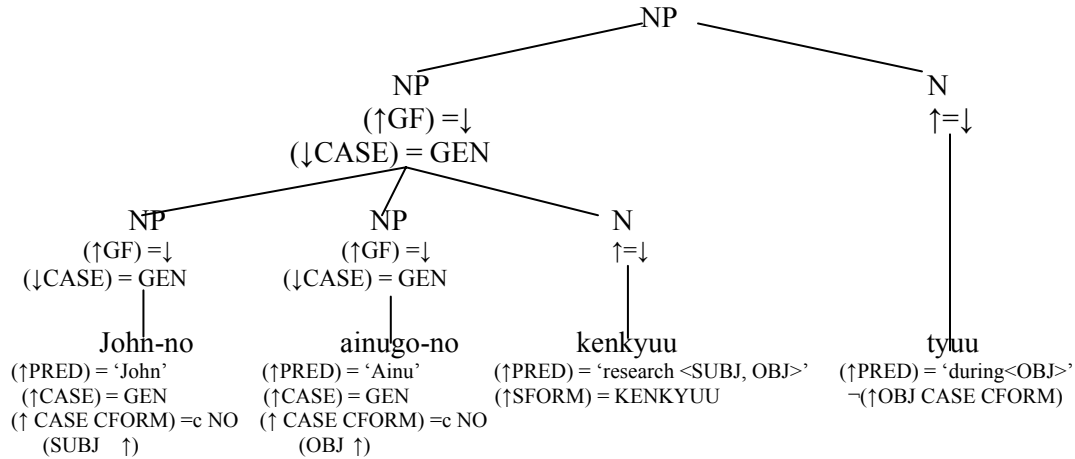
e. *sai*: N, (↑ PRED) = 'occasion<OBJ>'

<sup>14</sup> We will use SFORM or CFORM to stand for STEMFORM or CASEFORM for saving a space.

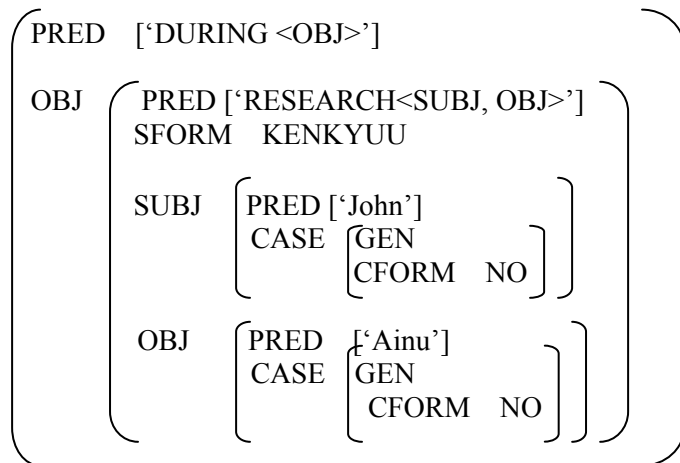
(↑ OBJ CASE CASEFORM) =c NO

Our c-structure analysis for NC-TAC as in (2a) can be represented as in (31). A NC-TAC is a nominal projection whose head consists of two nouns. An outer noun *tyuu* ‘during’ takes an argument NP headed by an inner noun *kenkyuu* ‘research’, which in turn takes its arguments. The Functional Consistency allows the inner noun to have arguments associated with a GF. The argument NPs receive a NC such as GEN(itive), because they are generated by the NP-rule (22b), which serves to license a NC for a complement NP. The Constructive Case Theory allows a genitive-marked NP to carry information about a GF, which can be unified with information about a GF associated with a head noun. As for the inner noun, it has no case morphology, though Functional Consistency allows the outer noun to have its argument associated with a GF. We assume that the inner noun itself cannot take case morphology due to the selectional restriction of the outer noun, so that it cannot carry information about a GF. Nevertheless, (31a) is legitimate since the defining equation for GEN in the NP-rule (22b) does not require but just allows an argument NP to have a GEN. The c-structure for NC-TAC (31a) can be mapped to the f-structure (31b).

(31)a. c-structure for (2a)



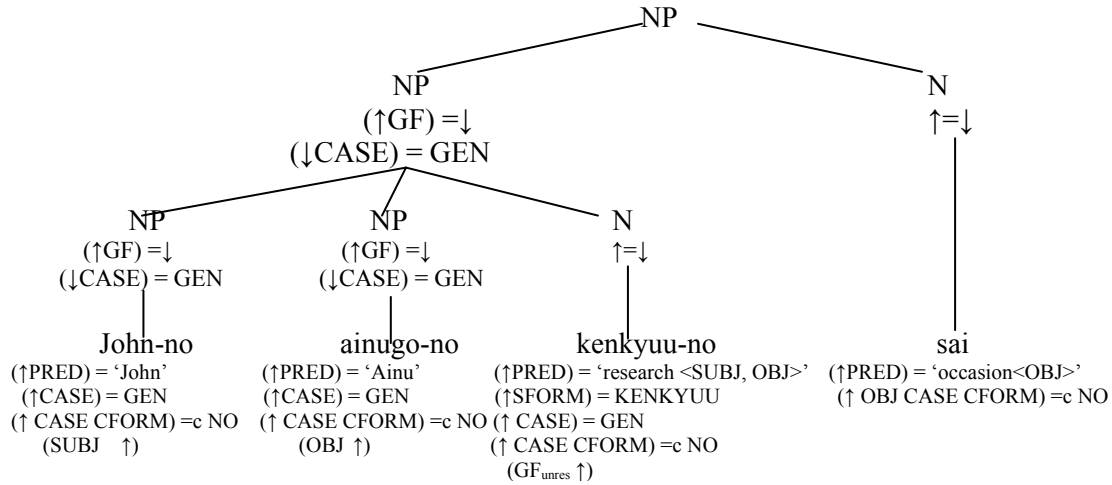
(31)b. f-structure for (2a)



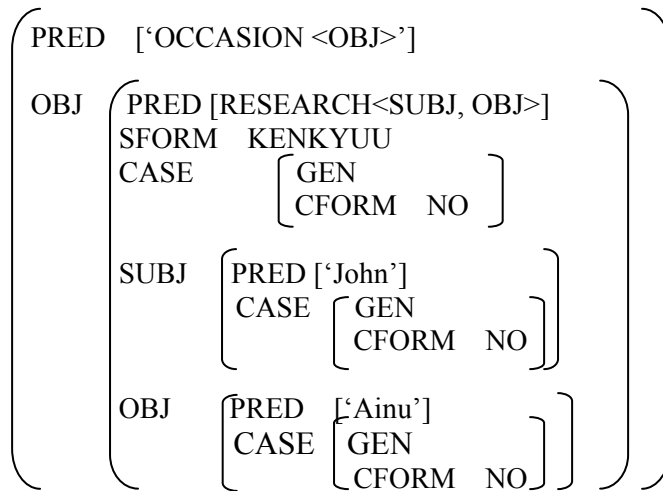
Similarly, the c- and f-structure for a NC-TAC, *John-no ainugo-no kenkyuu-no sai* ‘on the occasion of John’s research on Ainu’ can be represented as in (32a, b). Unlike (31a, b), the inner noun *kenkyuu* ‘research’ has a genitive case particle. Functional Consistency allows the outer noun *sai* ‘occasion’ to have its argument associated with a GF. We assume that the inner noun itself must take case morphology due to

the selectional restriction of the outer noun, so that it must carry information about a GF.

(32)a. c-structure for *John-no ainugo-no kenkyuu-no sai* ‘on the occasion of John’s research on Ainu’

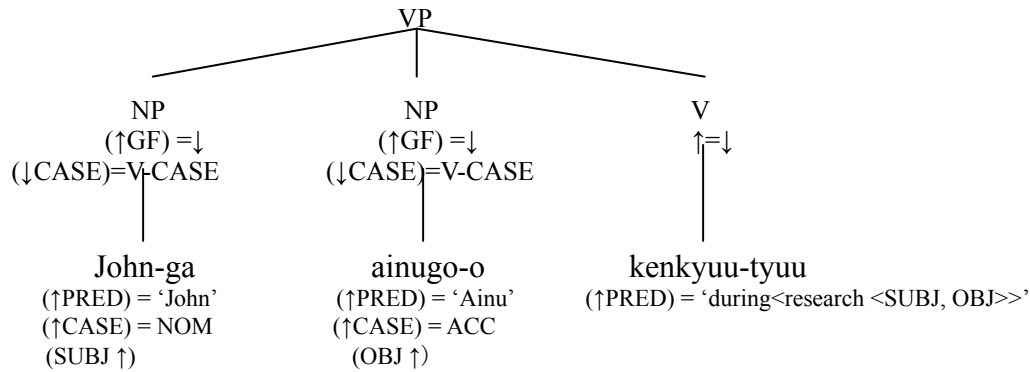


(32)b. f-structure for *John-no ainugo-no kenkyuu-no sai* ‘on the occasion of John’s research on Ainu’

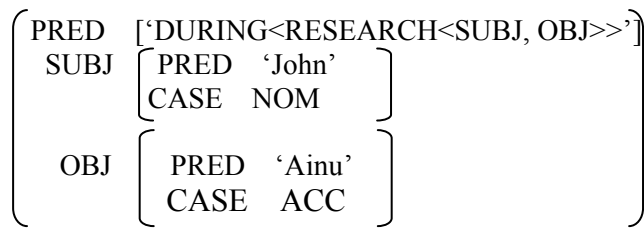


Next, let us move on to our c-structure analysis for VC-TAC as in (2b). A VC-TAC is a verbal projection whose head is a verb, which inherits arguments from an argument-taking noun. The arguments are syntactically realized as VC-marked NPs, since they are generated by the VP-rule (22a), which serves to license a VC for a complement NP. The Constructive Case Theory allows a VC-marked NP to carry information about a GF, which can be unified with information about the GF associated with a head verb. The c-structure for VC-TAC (2b) can be represented in (33a). It can be mapped to the f-structure in (33b).

(33)a. c-structure for (2b)



(33)b. f-structure for (2b)



## 4. On the Theoretical Preference for Head Sharing Analysis

In Section 2, we saw that Bresnan (1997)'s head sharing analysis can capture the following properties of MC-TAC.

(34)a. wordhood of the head

b. categoricity consistency: a verbal projection and a verbal head

In this section, we will see that other approaches cannot capture both of the properties.

### 4.1 Head Movement Approaches

Miyagawa (1991) claims that a temporal affix is a functional category such as ASP(ect) and an argument-taking noun moves to the position of ASP to derive a syntactically derived word. VCs such as Nom and Acc are assigned on the basis of a government-based case theory (cf. Chomsky 1981: 12), but as for a NC such as Gen, it “must be licensed by an N lexical head, so that if there is a genitive Case, the nominal head cannot raise”. This stipulation suggests that a head element of TAC cannot form a syntactically derived word in a MC-TAC. Thus, Miyagawa's head movement approach explains MC-marking at the cost of the property (34a) at every level of grammar<sup>15</sup>.

### 4.2 Lexical Approaches

So-called lexical approaches can share the view that head nouns can share a semantic property with verbs and the semantic property is responsible for VC-marking at the cost of the property (34b), following the lead of Iida (1987). She claims that a semantic feature [+aspect] associated with a temporal affix is

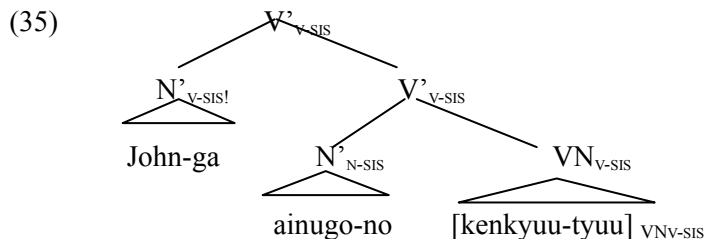
<sup>15</sup> Hoshi (1997)'s LF incorporation analysis can also be taken as a kind of head movement analysis. Like Miyagawa's account, it assumes that a head element does not form a syntactically derived word in a MC-TAC.

inherited by an entire head noun, which can consequently have a verbal argument structure, the source of VC-marking.

Sells (1990) explains MC-marking in TACs by distinguishing subcategorization from thematic structure (cf. Rappaport 1983). A head nominal (e.g. *kenkyuu-tyuu* ‘during research’) itself is associated with a thematic structure such as <Agent, Theme> and four possibilities for subcategorization (i.e. a lexical specification of syntactic realizations of arguments eligible to receive VCs: <VC, VC>, <NC, NC>, <VC, NC>, <NC, VC>). Mixed case marking is made possible if only the first argument in the thematic structure is subcategorized for as a syntactically realized (verbal) argument (i.e., <VC, NC>). For Sells, the head element of TAC is a noun and the entire TAC is a nominal projection. This view is incompatible with the property (34b).

Manning (1993)’s lexical underspecification (cf. Malouf (2000)’s type hierarchy) can serve to explain MC-marking in a TAC as well as the distinction of categorial from combinatoric information and of selection from subcategorization. As shown in (35), a lexically underspecified category such as VN (e.g., *kenkyuu-tyuu* ‘during research’) heads a verbal projection, based on their combinatoric information, V-SIS. Nevertheless, the VN can take a NC-marked argument *ainugo-no* ‘of Ainu’, since it is a lexically underspecified category which is sort-compatible with N and V and its argument phrase only selects for an N sister. The resultant phrase *ainugo-no kenkyuu-tyuu* ‘during research on Ainu’ can take a VC-marked subject argument *John-ga*, since it is a verbal projection and the subject phrase must specify a V sister.

Manning’s account is apparently compatible with the property (34b) in that it assumes a verbal projection for a MC-TAC. Nevertheless, the head VN in (35) must be sort-compatible with nouns, so that the account wrongly predicts that the head VN can be modified by adjectives. Thus, Manning’s account cannot capture the verbal property of the head of MC-TAC and does not reflect the property (34b).



### 4.3 Phrasal Coherence Approaches

Sells (1996) explains MC-marking in a TAC on the basis of the Dual Lexical Category Theory (cf. Lapointe 1993). A head element is taken as <V|N><sup>0</sup> which heads an external verbal projection and an internal nominal projection. This account can capture the so-called phrasal coherence (Malouf 2000) in that there appears to be an articulating point between categorically distinct projections in mixed category constructions across languages. However, since this account tries to capture phrasal coherence at c-structure, it is also incompatible with the property (34b), since it assumes that both verbal and nominal projections are involved in a MC-TAC. Also, as for modification by adjuncts, the account wrongly predicts that the head element is modified by adjectives due to the internal nominal projection. Although our head sharing analysis is also taken as a phrasal coherence approach, but it tries to capture the phrasal coherence at f-structure. Our head sharing analysis does not involve an inner nominal projection headed by the element that heads an external verbal projection at c-structure.

## 5. On the Morphology and Sub-Lexical Semantics of Head Elements in TACs

Our primary goal in this paper (i.e. an account for case markings in TAC) has been achieved thus far. In this section, we discuss some problems brought about by our head sharing analysis.

A problem for our analysis is the morphology of head elements in TACs, since we deal with different



types of temporal affixes identically, and since we assume that an element that has been called a (temporal) affix can serve as a full-fledged word. Typical temporal affixes (e.g. *-tyuu* ‘during’) must be directly concatenated with their preceding nouns, while periphrastic affixes need an intervening morpheme *-no* between themselves and the preceding nouns. Since the morpheme *-no* is superficially identical to a genitive case-marker, it raises the following questions related to case marking. The first question is whether some nouns can do without receiving or assigning NCs. This question is raised when we consider the morphology of the head element in NC-TACs, as shown below.

- (35)a. [<sub>NP</sub> [<sub>NP</sub> [<sub>N</sub> kenkyuu]] [<sub>N</sub> tyuu]]  
 b. [<sub>NP</sub> [<sub>NP</sub> [<sub>N</sub> kenkyuu]]-no [<sub>N</sub> sai]]

In NC-TACs, their head element consists of two nouns, an inner argument-taking noun (i.e. *kenkyuu* ‘research’) and an outer (temporal) noun (*tyuu* ‘during’, *sai* ‘occasion’). If a typical temporal affix serves as a head noun of a NC-TAC as in (35a), an inner argument-taking noun cannot be NC-marked in spite of the fact that the inner noun serves as an argument of the outer noun.

The question about NC-assignment in a nominal projection is not a serious problem for our analysis, since we do not assume that a NC is assigned by a nominal head but that it is licensed by phrase structure. In (35a), the outer noun selects an argument NP which has no case morphology. Moreover, even those who assume the case assignment by a nominal head might be able to conceive the fact as suggesting that NC-assignment is optional, unlike obligatory VC-assignment. In any case, further investigation is needed to give a satisfactory account for the question.

The other question is whether case marking can take place within a word. This question is raised when we consider the morphology of the head element in VC- or MC-TACs, as shown below.

- (36)a. [<sub>VP</sub> [<sub>v</sub> kenkyuu-tyuu]]  
 b. [<sub>VP</sub> [<sub>v</sub> [kenkyuu]-no [sai]]]

In VC-TACs, their head element serves as a single verb. If a VC-TAC takes a periphrastic temporal affix as a part of the head element, the affix appears to assign a NC to its host N within the head verb, as in (36b).

It is beyond the scope of this paper to answer this question, but one might be able to pursue the following possibilities. One possibility is that the morpheme *-no* is not a case particle, but a pre-nominal form of the copula (Iwasaki 1999), though this analysis might leave further questions about word formation in (36b). Another possibility is to permit case marking within a word. It is not impossible to pursue this possibility if we consider cross-linguistic facts (Blake 2001: 104-109) or genitive compounds in English or other languages (Shimamura 2001, Hoekstra 2002). However, this possibility might not be preferable within a LFG framework until case marking is proven to be a lexical process.

In addition to the questions raised above, one might wonder whether a lexical item can behave as either an affix or a word (i.e. head elements in VC-/MC-TACs vs. NC-TACs), and whether two nominal elements can derive a verb (i.e. head elements in VC-/MC-TAC)<sup>16</sup>. Besides, one can ask a question about constraints on morphological derivatives. That is, one might ask what kind of verbalization/nominalization allows extended heads. Or, one can seek the source of extended heads in their sub-lexical semantics, following the lead of Iida (1987), since the phenomena of mixed case marking are relevant to a range of head elements such as argument-taking nouns and verbalizing elements. We leave these questions open. Also, we leave further investigation of mixed case marking or mixed categories for future research. Due to space limitations, we cannot touch upon other constructions which involve mixed case marking or mixed categories in Japanese or other languages such as Verbalized Nominalization Constructions (Morimoto 1996, Bresnan 1997), Purpose Expressions (Miyagawa 1987, Matsumoto 1996), TACs in Korean (Lee 1993), Light Verb Constructions (Grimshaw and Mester 1988), some copula constructions in

<sup>16</sup> These questions were raised by Peter Sells and Stephen Wechsler (p.c.).

Japanese and Korean (Sells 1996, Yoon 2002), and some nominalization constructions in Japanese and Korean (Kikuta 2002, Chun et al. 2001). Also, in relation to TACs, we can ask whether and how they are related to the so-called post-syntactic compounds (Shibatani and Kageyama 1988).

## 6. Conclusion

In this paper, we claimed that, to account for mixed case marking in Japanese temporal affix constructions, a head sharing analysis is empirically preferable to other rival approaches. In addition, our theory of case can explain not only mixed case marking but also verbal and nominal case marking in a consistent way.

## Appendix

As we suggested in section 2.1.3, among the criteria of lexical integrity, conjoinability and gapping are sensitive to phonological wordhood, which is irrelevant to our discussion. They show a difference between two types of temporal affixes, typical and periphrastic, rather than a difference in wordhood of the head elements<sup>17</sup>. Thus, we cannot see a contrast between NC-TAC and VC-/MC-TAC in the following data. On the one hand, the conjoinability is used to show that a stem and an affix cannot be coordinated, though full-fledged words can (e.g. *\*Mary outran and –swam Bill. vs Mary outran and outswam Bill*). Argument-taking nouns and typical temporal affixes cannot be coordinated in VC-TACs, while argument-taking nouns and periphrastic affixes marginally can<sup>18</sup>. Moreover, the periphrastic affixes become more independent from their preceding argument-taking nouns in NC-/MC-TACs.

- (37)a. \*John-ga ainugo-o kenkyuu to tyoosa-tyuu [VC]  
 John-NOM Ainu-ACC research and survey-mid  
 ‘during John’s research and survey of Ainu’
- b. ?John-ga ainugo-o kenkyuu to tyoosa no sai [VC]  
 John-NOM Ainu-ACC research and survey GEN occasion  
 ‘on the occasion of John’s research and survey of Ainu’
- (38)a. \*John-no ainugo-no kenkyuu to tyoosa-tyuu [NC]  
 John-GEN Ainu-GEN research and survey-mid  
 ‘during John’s research and survey of Ainu’
- a’. \*John-ga ainugo-no kenkyuu to tyoosa-tyuu, [MC]  
 John-NOM Ainu-GEN research and survey-mid  
 Mary-ga ronbun-o kaita.  
 Mary-NOM paper-ACC wrote  
 ‘Mary wrote a paper during John’s research and survey of Ainu’
- b. John-no ainugo-no kenkyuu to tyoosa no sai [NC]  
 John-GEN Ainu-GEN research and survey GEN occasion  
 ‘on the occasion of John’s research and survey of Ainu’
- b’. John-ga ainugo-no kenkyuu to tyoosa no sai, [MC]  
 John-NOM Ainu-GEN research and survey-GEN occasion,

<sup>17</sup> According to the phonological wordhood, hyphenation for head elements of TACs in the Appendix is different from that in the body of this paper.

<sup>18</sup> Here, we do not deal with sub-lexical coordination, which involves *oyobi* ‘and’ (Kageyama 1993) or *naisi* ‘or’ (Sato 1998). Both coordinators can coordinate only an argument-taking noun which is a part of head elements of TACs (e.g. *kenkyuu oyobi tyoosa tyuu* ‘during a study and a survey’).

Mary-ga ronbun-o kaita.  
 Mary-NOM paper-ACC wrote  
 ‘Mary wrote a paper on the occasion of John’s research and survey of Ainu’

On the other hand, gapping is used to show that ellipsis cannot be applied to part of a word (e.g. \**John outran Bill and Mary –swam Patrick vs John outran Bill and Mary, Patrick*). Typical affixes cannot be gapped in VC-TACs (14a), while periphrastic ones can marginally (14b). Periphrastic affixes become more independent from their preceding argument-taking nouns in NC-/MC-TACs.

- (39)a. \*John-wa ainugo-o kenkyuu-~~tyuu~~, Mary-wa suwahirigo-o tyoosa-tyuu,  
 John-TOP Ainu-ACC research-~~mid~~, Mary-TOP Swahili-ACC survey-mid,  
 ronbun-o kaita. [VC]  
 paper-ACC wrote.  
 ‘John wrote a paper during his study of Ainu and Mary did so during her survey of Swahili.’
- b. ?John-wa ainugo-o kenkyuu ~~no sai~~,  
 John-TOP Ainu-ACC research GEN occasion,  
 Mary-wa suwahirigo-o tyoosa no sai, ronbun-o kaita. [VC]  
 Mary-TOP Swahili-ACC survey GEN occasion, paper-ACC wrote  
 ‘John wrote a paper on the occasion of his study of Ainu and Mary did so on the occasion of her survey of Swahili.’
- (40)a. \*John-wa ainugo-no kenkyuu-~~tyuu~~, [NC/MC]  
 John-TOP Ainu-GEN research-mid,  
 Mary-wa suwahirigo-no tyoosa-tyuu, ronbun-o kaita.  
 Mary-TOP Swahili-GEN survey-mid, paper-ACC wrote.  
 ‘John wrote a paper during his study of Ainu and Mary did so during her survey of Swahili.’
- b. John-wa ainugo-no kenkyuu ~~no sai~~, [NC/MC]  
 John-TOP Ainu-GEN research GEN occasion,  
 Mary-wa suwahirigo-no tyoosa no sai, ronbun-o kaita.  
 Mary-TOP Swahili-GEN survey GEN occasion, paper-ACC wrote  
 ‘John wrote a paper on the occasion of studying Ainu and Mary did so on the occasion of surveying Swahili.’

The data on conjoinability and gapping suggest a phonological difference between the two types of temporal affixes. That is, the typical affixes must be phonologically dependent on the host nouns, while the periphrastic affixes can be taken as phonologically full-fledged words. The phonological problem of conjoinability and gapping is also pointed out by Bresnan and Mchombo (1995). To solve the problem, they propose a prosodic ellipsis analysis. For example, the apparent counterexamples to conjoinability and gapping in (41) can be explained by assuming prosodically conditioned ellipsis as in (42).

- (41)a. infra e ultrasuoni ‘infra and ultra-sounds’ (Italian)  
 b. Freund oder Feindschaft ‘friendship or hostility’ (German)
- (42)a. (infra)<sub>w</sub>\_\_ e ultrasuoni  
 b. (Freund)<sub>w</sub>\_\_ oder Feindschaft

The same analysis can be applied to periphrastic temporal affixes as in (18).

(43) (kenkyuu)<sub>w</sub>\_\_\_to tyoosa no sai ‘on the occasion of research and survey’

The prosodic ellipsis analysis for the periphrastic temporal affixes is supported by the following fact. In general, a word accent can be altered only if the status of the word is demoted to a part of a word (e.g. *ka'ta* ‘shoulder’ + *tataki* ‘patting’ → *kata-ta'taki* ‘shoulder-patting’). An argument-taking noun like *tyoosa* ‘survey’ as in (44a) preserves its word accent pattern, which is indicated by a pitch fall (´), if the noun is followed by a periphrastic temporal affix as in (44b), whereas the word accent is altered if the noun is followed by a typical temporal affix as in (44c). Therefore, the periphrastic affix can be taken as a phonological word, while the typical one cannot.

- (44)a. tyo'osa  
‘a survey’
- b. tyo'osa no sai  
survey GEN occasion  
‘on the occasion of a survey’
- c. tyoosa-tyuu  
survey-mid  
‘during a survey’

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