Montagovian Morphology for Bracketing Paradox:
No Need for Syntax-Semantics Iconicity Kazuhiko Fukushima, *Kansai Gaidai University*

comments welcome at: kaz@kansaigaidai.ac.jp

This is part of a larger project called *Montagovian Morphology*. The book is yet to be completed (almost there). See Appendix for demo.

1   Introduction: Bracketing paradox and MORPHOLOGICAL INTEGRITY

LEXICAL (MORPHOLOGICAL) INTEGRITY (Lapointe 1980, Di Sciullo & Williams 1987, Bresnan & Mchombo 1995, Ackerman & Webeluth 1998, Booij 2005, Spencer 2005 etc.; contra Baker 1988, Lieber 1992, Hale & Keyser 1993, Halle & Marantz 1993, etc.):

> Lexical mechanisms employed for word-formation are distinct from those found in other domains (syntax in particular). And word-internal structure is not susceptible to processes external to the lexicon.

(1) Ackerman & Webeluth's (1998) version of LEXICALISM:

- (a) LEXICAL ADICITY: The adicity of a lexical item is lexically fully determined and cannot be altered by the syntactic context in which it appears.
- (b) MORPHOLOGICAL INTEGRITY: Syntactic mechanisms neither make reference to the daughters of morphological words nor can they create new morphological words in constituent structure.
- (c) MORPHOLOGICAL EXPRESSION: Lexical entries are uniformly expressed as single synthetic (syntactically atomic) word forms.

One challenge to MORPHOLOGICAL INTEGRITY, hence to COMPOSITIONALITY—bracketing paradox (see Pesetsky (1985) vs. Mootgat (1988a))

E.g. *transformational grammarian*
morphology: [[*transformational*] [*grammarian*]]
semantics: [[*transformational grammar*] *-ian*]

(2) Another more drastic challenge—SIZED INALIENABLE POSSESSION (SIP) in Japanese
a. Taroo -ga   [$_{NP}$ [$_N$ <u>ko</u>-kubi]-o]   kasige-ta (morphological bracketing)
       -NOM   small-neck-ACC tilt-PAST
'Taroo tilted his neck <u>slightly</u>' but ≠ 'Taroo tilted his <u>small</u> neck'
b. #Taroo -ga   <u>ookiku</u>   [$_{NP}$ [$_N$ <u>ko</u>-kubi]-o]   kasige-ta
       -NOM <u>in a large motion</u>   small-neck-ACC tilt-PAST
'???' ... incoherent due to the crash between *ko-* and *ookiku*
c. [$_S$ Taroo-ga [$_{VP}$ <u>ko</u> [$_{VP}$ kubi-o kasige-ta]]] (semantic bracketing)
d. Taroo -ga   kubi-o   kasige-ta [without a size-indicating suffix]
       -NOM neck-ACC tilt-PAST
'Taroo tilted his neck'

What I show/do here.

- Syntactically, an SIP expression and its 'host' verb are collocationally dependent.
- Semantically, either argument or adjunct SIP expressions are Montagovian functors. They take (or act upon) a predicate meaning as an argument to give rise to an appropriate interpretation. This has the effect of confining the unusual adverbial modification *within* SIP expressions.

- Solve hitherto unnoticed empirical problems faced by previous syntactic accounts. In doing so, it avoids employing mechanisms contradicting MORPHOLOGICAL INTEGRITY, namely LF movement of a bound morpheme or co-indexing a word-internal element.
- Retain MI (at least in the domain of SIP).
- Illustrate a way of accomplishing compositional semantics when it is apparently violated. No strict adherence to ICONICITY between syntax and semantics is needed.

(3) The wordhood of SIP expressions—*ko-kubi* (2a) is a single word!
a. *kayui ko-kubi 'itchy small-neck'[1], *[$_{\text{Rel.Cl}}$ Taroo-ga nade-ta] ko-kubi '[$_{\text{Rel.Cl}}$ Taroo stroked] small-neck' (cf. kayui kubi/[Taroo-ga nade-ta] kubi)
b. *ko-kayui kubi 'small-itchy neck', *ko-Taroo-ga nade-ta kubi 'small-[$_{\text{Rel.Cl}}$ Taroo stroked] neck'
c. *[totemo ko]-kubi '(Int.) very small-neck' (cf. [tomemo tiisai] kubi 'very small neck')
d. *[totemo [ko-kubi-o]] kasige-ru '(Int.) tilt one's neck very slightly' (cf. [tomemo tiisaku] kubi-o kasige-ru 'tilt one's neck very slightly')
e. *[ko- ka oo-] mata-de aruku '[small- or big-] groin-with walk, i.e. (Int.) walk with a small or large motion of legs'; (cf. [ko-mata ka oo-mata-de] aruku 'walk with a small or large motion of legs'[2])
f. *Taroo -ga   ko-   subayaku kubi-o   kasige-ta (cf. (2a))
       -NOM small quickly   neck-ACC tilt-PAST
'(Int.) Taroo quickly tilted his neck slightly'

(4) a. oo-guti-o ake-ru 'big-mouth-ACC open-PRES, i.e. open one's mouth <u>widely</u>' but not 'open one's <u>big</u> mouth'
b. oo-de-o hur-u 'big-arm-ACC swing-PRES, i.e. swing one's arms <u>in a large motion</u>' but not 'swing one's <u>big</u> arms'
c. oo-iki-o hak-u 'big-breath-ACC exhale-PRES, i.e. exhale <u>extensively</u>' but not necessarily 'exhale a large amount air'
d. oo-iki-o tuk-u 'big-breath-ACC inhale-PRES, i.e. inhale <u>extensively</u>' but not necessarily 'inhale a large amount air'
e. ko-kubi-o nage-ru 'small-neck-ACC through-PRES, i.e. lower one's neck forward <u>slightly</u>' but not 'lower one's <u>small</u> neck forward [cf. (2a) above]'
f. ko-te-o kazas-u 'small-hand-ACC raise-PRES, i.e. raise one's hand <u>slightly</u> (to shelter one's eyes)' but not 'raiser one's <u>small</u> hand'
g. ko-gosi-o kagame-ru 'small-lower.back-ACC bend-PRES, i.e. bend one's lower back <u>slightly</u>' but not 'bend one's <u>small</u> lower back'
h. ko-hiza-o ut-u 'small-knee-ACC tap-PRES, i.e. tap one's knee <u>lightly</u>' but not 'tap one's <u>small</u> knee' [alternatively, *ko-hiza-o tatak-u* 'small-knee-ACC hit-PRES']
i. oo-/ko-mata-ni/-de aruk-u 'big/small-groin-with walk-PRES, i.e. walk <u>with a big/small motion of</u> legs' but not 'walk with <u>big/small</u> legs'
j. boo-asi-de aruk-u 'big-leg-with walk-PRES, i.e. walk <u>with a big motion of</u> legs' but not 'walk with <u>big</u> legs'
k. ko-waki-ni kakae-ru 'small-under.arm-at hold-PRES, i.e. hold (something) under (one's) arm <u>lightly</u>' but not 'hold (something) under (one's) <u>small</u> arm' [alternatively, *ko-waki-ni hasam-u* 'small-under.arm-at pinch-PRES'.]

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[1]This means that 'tilting someone's itchy neck slightly' has to be rendered using a regular expression like (2d) as *kayui kubi-o sukosi kasige-ru* 'itchy neck-ACC slightly tilt-PRES'.

[2]*Mata* 'groin' is used here since it is the only one compatible with both of the size indicating prefixes.

l. ko-bara-ga suk-u 'small-stomach-NOM become.empty-PRES, i.e. get hungry <u>slightly</u>' but not 'someone's <u>small</u> stomach becomes empty'[3]

m. ko-bara-ga ita-i 'small-stomach-NOM painful-PRES, i.e. someone's stomach hurts <u>slightly</u>' but not 'someone's <u>small</u> stomach hurts'

n. ko-de-ga kik-u 'small-hand-NOM be.effective-PRES, i.e. (someone's) hand is dexterous <u>to a small degree</u>' but not '(someone's) <u>small</u> hand is dexterous'

o. ko-mune-ga waru-i 'small-chest-NOM bad-PRES, i.e. feel <u>slightly</u> ill in the chest' but not 'feel ill in someone's <u>small</u> chest'

[N.B.: from *Nihon Kokugo Daijiten* (Large-scale dictionary of the Japanese language) like the *OED*; Kindaichi (1957)—the earliest reference in print to the phenomenon as far as I can tell—labels SIP "illogical" (p. 105).]

2 An account compatible with MORPHOLOGICAL INTEGRITY: a proposal

2.1 More observations on SIP

- semi-productivity but over-all straightforward compositional semantics
- lexicalized collocational dependency between SIP arguments/adjuncts and verbs dictated by designated lexical items
- localized (clause-mate) collocational dependency between SIP arguments/adjuncts and their partner predicates
- qualitative disunity with true idioms

2.1.1 Semi-productivity, and lexical gaps

(5) a. both *ko-* 'small' and *oo-* 'big': *ko-mata* 'small-groin' and *oo-mata* 'big-groin'

b. only one: *ko-kubi* 'small-neck' but not *oo-kubi 'big-neck'; *oo-guti* 'big-mouth' but not *ko-guti 'small-mouth'

c. neither: **ko/oo-atama* '(Int.) small/big-head' or **ko/oo-momo* '(Int.) small/big-thigh'

2.1.2 Lexicalized collocational dependency

(6) a. *Taroo -ga <u>ko</u>-kubi-o arat-ta
        -NOM small-neck-ACC wash-PAST
'(Int.) Taroo washed his neck <u>slightly</u>'

b. Ziroo -ga kubi-o arat-ta
        -NOM neck-ACC wash-PAST
'Ziroo washed his neck'

2.1.3 Localized collocational dependency

(7) a. Taroo -ga [Hanako -ga <u>ko</u>-kubi-o kasige-ta]-to <u>ko</u>-mimi-ni hasan-da
        -NOM   -NOM small-neck-ACC tilt-PAST-COMP small-ear-in insert-PAST
'Taroo heard <u>slightly</u> that [Hanako tilted her neck <u>slightly</u>]'

b. Taroo -ga [Hanako -ga kubi-o kasige-ta]-to <u>ko</u>-mimi-ni hasan-da
        -NOM   -NOM neck-ACC tilt-PAST-COMP small-ear-in insert-PAST
'Taroo heard <u>slightly</u> that [Hanako tilted her neck]'
≠ 'Taroo heard <u>slightly</u> that [Hanako tilted her neck <u>slightly</u>]'

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[3] Though *ko-bara* also signifies 'lower abdomen', that is irrelevant here and below.

c. Taroo -ga   [Hanako -ga   <u>ko</u>-kubi-o   kasige-ta]-to   mimi-ni hasan-da
    -NOM   -NOM small-neck-ACC tilt-PAST-COMP ear-in   insert-PAST
'Taroo heard that [Hanako tilted her neck <u>slightly</u>]'
≠ 'Taroo heard <u>slightly</u> that [Hanako tilted her neck <u>slightly</u>]'

(8) a. Taroo -ga   [Hanako -ga   <u>ko</u>-kubi-o   kasige-ta]-to   mimi-ni si-ta
    -NOM   -NOM small-neck-ACC tilt-PAST-COMP ear-in   do-PAST
'Taroo heard that [Hanako tilted her neck <u>slightly</u>]'
b. *Taroo -ga   [Hanako -ga   <u>ko</u>-kubi-o   kasige-ta]-to   <u>ko</u>-mimi-ni si-ta
     -NOM   -NOM small-neck-ACC tilt-PAST-COMP small-ear-in do-PAST
'(Int.) Taroo heard <u>slightly</u> that [Hanako tilted her neck <u>slightly</u>]'
c. *Taroo -ga   [Hanako -ga   kubi-o   kasige-ta]-to   <u>ko</u>-mimi-ni si-ta
     -NOM   -NOM neck-ACC tilt-PAST-COMP small-ear-in do-PAST
'(Int.) = (a) above'

2.1.4   Disunity with regular idioms: coordination

(9) a. Taroo -ga [_{ADV} ryoo-te   to   <u>ko</u>-waki-ni]   hon-o   kakae-ta
     -NOM   both.hand and small-under.arm-at book-ACC hold-PAST
'Taroo [held some books with both hands] and [held others under his arm <u>lightly</u>]'
≠'Taroo [held some books with both hands <u>lightly</u>] and [held others under his arm <u>lightly</u>]'
b. Hanako -ga [_{ADV} hadasi   ka <u>oo-mata</u>-de] arui-ta
     -NOM   bare.foot or big-groin-by walk-PAST
'Hanako [walked bare foot] or [walked <u>with a big motion of legs</u>]'
≠'Hanako [walked <u>with a big motion of</u> bare feet] or [walked <u>with a big motion of legs</u>]'

(10) Taroo -ga [_{ADV} ryoo-te   to   waki-ni]   hon-o [_{ADV} <u>tyokotto</u>] kakae-ta
     -NOM   both.hand and under.arm-at book-ACC lightly   hold-PAST
'Taroo [held some books with both hands <u>lightly</u>] and [held others under his arm <u>lightly</u>]'
≠'Taroo [held some books with both hands] and [held others under his arm <u>lightly</u>]'

(11) a. Taroo -ga [_{NP} ryoo-me   to   <u>oo-guti</u>-o]   ake-ta (cf. (4a))
     -NOM   both-eyes and big-mouth-ACC open-PAST
'Taroo [opened his eyes] and [<u>widely</u> opened his mouth]'
b. Hanako -wa [_{NP} me   ka <u>ko-de</u>-ga]   kik-u (cf. (4n))
     -TOP   eyes or small-hands-NOM be.effective-PRES
'As for Hanako, her eyes are keen or [her hands are dexterous <u>slightly</u>].'

(12) a. Taroo -ga   Ziroo -no   <u>asi</u>-o   <u>hippat</u>-ta
     -NOM   -GEN leg-ACC pull-PAST
'(Lit.) Taroo pulled Ziroo's leg'
'(Idiom) Taroo derailed Ziroo's effort' [No body part is needed.]
b. Taroo -ga   Ziroo -no [_{NP} te   to   <u>asi</u>-o]   <u>hippat</u>-ta
     -NOM   -GEN   arm and leg-ACC pull-PAST
'(Lit.) Taroo pulled Ziroo's arm and leg'
≠ '(Idiom) Taroo pulled Ziroo's arm and derailed Ziroo's effort'

(13) A proper account for SIP expressions at least needs to accommodate:
(i) lexicalized and localized collocational dependencies between SIP expressions and their partner predicates, and
(ii) the peculiar adverbial modification—the instigator of morpho-semantic bracketing paradox—resulting in fairly literal, systematic, and compositional semantic interpretation.

2.2 Syntax of the SIP construction

(14) Syntactic framework—just enough to put words together
- CONSTRAINT-BASED LEXICALISM (CBL) for Japanese: Fukushima (2007/2005/2003/ 2002/1999a,b/1998, Gunji 1999/1987, Gunji & Hasida 1996, and Sells 1995 inter alia
- more generally—HEAD-DRIVEN PHRASE STRUCTURE GRAMMAR (HPSG) (Pollard & Sag 1994; Sag, Wasow, & Bender 2003
- Bracketing paradox in CONSTRAINT-BASED LEXICALISM:
    Müller (2003) on the particle verb construction in German
    Kubota (2007) on adverbial scope in the causative construction in Japanese
- More broader theory of re-interpretation based on CBL:
Egg (2004/2005)

2.2.1 Capturing collocation: Lexical entries, syntactic rules and principles

(15) a. Lexical entry of *kasige* 'tilt'
kasige: {POS V; FORM $\boxed{1}$*kasige*; SUBCAT<NP$_{ga}$[COLLOC $\boxed{1}$], NP$_o$[COLLOC $\boxed{1}$]>; SEM **kasige′**}
[FORM: morphological head form; COLLOC: collocation; both are HEAD features.]
b. Lexical entry of *kubi* 'neck' [a regular nominal with COLLOC underspecified]
kubi: {POS N; SUBCAT<>; COLLOC [ ]; SEM **kubi′**}
c. Lexical entry of *ko-kubi* 'small-neck' [a SIP nominal with COLLOC specified as *kasige*]
ko-kubi: {POS N; SUBCAT<>; COLLOC *kasige*; SEM **ko-kubi′**}
d. Lexical entry of *ko-waki* 'small-under.arm' [a SIP nominal with COLLOC specified as *kakae*]
ko-waki: {POS N; SUBCAT<>; COLLOC *kakae*; SEM **ko-waki′**}
e. Lexical entry of *-ni*
-ni: {POS ADV; SUBCAT<NP[COLLOC $\boxed{1}$]>; COLLOC $\boxed{1}$; ADJUNCT IVP[FORM $\boxed{1}$]; SEM **ni′**}
f. Lexical entry of *ko-waki-ni* 'small-under.arm-at' [a SIP adverb with COLLOC specified as *kakae*]
ko-waki-ni: {POS ADV; SUBCAT<>; COLLOC $\boxed{1}$*kakae*; ADJUNCT IVP[FORM $\boxed{1}$]; SEM **ko-waki-ni′**}
Lexical entry of *waki-ni* 'under.arm-at' [a regular adverb with COLLOC underspecified]
waki-ni: {POS ADV; SUBCAT<>; COLLOC [ ]; ADJUNCT IVP; SEM **waki-ni′**}

(16) a. M[other] → X H[ead] [with X = C[omplement] or A[djunct]] (for complementation and adjunction)
b. M → H CONJ H (for coordination)
c. HEAD FEATURE PRINCIPLE (HFP): The values of the HEAD features of M are identical to those of the HEAD features of H.
d. SUBCAT FEATURE PRINCIPLE (SFP): In complementation (i.e. M → C H), the value

of the SUBCAT feature of H unifies with the value of the SUBCAT feature of M except for the category that unifies with C.

e. ADJUNCT FEATURE PRINCIPLE (AFP): In adjunction (i.e. M → A H), the value of ADJUNCT feature of A unifies with H.

f. COORDINATION PRINCIPLE (CP): In coordination: (i) the values of the HEAD features of M unify with those of the HEAD features of daughters; (ii) the value of the FORM feature of M is a set consisting of the values of the FORM features of head daughters.[4]

g. (i) Two categories X and Y are said to UNIFY if, for each feature F that has a value defined in both, (ia) the value of F of X and the value of F of Y are identical when F is binary or multi-valued feature. Or (ib) the value of F of X and the value of F of Y unify when F is a category-valued feature. (ii) Two sets of categories are said to UNIFY if there is a one-to-one correspondence between the two sets, and each member of one set unifies with a member of the other.

2.2.2 Syntactic demonstration part 1: basic structures

(17) Tree for *Taroo-ga ko-kubi-o kasige-ta* 'Taroo tilted his neck slightly' (=(2a))[5]

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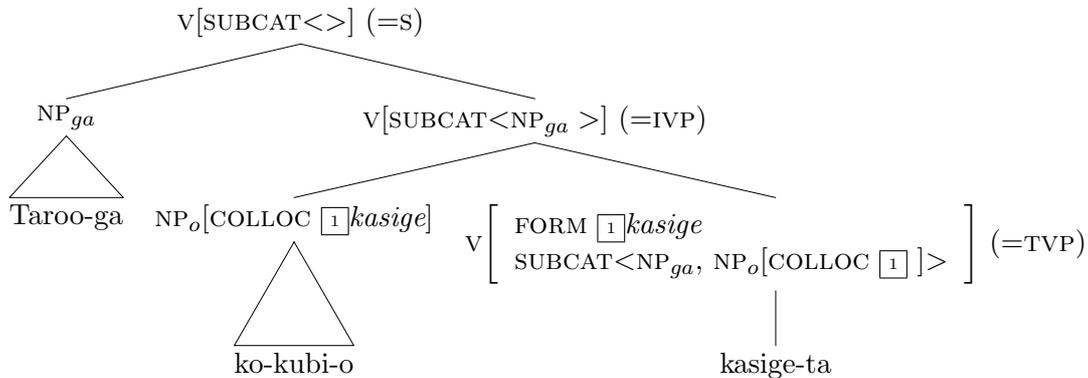
[4]The coverage of (16f/ii) is not limited to SIP expressions. It extends over to the cases of genuine idioms formed employing coordination: e.g. *te-mo asi-mo de-nai* '(Lit.) hand-and foot-and protrude-NEG (i.e. (Idiom) unable to do anything)' in (ia) below. The meaning of this idiom is unpredictable from the idioms in (ib)/(ic) where the same verb is used with *te* 'hand' alone or with *asi* 'foot' alone, respectively. (All of (ia), (ib), and (ic) have literal meanings as well.) To obtain, for example, the idiom (ib), the idiomatic verb has to SUBCATegorize for a subject NP argument with the specification [FORM *te*] (à la Sag, Wasow, & Bender 2003). In contrast, to make (ia) available, the verb needs its (coordinated) subject NP to be specified as [FORM {*te, asi*}].

(i) a. Hanako -wa te-mo asi-mo de-nakat-ta
        -TOP hand-and foot-and protrude-NEG-PAST
   'Hanako was unable to do anything (about something)'

  b. Hanako -wa te-ga de-nakat-ta
        -TOP hand-NOM protrude-NEG-PAST
   'Hanako could not afford (something)'

  c. Hanako -wa asi-ga de-nakat-ta
        -TOP foot-NOM protrude-NEG-PAST
   'Hanako did not exceed the budget (for something)'

So far, at least two different occasions (namely, the SIP construction and genuine idioms), call for (16f/ii) independently.

[5]A sentence is a projection of a verbal HEAD whose SUBCAT feature value is an empty list '<>'. So a transitive verb (or TVP) = V[SUBCAT<NP, NP>]; VP (or IVP) = V[SUBCAT<NP>]; S = V[SUBCAT<>].

(18) Tree for *Taroo-ga ko-kubi-o arat-ta* '(Int.) Taroo washed his neck slightly' (=(6a), cf. (2a))

$$*\text{V}[\sim]$$

- NP$_{ga}$
  - Taroo-ga
- V$[\sim]$
  - NP$_o$[COLLOC $\boxed{1}$*kasige*]
    - ko-kubi-o
  - V $\begin{bmatrix} \text{FORM } \boxed{1}\textit{arat} \\ \text{SUBCAT}<\text{NP}_{ga}, \text{NP}_o[\text{COLLOC } \boxed{1}\;]> \end{bmatrix}$
    - arat-ta

(19) Tree for *Hanako-ga ko-waki-ni hon-o kakae-ta* 'Hanako held books under her arm lightly' [with an adjunct SIP element]

$$\text{V}[\text{SUBCAT}<>]$$

- NP$_{ga}$
  - Hanako-ga
- V[SUBCAT$<$NP$_{ga}>$]
  - ADV $\begin{bmatrix} \text{SUBCAT}<> \\ \text{ADJUNCT IVP}[\text{FORM } \boxed{1}\;] \\ \text{COLLOC } \boxed{1}\textit{kakae} \end{bmatrix}$
    - ko-waki-ni
  - V $\begin{bmatrix} \text{SUBCAT}<\text{NP}_{ga}> \\ \text{FORM } \boxed{1} \end{bmatrix}$
    - NP$_o$
      - hon-o
    - V $\begin{bmatrix} \text{SUBCAT}<\text{NP}_{ga}, \text{NP}_o> \\ \text{FORM } \boxed{1}\textit{kakae} \end{bmatrix}$
      - kakae-ta

(20) Hanako -ga   tegiwayoku ko-waki-ni   hon-o   kakae-ta
        -NOM skillfully   small-under.arm-at book-ACC hold-PAST
    'Hanako skillfully held some books under her arm lightly'

2.2.3 Syntactic demonstration part 2: coordination

(21) Tree for *Taroo-ga ryoo-te to ko-waki-ni hon-o kakae-ta* 'Taroo [held some books with both hands] and [held others under his arm lightly] (= (9a))'
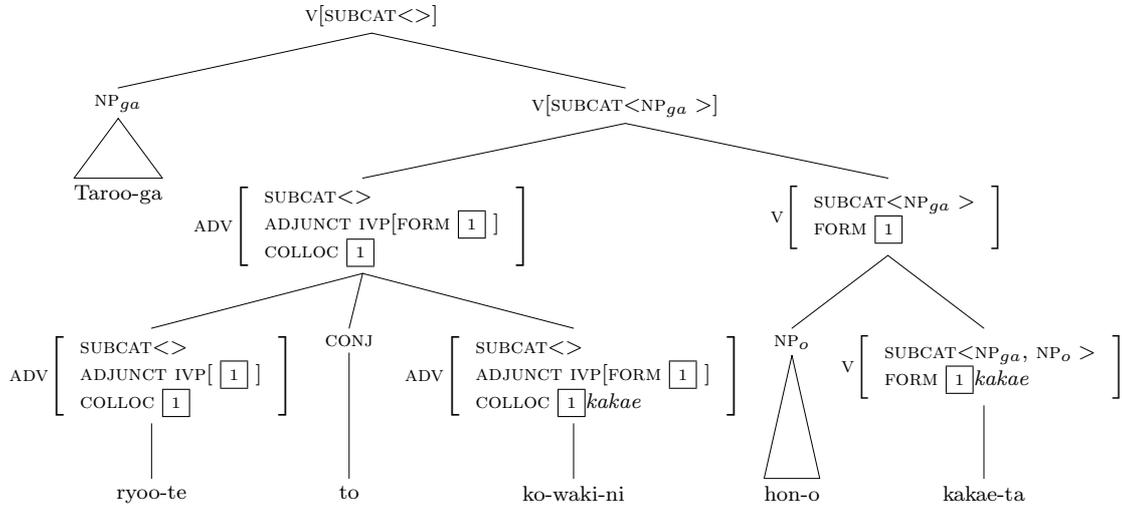

(22) *Ryoo-te* as an adverbial?

a. other adverbial nouns: e.g. *kyoo* 'today', *kinoo* 'yesterday', and *san-nen-mae(-ni)* 'three-year-before(-at)'

Postpostion ellipsis:

b. Taroo -ga   hon-o   kakae-ta-no-wa   ryoo-te(-ni)-da-ta
        -NOM book-ACC hold-PAST-COMP-TOP both-hands-with-COP-PAST
    'Taroo's holding books was carried out with both hands'

c. [Taroo -ga   ryoo-te(-ni)] sosite [Hanako -ga   kata-te-ni]   hasi-o   mot-ta
        -NOM both-hands-in and   -NOM single-hand-in chop.stick hold-PAST
    'Taroo held chop sticks in both hands and Mary in one hand'

(23) Tree for *Taroo-ga ryoo-me to oo-guti-o ake-ta* 'Taroo [opened both of his eyes] and [widely opened his mouth]' (=(11a))
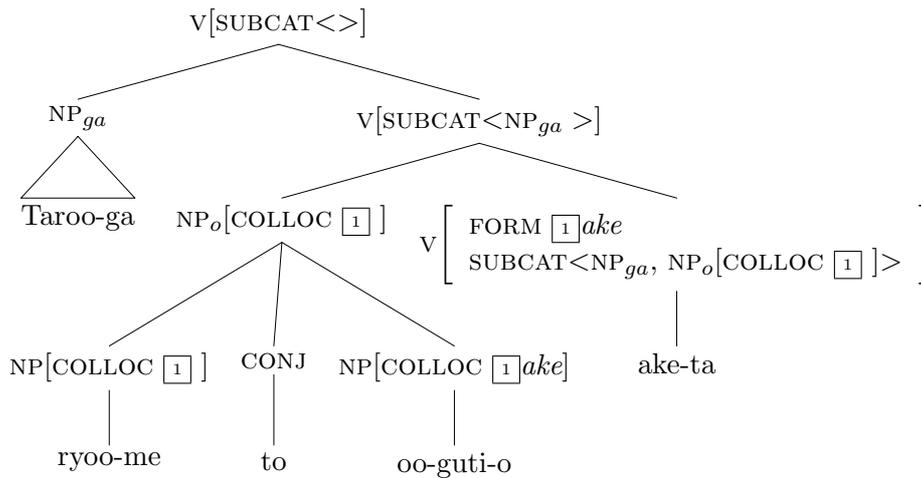
(24) *Hanako -ga [NP oo-de   to   oo-guti-o]   hiroge-ta
            -NOM   big-arm and big-mouth-ACC open-PAST
    '(Int.) Hanako [opened her arms widely] and [opened her mouth widely]'
    [Cf.: OK: *oo-de hiroge-ta* vs. *oo-guti-o ake-ta/*hiroge-ta*]

(25) *Taroo -ga   ko-kubi-o   [kasige (sosite) sawat-ta]
              -NOM small-neck-ACC tilt   and   touch-PAST
       '(Int.) Taroo [slightly tilted his neck] and [sligtly touched his neck]'

2.3   Semantics of the SIP construction—Montagovian Morphology

2.3.1   Semantics of complement SIP expressions—as GENERALIZED QUANTIFIERS (GQs)

(26) TYPE-DRIVEN TRANSLATION (Klein & Sag 1985)
    a. Translations for the constituents of tree (17):
    kasige-ta 'tilted': $\lambda T_1 \lambda T_2.T_2(\lambda y.T_1(\lambda x.((\mathbf{kasigeta}'(x))(y))))$
    ko-kubi-o 'small-neck': $\lambda Q.\mathbf{ko}'Q(\mathbf{iposs}'(\mathbf{kubi}'))$[6]
    Taroo-ga: $\lambda P.P(taroo)$
    [N.B.: The translation of *ko-kubi* is lexically obtained by combining $\mathbf{kubi}'$ and
    $\lambda P \lambda Q.\mathbf{ko}'Q(\mathbf{iposs}'(P))$ (i.e. the translation for *ko-*). The former is a common noun of
    the type $< e,t >$. The function $\mathbf{iposs}'$ picks out an individual from P that belongs
    inalienably to someone (the speaker or the referent of the subject of a predicate with an
    SIP object) who is contextually appropriate as a possessor. P can contain plural individ-
    uals in the sense of Link (1983). The mechanism of this function is left vague. The case
    markers *-ga* and *-o* are identity functions semantically. TYPE(T)=NP$'$=$<< e,t >, t >$
    (i.e. a GQ); TYPE(P)=TYPE(Q)=$< e,t >$. Tense is ignored here but see Appendix.]
    b. Translation for (17):
    ko-kubi-o kasige-ta: $\lambda T_1 \lambda T_2.T_2(\lambda y.T_1(\lambda x.(\mathbf{kasigeta}'(x))(y)))(\lambda Q.\mathbf{ko}'Q(\mathbf{iposs}'(\mathbf{kubi}')))$
    reduction: $\lambda T_2.T_2(\lambda y.\mathbf{ko}'\mathbf{kasigeta}'(\mathbf{iposs}'(\mathbf{kubi}'))(y))$
    Taroo-ga ko-kubi-o kasige-ta: $\lambda T_2.T_2(\lambda y.\mathbf{ko}'\mathbf{kasigeta}'(\mathbf{iposs}'(\mathbf{kubi}'))(y))(\lambda P.P(taroo))$
    reduction: $\mathbf{ko}'\mathbf{kasigeta}'(\mathbf{iposs}'(\mathbf{kubi}'))(taroo)$
    [N.B.: TYPE$(\mathbf{ko}')$=$<< e,t >, < e,t >>$; TYPE$(\mathbf{kasigeta}')$=$< e, < e,t >>$.][7]

(27) a. Translations for the constituents of tree (18):
    ake-ta 'opened': $\lambda T_1 \lambda T_2.T_2(\lambda y.T_1(\lambda x.((\mathbf{aketa}'(x))(y))))$
    ryoo-me 'both-eyes': $\lambda Q.Q(\mathbf{iposs}'(\mathbf{ryoome}'))$
    oo-guti 'big-mouth': $\lambda Q.\mathbf{oo}'Q(\mathbf{iposs}'(\mathbf{kuti}'))$[N.B.: *kuti* $\to$ *guti* with sequential voicing]
    Taroo-ga: $\lambda P.P(taroo)$
    b. Translation for (17):
    ryoo-me to oo-guti-o (coordination of two NPs):
    $\lambda Q.Q(\mathbf{iposs}'(\mathbf{ryoome}')) \,\&\, \mathbf{oo}'Q(\mathbf{iposs}'(\mathbf{kuti}'))$
    ryoo-me to oo-guti-o ake-ta:
    $\lambda T_1 \lambda T_2.T_2(\lambda y.T_1(\lambda x.(\mathbf{aketa}'(x))(y)))(\lambda Q.Q(\mathbf{iposs}'(\mathbf{ryoome}')) \,\&\, \mathbf{oo}'Q(\mathbf{iposs}'(\mathbf{kuti}')))$
    reduction: $\lambda T_2.T_2(\lambda y.(\mathbf{aketa}'(\mathbf{iposs}'(\mathbf{ryoome}'))(y) \,\&\, \mathbf{oo}'\mathbf{aketa}'(\mathbf{iposs}'(\mathbf{kuti}'))(y)))$
    Taroo-ga ryoo-me to oo-guti-o ake-ta:
    $\lambda T_2.T_2(\lambda y.(\mathbf{aketa}'(\mathbf{iposs}'(\mathbf{ryoome}'))(y) \,\&\, \mathbf{oo}'\mathbf{aketa}'(\mathbf{iposs}'(\mathbf{kuti}'))(y)))(\lambda P.P(taroo))$

---

[6]Inalienable possessive relations are not captured by the semantic account here. Though it can indeed
be viewed as another indication of lexical-semantic idiosyncrasy, the reason why only inalienable possession
(when combined with the size-indicating prefixes) gives rise to the peculiar adverbial modification is left
unexplored. As far as I know, there has not been any explanation in the literature regarding the uniqueness
of inalienable possession in this connection. Tense is ignored in this paper.

[7]Though truth conditions for (26b) (and others below) can be furnished along the lines of Cresswell
(1985), they are not included here. For the purpose of the current paper, it is sufficient to show semantic
translations that serve as the bases for compositional interpretation.

reduction: $\mathbf{aketa'}(\mathbf{iposs'}(\mathbf{ryoome'}))(taroo)\,\&\,\mathbf{oo'aketa'}(\mathbf{iposs'}(\mathbf{kuti'}))(taroo)$

[N.B.: TYPE($\mathbf{oo'}$)$=<<e,t>,<e,t>>$; TYPE($\mathbf{aketa'}$)$=<e,<e,t>>$.]

2.3.2 Semantics of adjunct SIP expressions—as ENDOCENTRIC MODIFIERs

(28) a. Translations for the constituents of tree (21):

$kakae\text{-}ta$ 'held': $\lambda T_1 \lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.T_1(\lambda x.(\mathbf{kakaeta'}(x))(y))))$

[N.B.: An optional place holder ('$\vec{A}$') of an adverbial modifier is inserted by a lexical rule. The notation '$\vec{A}$' indicates that there are zero or more As.]

$hon\text{-}o$ 'books': $\lambda P.P(hon)$

$ko\text{-}waki$ 'small-under.arm': $\lambda Q.\mathbf{ko'}Q(\mathbf{iposs'}(\mathbf{waki'}))$

$ko\text{-}waki\text{-}ni$ 'small-under.arm-at': $\lambda Q \lambda x.\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(Q(x))$

$Taroo\text{-}ga$: $\lambda P.P(taroo)$

[N.B.: $ko\text{-}waki\text{-}ni$ is obtained by combining $\lambda T \lambda Q \lambda x.T(\lambda y.\mathbf{ni'}(y)(Q(x)))$ (i.e. the translation for $-ni$) and the translation of $ko\text{-}waki$ above. 'hon' here is a plural individual. To focus on the issues of adverbial modification, I eschew the minute quantificational aspects of NPs in this paper. TYPE(T)=NP$'$; TYPE(A)$=<<e,t>,<e,t>>$; TYPE(P)=TYPE(Q)$=<e,t>$.]

b. Translation for (18):

$hon\text{-}o\ kakae\text{-}ta$: $\lambda T_1 \lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.T_1(\lambda x.(\mathbf{kakaeta'}(x))(y))))(\lambda P.P(hon))$

reduction: $\lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.(\mathbf{kakaeta'}(hon))(y)))$

$ko\text{-}waki\text{-}ni\ hon\text{-}o\ kakae\text{-}ta$:

$\lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.(\mathbf{kakaeta'}(hon))(y)))(\lambda Q \lambda x.\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(Q(x)))$

reduction: $\lambda T_2.T_2(\lambda x.\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(\mathbf{kakaeta'}(hon))(x))$

$Taroo\text{-}ga\ ko\text{-}waki\text{-}ni\ hon\text{-}o\ kakae\text{-}ta$:

$\lambda T_2.T_2(\lambda x.\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(\mathbf{kakaeta'}(hon))(x))(\lambda P.P(taroo))$

reduction: $\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(\mathbf{kakaeta'}(hon))(taroo)$

[N.B.: TYPE($\mathbf{ko'}$)=TYPE($\mathbf{ni'}(\mathbf{iposs'}(\mathbf{waki'}))$)$=<<e,t>,<e,t>>$; TYPE($\mathbf{kakaeta'}$)$=<e,<e,t>>$.]

(29) a. Translations for the constituents in example (9):

$kakae\text{-}ta$ 'held': $\lambda T_1 \lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.T_1(\lambda x.(\mathbf{kakaeta'}(x))(y))))$

$hon\text{-}o$ 'books': $\lambda P.P(hon)$

$ko\text{-}waki\text{-}ni$ 'small-under.arm': $\lambda Q \lambda x.\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(Q(x))$

$ryoo\text{-}te$ 'both-hands': $\lambda Q \lambda x.\mathbf{ni'}(\mathbf{iposs'}(\mathbf{ryoo\text{-}te'}))(Q(x))$

$Taroo\text{-}ga$: $\lambda P.P(taroo)$

[N.B.: TYPE(A)$=<<e,t>,<e,t>>$; TYPE(Q)$=<e,t>$]

b. Translation for example (9):

$ryoo\text{-}te\ to\ ko\text{-}waki\text{-}ni$ (coordination of two ADVs):

$\lambda Q \lambda x.(\mathbf{ni'}(\mathbf{iposs'}(\mathbf{ryoo\text{-}te'}))(Q(x))\,\&\,\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(Q(x)))$

$hon\text{-}o\ kakae\text{-}ta$: $\lambda T_1 \lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.T_1(\lambda x.(\mathbf{kakaeta'}(x))(y))))(\lambda P.P(hon))$

reduction: $\lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.(\mathbf{kakaeta'}(hon))(y)))$

$ryoo\text{-}te\ to\ ko\text{-}waki\text{-}ni\ hon\text{-}o\ kakae\text{-}ta$:

$\lambda \vec{A} \lambda T_2.T_2(\vec{A}(\lambda y.(\mathbf{kakaeta'}(hon))(y)))(\lambda Q \lambda x.(\mathbf{ni'}(\mathbf{iposs'}(\mathbf{ryoo\text{-}te'}))(Q(x))\,\&\,\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(Q(x))))$

reduction: $\lambda T_2.T_2(\lambda x.(\mathbf{ni'}(\mathbf{iposs'}(\mathbf{ryoo\text{-}te'}))(\mathbf{kakaeta'}(hon))(x)\,\&\,\mathbf{ko'ni'}(\mathbf{iposs'}(\mathbf{waki'}))(\mathbf{kakaeta'}(hon))(x)))$

$Taroo\text{-}ga\ ko\text{-}waki\text{-}ni\ hon\text{-}o\ kakae\text{-}ta$:

$$\lambda T_2.T_2(\lambda x.(\mathbf{ni}'(\mathbf{iposs}'(\mathbf{ryoo\text{-}te}'))(\mathbf{kakaeta}'(hon))(x) \,\&\, \mathbf{ko}'\mathbf{ni}'(\mathbf{iposs}'(\mathbf{waki}'))$$
$$(\mathbf{kakaeta}'(hon))(x)))(\lambda P.P(taroo))$$

reduction: $\mathbf{ni}'(\mathbf{iposs}'(\mathbf{ryoo\text{-}te}'))(\mathbf{kakaeta}'(hon))(taroo) \,\&\, \mathbf{ko}'\mathbf{ni}'(\mathbf{iposs}'(\mathbf{waki}'))$
$(\mathbf{kakaeta}'(hon))(taroo)$

3 Accounts incompatible with MORPHOLOGICAL INTEGRITY and their problems

3.1 Kitagawa (1986)

(30) LF movement of *ko-* and adjunction to VP (à la Petsesky 1985)
[S Taroo-ga [VP ko$_i$ [VP [NP [N t_i-kubi-o]] kasige-ta]]]

(31) a. Taroo -ga   [ADV [ADV ryoo-te] to   [ADV <u>ko-waki-ni</u>]]   hon-o   kakae-ta
       -NOM   both.hand   and small-under.arm-at book-ACC hold-PAST
    'Taroo [held some books with both hands] and [held others under his arm <u>lightly</u>]'
    ≠ 'Taroo [held some books with both hands <u>lightly</u>] and [held others under his arm
    <u>lightly</u>]'
    b. Kitagawa's LF: [S Taroo-ga [VP ko$_i$ [VP [NP ryoo-te to t_i-waki]-ni [VP hon-o kakae-ta]]]]

(32) a. Taroo -ga   [VP$_1$ [VP odor-i]   (sosite) [VP <u>zyoozuni</u> utat-ta]]
       -NOM   dance-CONJ and   well   sing-PAST
    'Taroo [danced] and [sang <u>well</u>]'
    ≠ 'Taroo [danced <u>well</u>] and [sang <u>well</u>]'
    b. LF: *Taroo-ga [VP$_2$ <u>zyoozuni</u>$_i$ [VP$_1$ [VP odor-i] (sosite) [VP t_i utat-ta]]]^8

(33) a. Taroo -ga   [Hanako -ga   <u>ko</u>-kubi-o   kasige-ta]-to   mimi-ni hasan-da
       -NOM   -NOM small-neck-ACC tilt-PAST-COMP ear-in   insert-PAST
    '≠ Taroo heard <u>slightly</u> that Hanako tilted her neck <u>slightly</u>'
    b. Taroo-ga [VP ko$_i$ [VP$_2$ [S Hanako-ga [VP t_i [VP$_1$ t_i-kubi-o kasige-ta]]]-to mimi-ni hasan-
    da]]

(34) Tegiwayoku$_i$, Taroo -ga [Hanako -ga t_i ryoori-deki-ru]-to   ko-mimi-ni hasan-da
    skillfully   -NOM   -NOM cook-able-PRES-COMP small-ear-in insert-PAST
    'Skillfully$_i$, Taroo heard slightly [that Hanako is able to cook t_i]'
    [I.e.: a sequence of successive short movements of a VP-adverb is indeed possible out
    of the embedded clause]

3.2 Morita (2003)

(35) a. *ko-* as an 'aspectual delimiter' (atelic → telic) for a verb that is co-indexed with an
    Op[erator] restricting the verb
    b. [S Taroo-ga [VP [NP [N ko$_i$-kubi-o]] [Op$_i$ kasige-ta]]]

(36) a. Taroo -ga   [ADV [ADV ryoo-te] to   [ADV <u>ko-waki-ni</u>]]   hon-o   kakae-ta
       -NOM   both.hand   and small-under.arm-at book-ACC hold-PAST
    'Taroo [held some books with both hands] and [held others under his arm <u>lightly</u>]'
    ≠ 'Taroo [held some books with both hands <u>lightly</u>] and [held others under his arm

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^{8}Alternatively, 'across-the-board' verb movement (Koizumi 2000) along with the extraction of the object
NP as in (i) may appear to solve the problem here.
   (i) [VP$_1$ ryoo-te t_i t_j] to [VP$_2$ ko-waki-ni t_i t_j] hon-o$_i$ kakae-ta$_j$
However, Fukushima (2003) has shown that such verb movement out of a coordination domain with the
conjunction *to* creates more problems than it is purported to solve.

<u>lightly</u>]'
b. Morita-style analysis: [$_S$ Taroo-ga [$_{VP}$ [$_{ADV}$ ryoo-te to ko$_i$-waki-ni] [$_{VP}$ hon-o [Op$_i$ kakae-ta]]]]

(37) a. Followers of McCarthy$_i$ are now puzzled by his$_i$ intentions
b. *McCarthy$_i$ites are now puzzled by his$_i$ intentions
(anaphoric islands of Postal 1969)

(38) *[$_{NP}$ [$_N$ Onna$_i$-tarasi]]-ga kanozyo$_i$-o yuuwakusi-ta
    woman-deceiving-NOM her seduce-PAST
'(Int.) A woman$_i$izer seduced her$_i$'

(39) The issue of semantic opacity or transparency:
Although casual [cocaine use] is down, the number of people using it routinely has increased. (Ward et. al.'s (22a))

(40) a. Taroo -ga [Hanako -ga kubi-o kasige-ta]-to <u>ko</u>-mimi-ni hasan-da
    -NOM   -NOM neck-ACC tilt-PAST-COMP small-ear-in insert-PAST
 'Taroo heard <u>slightly</u> that [Hanako tilted her neck]'
$\neq$ 'Taroo heard <u>slightly</u> that [Hanako tilted her neck <u>slightly</u>]'
b. Morita-style analysis for (a): Taroo-ga [$_{VP}$ [$_S$ Hanako-ga kubi-o [Op$_i$ kasige-ta]]-to ko$_i$-mimi-ni [Op$_i$ hasan-da]]
c. Taroo -ga [Hanako -ga <u>ko</u>-kubi-o kasige-ta]-to mimi-ni hasan-da
    -NOM   -NOM small-neck-ACC tilt-PAST-COMP ear-in insert-PAST
 'Taroo heard that [Hanako tilted her neck (<u>slightly</u>])'
'$\neq$ Taroo heard <u>slightly</u> that [Hanako tilted her neck <u>slightly</u>]'
d. Morita-style analysis 1 for (c): Taroo-ga [$_{VP}$ [$_S$ Hanako-ga ko$_i$-kubi-o [Op$_i$ kasige-ta]]-to mimi-ni [Op$_i$ hasan-da]]
Morita-style analysis 2 for (c): Taroo-ga [$_{VP}$ [$_S$ Hanako-ga ko$_i$-kubi-o kasige-ta]-to mimi-ni [Op$_i$ hasan-da]]

(41) *Taroo -ga [$_{NP}$ [Masako -no sensei]-to [Ziroo$_i$ -no sensei-ni]] zibun$_i$-o syookaisi-ta
    -NOM   -GEN teacher-and -GEN teacher-DAT self-ACC introduce-PAST
'(Int.) Taroo introduced Ziroo to Hanako's teacher and to Ziroo's teacher'

(42) a. *Taroo -ga [Hanako -ga kubi-o kasige-ta]-to <u>ko</u>-mimi-ni si-ta (= (8c))
     -NOM   -NOM neck-ACC tilt-PAST-COMP small-ear-in do-PAST
 '(Int.) Taroo heard that [Hanako tilted her neck <u>slightly</u>]'
b. Morita-style analysis for (a): Taroo-ga [$_{VP}$ [$_S$ Hanako-ga kubi-o [Op$_i$ kasige-ta]]-to ko$_i$-mimi-ni si-ta]
c. Taroo$_i$ -ga [$_S$ Hanako -ga kare$_i$-o bakanisi-ta]-to omot-ta
    -NOM   -NOM him-ACC ridicule-PAST-COMP think-PAST
 'Taroo though that Hanako ridiculed him'

(43) Taroo -ga <u>san-pun-kan</u> ko-waki-ni hon-o kakae-tei-ta
   -NOM three-minute-duration small-under.arm-at book-ACC hold-PROG-PAST
'Taroo was lightly holding a book under his arm <u>for three minutes</u>'

4 Discussion and concluding remarks

Summary of the current account:

- The syntactic analysis establishes the local ('clause-mate') collocational dependency between SIP expressions and their host verbs.
- Semantically, both argument and adjunct SIP expressions are Montagovian functors—the former is a GQ and the latter is an endocentric modifier, both of which take a predicate meaning as an argument to render an appropriate interpretation. This makes it possible to confine the unusual adverbial modification associated with the size-indicating prefixes *ko-* and *oo- within* the SIP expressions proper.
- The proposed analysis not only accommodates the bracketing paradox arising in the SIP construction but also offers a platform for straightforward compositional semantic interpretation of the construction.
- It solves Kitagawa-Morita problems reviewed in section 3 without additional stipulations.

Consequences of the current account:

- It enables us to remain faithful to MORPHOLOGICAL INTEGRITY.
- Compositional semantic interpretation does not require iconic correspondence between syntax and semantics after all (see also Egg 2004/2005)

Appendix: Montagovian Morphology—a rough sketch

- Montague semantics: (i) compositional, (ii) truth conditional, (iii) intensional, and (iv) model-theoretic (Montague 1973).
- Montagovian Morphology: an attempt to characterize, in strictly compositional fashion, the semantic properties of complex lexical items created by word-formation rules. When necessary, it elucidates aspects reflecting items (ii)-(iv) above regarding a given lexical item.
- Affinity to: CATEGORIAL MORPHOLOGY of Hoeksema (1985) and Moortgat (1988a,b).
- Contrast to: Bittner's (1994a,b) CROSS-LINGUISTIC SEMANTICS—semantics for word-building in syntax (with S-structure as the basis for semantic interpretation).

Some demonstration (with post-verbal morphemes):

(44) Past tense morpheme *-ta*
definition: $\lambda P \lambda \vec{y} \lambda x . \mathrm{PAST}(P(\vec{y})(x))$
truth condition: $\|\mathrm{PAST}(P(\vec{y})(x))\|^{M,w,i,g} = 1 \leftrightarrow \exists i' : i' < i, \|P(\vec{y})(x)\|^{M,w,i',g} = 1$
example (intransitive verb): *odot-ta* 'dance-PAST' [N.B.: [odor] → [odot]]
$\lambda P \lambda x . \mathrm{PAST}(P(x))(\lambda y . \mathbf{odor}'(y))$ reduction: $\lambda x . \mathrm{PAST}(\mathbf{odor}'(x))$
example (transitive verb): *tabe-ta* 'eat-PAST'
$\lambda P \lambda y \lambda x . \mathrm{PAST}(P(y)(x))(\lambda y_1 \lambda x_1 . \mathbf{tabe}'(y_1)(x_1))$ reduction: $\lambda y \lambda x . \mathrm{PAST}(\mathbf{tabe}'(y)(x))$
[N.B.: Likewise for the present tense morpheme *-(r)u*. Subscription like 'x_1' indicates distinct variables.]

(45) Speculative modal morpheme *-daroo* 'might'
definition: $\lambda P \lambda \vec{y} \lambda x . \mathrm{MIGHT}(P(\vec{y})(x))$
truth condition: $\|\mathrm{MIGHT}(P(\vec{y})(x))\|^{M,w,i,g} = 1$ iff
$\bigcap g(<w,i>) \cap \{<w',i'>: \|P(\vec{y})(x)\|^{M,w',i',g} = 1\} \neq \emptyset$

example: *odot(-ta)-daroo* 'danced-might' [N.B.: Ignoring the tense on the verb (-*ta*) for now. See (48) below.]

$\lambda P \lambda x.\text{MIGHT}(P(x))(\lambda y.\textbf{odor}'(y))$ reduction: $\lambda x.\text{MIGHT}(\textbf{odor}'(x))$

(46) Causative morpheme -*sase* 'cause'
definition: $\lambda P \lambda \vec{z} \lambda y \lambda x.\text{CAUSE}(P(\vec{z})(y), x)$
example: *odor-ase* 'dance-cause, i.e. make someone dance' [N.B.: [sase] $\rightarrow$ [ase].]
$\lambda P \lambda y \lambda x.\text{CAUSE}(P(y), x)(\lambda z.\textbf{odor}'(z))$ reduction: $\lambda y \lambda x.\text{CAUSE}(\textbf{odor}'(y), x)$

(47) Control morpheme -*hazime* 'begin'
definition: $\lambda P \lambda \vec{y} \lambda x.\text{BEGIN}(P(\vec{y})(x), x)$
example: *odori-hazime* 'dance-begin' [N.B.: [odor] $\rightarrow$ [odori].]
$\lambda P \lambda x.\text{BEGIN}(P(x), x)(\lambda z.\textbf{odor}'(z))$ reduction: $\lambda x.\text{BEGIN}(\textbf{odor}'(x), x)$

(48) a. Hanako -ga Taroo -ni   odor-ase-hazime-ta-daroo
          -NOM   -DAT dance-cause-begin-PAST-might
'Hanako might have begun to let Taroo dance'
   b. *odor-ase-hazime-ta-daroo* 'dance-cause-begin-PAST-might, i.e. might have begun to let someone dance'
$\lambda P \lambda y \lambda x.\text{MIGHT}(P(y)(x))(\lambda y_1 \lambda x_1.\text{PAST}(\text{BEGIN}(\text{CAUSE}(\textbf{odor}'(y_1), x_1), x_1)))$
reduction: $\lambda y \lambda x.\text{MIGHT}(\text{PAST}(\text{BEGIN}(\text{CAUSE}(\textbf{odor}'(y), x), x)))$
Translation for (48a): $\text{MIGHT}(\text{PAST}(\text{BEGIN}(\text{CAUSE}(\textbf{odor}'(traoo), hanako), hanako)))$

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