A CATEGORIAL TREATMENT OF SCRAMBLING IN JAPANESE*

Akira Kurahone
University of Texas at Austin

Introduction. In generative studies of Japanese, the term 'Scrambling' has been used to account for the intuitively obvious relationship bebween sentences like (1a) and (1b).

(1) a. John-ga Bill-o mi-ta.
subj obj see-past

b. Bill-o John-ga mi-ta.
obj subj see-past

'John saw Bill.'

The phenomenon has presented linguists with an interesting problem. especially in conjunction with treatments of other linguistic phenomena (e.g., Case-Marking, Reflexivization, etc.).

This paper presents a categorial treatment of Scrambling in a simplex sentence. The basic framework has been taken from Montague's Universal Grammar (1970) and Proper Treatment of Quantification in Ordinary English (1973). The purpose of this paper is two-fold. It attempts to provide (i) a categorial syntax capable of directly generating scrambled variants of a canonical form, and (ii) a semantic account for the truth functional meaning equivalence among variants. While a direct generation approach is not new (e.g., Whitman (1979), Hale (1980), Farmer (1980), Chomsky (1980), Ostler (1980), etc.), there is yet no universally accepted analysis that offers a rigorous semantic account.

Arguments against a Scrambling rule. The most widely accepted account for Scrambling is transformational. However, it is not free of problems because it has certain properties that are not shared by other attested rules of grammar. Because of this, ever since Chomsky (1965), Scrambling has been regarded as stylistic. Ross (1967) supports this view and discusses peculiar properties of stylistic rules like Scrambling.

Recently, Whitman (1979) has examined thoroughly the consequences of Scrambling in Japanese and states:

> ... I argue that this [that Scrambling is radically unlike other attested rules of grammar] is a reason to doubt that Scrambling is a rule of grammar at all. Twelve arguments from Japanese show that if we take Scrambling seriously as an actual stylistic rule, we find that it is both undesirable as a permissible rule type, and incapable of accounting for the facts that it was created to explain. (p.342)

Whitman's arguments. Arguing against the transformational treatment, Whitman uses Harada's (1977) rule as representative. He prefers it to Ross' original rule or N. McCawley's (1976) rule for Japanese in the sense that it does not require listing all the Scrambling categories. As an

expository reference, Harada's rule is presented below.

(2) Harada's Scrambling Rule:

$$W - (\overline{X}_i) - W - (\overline{X}_j) - W - V - W \longrightarrow$$

$$W - (\overline{X}_j) - W - (\overline{X}_i) - W - V - W$$

Listed below are Whitman's twelve arguments against the above rule although some of them count against any transformational treatment of Scrambling.

(3) a) Scrambling is a variable moving rule.

b) Scrambling applies infinitely to its own output.

c) Scrambling violates strict cyclicity.

d) Scrambling cannot be constrained by a bounding condition.

e) Scrambling cannot be constrained by relativized A-over-A principle.

f) An NP in an embedded sentence may be scrambled out, producing a bad result.

g) An NP in a coordinate structure may be scrambled out, producing a bad result.

h) An NP in an adverbial clause may be scrambled out, producing a bad result.

i) An NP in a copular sentence may be scrambled out, producing a bad result.

j) An NP in a reduced clause may be scrambled out, producing a bad result.

k) and l) An NP in a double-ga construction may be scrambled out, producing a bad result.

These criticisms will be evaluated individually after I have proposed a categorical analysis. It will be shown that the new analysis is not subject to these criticisms.

Whitman's base generation proposal. Whitman offers an analysis which freely inserts lexical items into the complement NP nodes generated by the base, consequently deriving free surface NP order without recourse to a rule of Scrambling. Stated below is his basic hypothesis.

(4) The Minimal Base Hypothesis (MBH): [Whitman's (27)]

The major syntactic categories of Japanese consists only of NP and VP. The possible expansions of the category NP include N, N+P (Postposition), Adverb and S. Oblique postpositions are inserted under P by the rules of lexical insertion. The nominative marker ga and the accusative marker o are inserted by transformation.

Then he proposes the following base rules:

(5) [Whitman's (28)]

$$S \longrightarrow NP(NP)(NP)(NP)VP$$

$$NP \longrightarrow \begin{cases} N \\ N+P \\ ADV \\ S \end{cases}$$

By letting the two case markers, ga and o, be introduced transformationally in random order within simplex sentences, Whitman eliminates the need for a rule of Scrambling.[1] He writes:

> The first five arguments.... which involve problems with the formulation of Scrambling itself, are of course irrelevant to the MBH. The next three arguments, which involve contexts where Scrambling as formulated in (7) [our (2)] ungrammatically scrambles elements out of embedded clauses, are also no problem for the MBH, which does not move anything at all. (p.350)

Whitman offers some account for the points (3i-l). In spite of a further extension of his grammatical machinery, however, they are not convincing.

Problems for Whitman's analysis. Whitman's decision to eliminate the oblique postpositional category from the major syntactic categories is based on his observation that in Japanese both case marked NPs and oblique postpositional phrases have the same surface form, i.e., an NP and a particle following it. Whitman states:

> There is little reason for distinguishing separate categories of NP and PP in Japanese. All nominal complements receive postpositional case marking. Japanese semantic equivalents of English NPs and PPs do not fall into any neat class of non-oblique and oblique cases. Thus,...a categorial distinction between NP and PP is more obviously unnecessary than it is in English. (p.344)

His observation neglects the fact that a simple adverbial expression, one which does not consist of an NP plus a particle, can also participate in Scrambling. This is illustrated in the following:

(6)	a.	John-ga subj	uta-o song-obj	hakkiri clearly	utat-ta. sing-past
	b.	John-ga	hakkiri	uta-o	utat-ta.
	c.	Uta-o	John-ga	hakkiri	utat-ta.
	d.	Uta-o	hakkiri	John-ga	utat-ta.
	e.	Hakkiri	John-ga	uta-o	utat-ta.
	f.	Hakkiri	uta-o	John-ga	utat-ta.

'John sang a song clearly.'

The word hakkiri is a verb phrase adverb and does not have the form of an NP followed by a particle. This means that such phrases can be generated only by expanding NP into Adverb. This is objectionable, however, since the distributional properties of the two category expressions are not the same. To mention a few, adverb phrases do not take a subject marker or an object marker; they cannot be modified by a relative clause; nor can they be followed by a genitive particle. Thus Whitman's analysis is viable only if distributional differences between adverbs and NPs are ignored.

Another problem of Whitman's analysis is that it allows a lot of undesirable strings to be generated. In particular, as Whitman himself acknowledges, it generates strings that contain NPs with no case marking. Whitman asserts that the interpretation of grammatical relations of NP complements in Japanese is accomplished on the basis of case marking. By invoking a principle of interpretation, he attempts to filter out sentences containing non-case marked NPs by considering them as semantically uninterpretable. However, since he does not show exactly how that basic principle works, the semantic aspect of Scrambling is left completely open.

A categorial treatment. What Whitman's claim amounts to is that the rule of Scrambling should be eliminated because it is not a permissible rule. His claim is premature because he has not proven that no rule of a permissible type can be given for Scrambling. He has only shown that all the rules proposed so far are not of a permissible type, but there is no reason to eliminate a Scrambling rule from Japanese if it is possible to formulate one that is permissible. I will show later how this can be done.

As pointed out above, Whitman's alternative analysis has the following two problems: (i) although his Minimal Base Hypothesis enables one to postulate a single category, NP, as the sole participant of the Scrambling phenomenon, his analysis is only effective as long as Scrambling involves case marked NPs or postpositional phrases, lacking an account of the fact that simple adverb phrases can freely participate in Scrambling; (ii) it gives no semantic account of the grammatical relations of scrambled constituents. Since one of the strongest motivations for postulating a rule of Scrambling is to explain the truth functional equivalence among the Scrambled variants, any remedial attempt must also address this issue. It seems pointless to provide only a syntactic analysis without semantics.

In the following, I will present a way to directly generate Scrambled variants of a simplex sentence in terms of a categorial grammar which involves a compositional syntax and semantics and is constructed on the basis of a "procedural assumption that in the absence of good evidence to the contrary, no surface construction should be treated as arising secondarily from some putative antecedent structure" (cf. Stump 1979:472).

In proposing my analysis, I will assume familiarity with Montague grammar and will accordingly present the fragment very informally, due to space limitation and for ease of exposition.

Fragment. Table I will serve as our initial lexicon. Listed in the leftmost column are the syntactic categories that will be at our disposal.

Categorial definitions into which syntactic and semantic information can be encoded are listed in the second column. In the right-most column, we list basic expressions and their respective translations.

Because of Montague's requirement that there be a unique semantic type for each syntactic category, we have been forced to postulate several categories for verbs. Since this does not enable us to capture the syntactic and morphological properties of category verb, we will adopt Cooper's (1975) suggestion and allow our type assignment function f to range over subcategorization features of verbs. Once this move is made, there is no difference between the number of categories that need to be postulated in a categorial analysis of a fragment and the number of subcategorization features needed in a comparable standard analysis.

Table I

categories	category definitions	basic expressions	translations
NP		Bill	$\lambda V^{<s,<e,t>>} V(b)$
		Mary	$\lambda V^{<s,<e,t>>} V(m)$
		John	$\lambda V^{<s,<e,t>>} V(j)$
		sono hon	that' (^book')
		sono gakkoo	that' (^school')
IV		aruk-	walk'
TV		mi-	see'
DTV		age-	give'
Sbuj.P.	(S/IV)/NP	ga	$\lambda V_1^{<s,f(NP)>} \lambda V_2^{<s,f(IV)>} V_2(V_1)$
Obj.P.	(IV/TV)/NP	o	$\lambda V_1^{<s,f(NP)>} \lambda V_2^{<s,f(TV)>} V_2(V_1)$
Dat.P.	(TV/DTV)/NP	ni	$\lambda V_1^{<s,f(NP)>} \lambda V_2^{<s,f(DTV)>} V_2(V_1)$
Post.P.	(IV/IV)/NP	de	in'
Past P.	$\overline{S}/S$	ta	$\lambda V^{<s,t>} H(V)$

A word about the notation is in order. NP, IV, TV, and DTV mean noun phrase, intransitive verb phrase, transitive verb phrase, and ditransitive verb phrase categories respectively. We assume that function g has mapped all the basic linguistic expressions into expressions of intentional logic, which are listed under the translation column.

By $V^{<f(X)>}$ is meant a variable ranging over expressions of type <f(X)>, for any syntactic category X. H is the past tense operator whose semantic type is <<s,t>,t>.

We have the following type assignment.

f(NP)=<<s,<e,t>>,t> f(TV)=<<s,f(NP>,f(IV)>

f(IV)=<<s,f(NP)>,t> f(DTV)=<<s,f(NP)>,f(TV)>

Type assignment for other categories can be obtained by recursively applying type assignment function f.

The syntactic rules of the fragment are divided into two types --- rules of functional application (those that utilize either left- or right concatenation straightforwardly) and rules of non-functional application (those that utilize transformation like operation).

(7) Rules of Functional Application.

S_1. If $\alpha \in P_{(S/IV)/NP}$ and $\beta \in P_{NP}$, then $F_1(\alpha,\beta) \in P_{S/IV}$, where $F_1(\alpha,\beta) = \beta\alpha$ and translates as $\alpha'(\hat{}\beta')$.

S_2. If $\alpha \in P_{(IV/TV)/NP}$ and $\beta \in P_{NP}$, then $F_1(\alpha,\beta) \in P_{IV/TV}$, where $F_1(\alpha,\beta) = \beta\alpha$ and translates as $\alpha'(\hat{}\beta')$.

S_3. If $\alpha \in P_{(TV/DTV)/NP}$ and $\beta \in P_{NP}$, then $F_1(\alpha,\beta) \in P_{TV/DTV}$, where $F_1(\alpha,\beta) = \beta\alpha$ and translates as $\alpha'(\hat{}\beta')$.

S_4. If $\alpha \in P_{S/IV}$ and $\beta \in P_{IV}$, then $F_2(\alpha,\beta) \in P_{IV}$, where $F_2(\alpha,\beta) = \alpha\beta$ and translates as $\alpha'(\hat{}\beta')$.

S_5. If $\alpha \in P_{IV/TV}$ and $\beta \in P_{TV}$, then $F_2(\alpha,\beta) \in P_{IV}$, where $F_2(\alpha,\beta) = \alpha\beta$ and translates as $\alpha'(\hat{}\beta')$.

S_6. If $\alpha \in P_{TV/DTV}$ and $\beta \in P_{DTV}$, then $F_2(\alpha,\beta) \in P_{TV}$, where $F_2(\alpha,\beta) = \alpha\beta$ and translates as $\alpha'(\hat{}\beta')$.

S_7. If $\alpha \in P_{\overline{S}/S}$ and $\beta \in P_S$, then $F_1(\alpha,\beta) \in P_{\overline{S}}$, where $F_1(\alpha,\beta) = \beta\alpha$ and translates as $\alpha'(\hat{}\beta')$.

S_8. If $\alpha \in P_{IV/IV}$ and $\beta \in P_{IV}$, then $F_2(\alpha,\beta) \in P_{IV}$, where $F_2(\alpha,\beta) = \alpha\beta$ and translates as $\alpha'(\hat{}\beta')$.

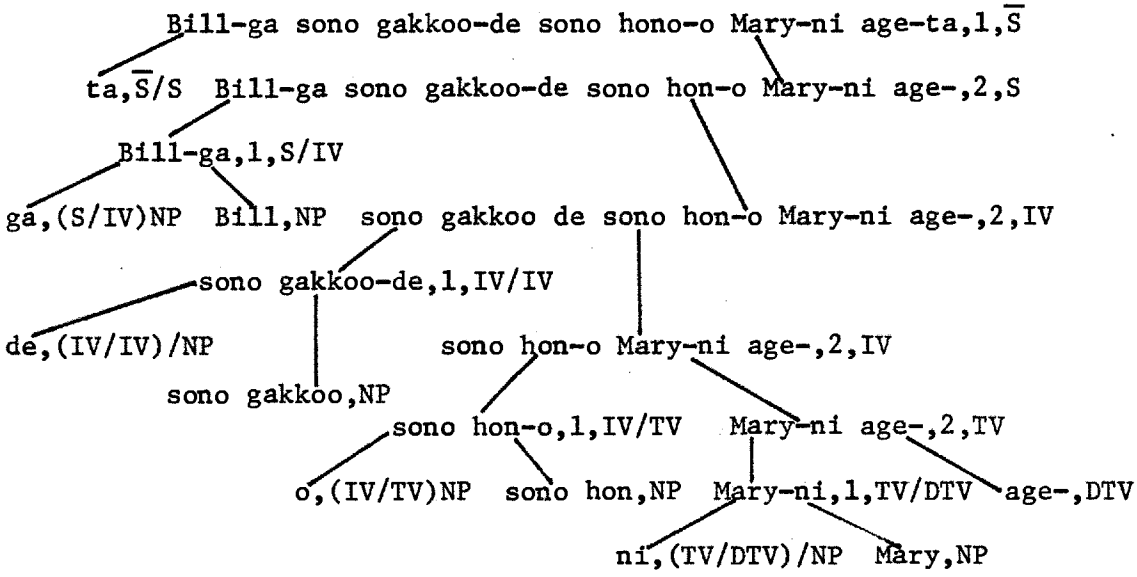
S_9. If $\alpha \in P_{(IV/IV)/NP}$ and $\beta \in P_{NP}$, then $F_1(\alpha,\beta) \in P_{IV/IV}$, where $F_1(\alpha,\beta) = \beta\alpha$ and translates as $\alpha'(\hat{}\beta')$.

S_1 is our subject-phrase producing rule which combines subject marker ga and an NP expression. S_2 is our object-phrase producing rule which combines object marker o and NP expression. S_3 is our dative-phrase producing rule which combines dative object marker ni and an NP expression. S_4 combines a subject phrase expression and an intransitive verb phrase expression, producing an infinitival clause expression. S_5 takes an object phrase expression and a transitive verb phrase expression as input and produces an intransitive verb phrase expression. S_6 combines a dative object phrase expression and a ditransitive verb phrase expression. S_7 adds the past tense marker ta to an infinitival clause expression, producing a tensed clause expression. S_8 combines an adverb phrase expression and an intransitive verb phrase expression, producing a new intransitive verb phrase expression. S_9 combines a postposition expression and an NP expression, yielding an adverb phrase expression.

In a derivation of example (8), rules S_1 - S_9 have been applied once each.[2]

(8) Bill-ga sono gakkoo-de hono-o Mary-ni age-ta
subj that school in book obj dat give-past
'Bill gave Mary that book in that school.'

(9)



Analysis tree (9) has the following semantic derivation.

(10)

i) ni' $\lambda V_1^{<s,f(NP)>}\lambda V_2^{<s,f(DTV)>}V_2(V_1)$

ii) Mary' $\lambda V^{<s,<e,t>>}V(m)$

iii) Mary-ni' $\lambda V_1^{<s,f(DTV)>}V_1(\lambda V_2^{<s,<e,t>>}V_2(m))$:S_3

iv) age-' give'

v) Mary-ni age-' give' $(\lambda V^{<s,<e,t>>}V(m))$:S_6

vi) o' $\lambda V_1^{<s,f(NP)>}\lambda V_2^{<s,f(TV)>}V_2(V_1)$

vii) sono hon' that' (^book')

viii) sono hon-o' $\lambda V^{<s,f(TV)>}V$(that'(^book')) :S_2

ix) sono hon-o Mary-ni age-'

give'($\lambda V^{<s,<e,t>>}V(m)$)(that'(^book')) :$S_5$

x) de' in'

xi) sono gakkoo' that' (^school')

xii) sono gakkoo de' in'(^that'(^school')) :S_9

xiii) sono gakkoo de sono hon-o Mary-ni age-'

in'(^that'(^school'))(^give'($\lambda V^{<s,<e,t>>}V(m)$)(that'(^book)))

xiv) ga' $\lambda V_1^{<s,f(NP)>}\lambda V_2^{<s,f(IV)>}V_2(V_1)$

xv) Bill' $\lambda V^{<s,<e,t>>}V(b)$

xvi) Bill-ga' $\lambda V_1^{<s,f(IV)>}V(\lambda V_2^{<s,<e,t>>}V_2(b))$:S_1

xviii) ta' $\lambda V^{<s,t>}H(V)$

xix) Bill-ga sono gakkoo de sono hon-o Mary-ni age-ta'

H(in'(^that'(^school'))(give'($\lambda V_1^{<s,<e,t>>}V(m)$)(that'(^book'))

$(\lambda V_2^{<s,t>>}V(b))))$:S_7

xx) Bill-ga sono gakkoo de sono hon-o Mary-ni age-ta'

H(in'(^that'(^school'))(give'($\lambda V^{<s,<e,t>>}V(m)$)(that'(^book'))(b))

:MP_1

The final line expresses what example (8) means.

It is obvious that no scrambled variants can be generated by rules S_1 - S_9. To obtain them, we need to add one more rule.

Before stating our scrambling rule, we introduce the following two new definitions which enable us to utilize rule schemata to simplify the present fragment. The first definition specifies the property 'verb.'

(11) Category A has the property 'verb' iff for all α, $\alpha \in A$,

i) α is conjugable

ii) α is unbound (= not a suffix).

The first clause utilizes a morphological property to distinguish verbs and auxiliary verbs from the rest of the syntactic categories. The second clause distinguishes the main verbs from the auxiliary verbs.

The second definition characterizes the property 'Pred.'

(12) Category A has the property 'Pred' iff for all α, $\alpha \in A$,

i) $\alpha = \alpha_1\alpha_2$

ii) $\alpha \in B\in$ 'verb'

Definition (12) is a different way of stating the verb final constraint in Japanese by stipulating that the heads of verb phrases (intransitive, transitive, ditransitive, etc. verb phrases) and infinitival clauses are verbs.[3]

By making use of definitions (11) and (12), we can collapse rules S_4 - S_6 and S_8 through schematization.

(13) S_{10}. If $\alpha \in P_{X/Y}$ and $\beta \in P_Y$, where $X,Y \in$ Pred, then $F_2(\alpha,\beta) \in P_X$, where $F_2(\alpha,\beta) = \alpha\beta$ and translates as $\alpha'(\hat{}\beta')$.

For expository convenience, we will fix the set 'Pred' until further addition is needed.

(14) Pred={ S,IV,TV,DTV }

The definition of 'Pred' prevents any expression which is not a member of the categories listed in (14) from participating in rule S_{10}. The generalization that is captured by the use of rule S_{10} is that the introduction of case marked NPs and adverb phrases in a derivation is achieved by a single rule.

The following is a categorial rule for Scrambling that utilizes a transformation like structural operation F_3, performing an infixation operation and concatenation simultaneously.

(15) S_{11}. If $\alpha \in P_{W/X}$ and $\beta \in P_X$, then $F_3(\alpha,\beta) \in P_W$, where $F_3(\alpha,\beta) = \beta_1\beta_2\alpha\beta_3$, where $\beta=\beta_1\beta_2\beta_3$, $\beta_2 \in P_{Y/Z}$, and W,X,Y,Z $\in$ Pred, and $F_3(\alpha,\beta)$ translates as $\alpha'(\hat{}\beta')$.

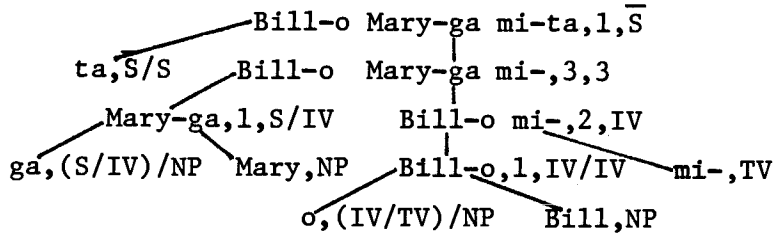
A brief remark about S_{11} seems to be in order. This rule is not a Scrambling rule in the usual sense, i.e., it does not change the order of constituents in a string. However, it has a similar effect because it allows the same constituents to be combined in more than one order. The categories of type X/Y, where X and Y are in Pred, are case marked NPs and adverbs.

How rule S_{11} treats scrambled sentences can be best seen by considering the following example.

(16) Bill-o Mary-ga mi-ta.
obj subj see-past
'Mary saw Bill.'

This example can be generated as follows.[4]

(17)



Analysis tree (17) has the following semantic derivation.

(18)

i) o' $\lambda V_1^{<s,f(NP)>} V_2^{<s,f(TV)>} V_2(V_1)$

ii) Bill' $\lambda V^{<s,<e,t>>} V(b)$

iii) Bill-o' $\lambda V_1^{<s,f(TV)>} V_1(\ V_2^{<s,\ e,t>>} V_2(b))$:S_2

iv) mi-' see'

v) Bill-o mi-' see'$(\lambda V^{<s,<e,t>>} V(b))$:S_1

vi) ga' $\lambda V_1^{<s,f(NP)>} \lambda V_2^{<s,f(IV)>} V_2(V_1)$

vii) Mary' $\lambda V^{<s,<e,t>>} V(m)$

viii) Mary-ga' $\lambda V_1^{<s,f(NP)>} V_1(V_2^{<s,<e,t>>} V_2(m))$:S_1

ix) Bill-o Mary-ga mi-'
see' $(\lambda V_1^{<s,<e,t>>} V_1(b))(V_2^{<s,<e,t>>} V_2(m))$:S_1

x) ta' $\lambda V^{<s,t>} H(V)$

xi) Bill-o Mary-ga mi-ta'
$H(see'(\lambda V_1^{<s,<e,t>>} V_1(b))(V_2^{<s,\ e,t>>} V_2(m)))$:S_7

xii) Bill-o Mary-ga mi-ta'
$H(see'(\lambda V^{<s,<e,t>>} V\ (b))(m)$:MP_1

The final line expresses what example (16) means.

A scrambled sentence with a DTV, an adverb phrase, or a postpositional phrase can be generated in a similar fashion.

Discussion and possible extensions of the fragment. In the following, we will consider the Scrambling rule, S_{11}, of the present fragment with respect to Whitman's twelve arguments against maintaining a Scrambling rule in Japanese. We will also indicate how copular sentences, reduced clauses, and double-ga constructions can be described within the present fragment.[5]

Whitman's argument (3a), 'Scrambling is a variable moving rule,' is irrelevant since in the present analysis nothing is moved.

Argument (3b), 'Scrambling applies infinitely to its own output,' is also irrelevant in the present analysis because the expression that results from the application of rule S_{11} is in a different syntactic category. Consequently, S_{11} never applies infinitely to its own output.

Argument (3c) is irrelevant because any violation of cyclicity can be ruled out by island conditions.

Whitman's criticism (3d) is motivated by his observation that Scrambling cannot be constrained by the upward bounding condition. His argument, however, is not convincing.

In order to justify (3d), Whitman has adopted Kuno's (1973) complex structure analysis for the Japanese thematic construction and presents the following:

(19) [$_s$ Zoo-wa [$_s$ hana-ga naga-i]] (Whitman's (10))
elephant-top nose-subj long-pres

'As for an elephant, its nose is long.'

(20) Hana-ga zoo-wa naga-i. (Whitman's (11))
'the same interpretation as in (19)'

Whitman writes:

> If we accept the structure in (10) [our (19)] for thematic sentences, then (11) [our (20)], which is perfectly possible, is a violation of the upward bounding condition on Scrambling. (p.346)

Now it is true that both (19) and (20) share the same interpretation. However, this fact alone is not sufficient to conclude that every sentence of the structural form (19) has a counterpart of the form (20). Notice that (21), which Kuno uses to motivate his Thematization analysis, has only an ungrammatical counterpart, namely (22).

(21) [$_S$ Sakana-wa [$_S$ tai-ga i-i]]
fish-top redsnapper-subj good-pres

'As for fish, redsnapper is the best.'

(22) *Tai-ga sakana-wa ii.

The contrast between (20) and (22) suggests that the exact grammatical properties of the thematic construction is still controversial and not completely understood. Thus for the time being, it seems premature to conclude anything one way or the other about upward bounding with regard to these constructions.

Arguments (3e,f,g,h) do not directly apply to the present analysis because it does not utilize the relativized A-over-A principle. However, a notion of island has to be somehow captured in the present framework because in a larger fragment containing sentential embedding structures, such a constraint is needed to block generation of undesirable strings like (23b).

(23) a. John-ga hon-o Bill-ga watasi-ta hito-ni at-ta.
subj book-obj subj hand-past person-dat meet-past

'John met the person to whom Bill handed the book.'

b. *Hon-o Bill-ga John-ga watasi-ta hito-ni at-ta.

In (23), the infixation of expression John-ga into a relative clause must be avoided. Actually, an infixation of an expression into an embedded sentence in general through rule S_{11} has to be blocked. To make this possible, we need to have something like Chomsky's Propositional Island Constraint (PIC), however stated.[6]

That some constraint is needed to restrict the application of S_{11} should not be taken as a piece of evidence against maintaining a Scrambling rule in Japanese, however, because all it means is that rule S has to be constrained by a PIC-like constraint like any other rule needing some constraint.

Some extensions. In the following, we will make some suggestions for the treatments of 1) copular sentences, 2) the reduced clause that Whitman discusses, and 3) the two types of double-ga constructions.[7]

Copular sentences. Point (3i) is concerned with an undesirable effect of a Scrambling rule on copular sentences that is formulated in such a way that it permutes arbitray NPs. Observe the following examples.

(24). a. Bill-ga Taroo no sensei desi-ta.
subj 's teacher be-past

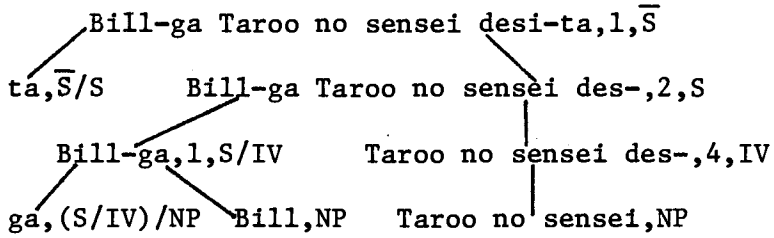
b. *Taroo no sensei Bill-ga desi-ta

Notice that the predicate nominal, e.g., Taroo no sensei in (24a), cannot be followed by a case marking particle. This means that a rule that introduces other complements cannot introduce the predicate nominal. A special rule is needed just to treat it. Since in many languages copular sentences display idiosyncratic peculiarities, my decision to postulate a separate rule for the copular construction in Japanese is not a new idea.[8]

(25) S_{12}. If $\alpha \in P_{NP}$, then $F_4(\alpha) \in P_{IV}$, where $F_4(\alpha)=\alpha$des
and translates as $\lambda V^{<s,f(NP)>}[\check{}V=\check{}\alpha']$.

Example (24a) has the following derivation.

(26)



Analysis tree (26) has the following semantic derivation.

(27)

i) Taroo no sensei' s'(^Taroo')(^teacher')

ii) Taroo no sensei des-'
$\lambda \check{V}^{<s,f(NP)>}[\check{}V=\check{}(s'(\hat{}Taroo')\ (\hat{}teacher'))]$

iii) ga' $\lambda V_1^{s,f(NP)}\ \lambda \check{V}_2^{<s,\ f(IV)>} V_2(V_1)$

iv) Bill' $\lambda \check{V}^{<s,<e,t>>} V(b)$

v) Bill-ga' $\lambda \check{V}_1^{<s,f(IV)>} V_1(\lambda \check{V}_2^{<s,<e,t>>} V_2(b))$

vi) Bill-ga Taroo no sensei des-'
$[^{v}(\lambda V^{<s,\ <e,\ t>>}V_1(b)) = {}^{v}(s'(\hat{}Taroo')\ (\hat{}teacher'))]$:S_{10}

vii) ta' $\lambda V^{<s,t>}H(V)$

viii) Bill-ga Taroo no sensei desi-ta'
$H\ [^{v}(\lambda V_1^{<s,\ <e,t>>}V_1(b)) = {}^{v}(s'(\hat{}Taroo')(\hat{}teacher'))]$:S_7

Notice that S_{11} cannot be used to combine Bill-ga and Taroo no sensei des- in the derivation of (26) because the second expression will not satisfy the input specification of S_{11}. Thus undesirable strings like (24b) will not be generated.

Reduced clauses. Point (3j) is about undesirable effect that a rule of Scrambling might have on reduced clauses. First, Whitman assumes that sentence pairs like (28a,b) are transformationally related through the rule of Subject-to-Object Raising, whose effect is to raise the embedded subject phrase into the matrix clause, making it an object phrase.[9]

(28) [Whitman's (19)]

a. Boku-ga John-ga baka da to omot-ta.
I-subj subj idiot is Comp think-past
'I thought that John was an idiot.'

b. Boku-ga John-o baka to omot-ta.
subj obj idiot think-past
'the same interpretation as in (28a)'

Whitman claims that since in (28b), the copular NP has been changed into an NP plus a postposition, it should be possible to have Scrambling in it. This prediction is false since the result of Scrambling (28b) is bad as shown in (29).

(29) *Boku-ga baka to John-o omot-ta. (Whitman's (21b))

Whitman's criticism (that Scrambling might scramble an NP in a reduced clause yielding a bad result) is valid if and only if we accept transformational relatedness between (28a) and (28b). However, if it is possible to obtain (28b) independently (i.e., not as a secondary expression derived from underlying structure (28a)) and if expressions like baka to are not analyzed as an NP plus a particle, (3j) would lose its force.

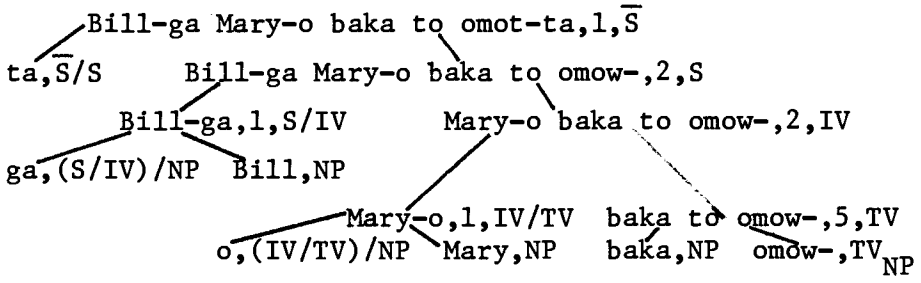
There is no reason to assume that a structure like (28b) has to be derived transformationally. [10]For instance, it can be generated directly in the following way.[11]

(30) S_{13}. If $\alpha \in P_{TV_{NP}}$ and $\beta \in P_{NP}$, then $F_5(\alpha,\beta) \in P_{TV}$, where $F_5(\alpha,\beta)$=βtoα and translates as $\alpha'(\hat{}\beta')$.

A few remarks are in order. TV_{NP}, where $f(TV_{NP})$=<<s,f(NP>,f(TV)> is a verb subcategory that takes an expression of the form an NP plus particle to to yield a TV phrase expression.[12] The members of this category consist of those verbs whose distributional properties are the same as those of omow- in example (28b). [13, 14]

Example (28b) can be generated with the help of S_{13} as follows:

(31)



Analysis tree (31) has the following semantic derivation.[15]

(32)

i) baka' $\lambda V^{<s,<e,t>>} \exists x[idiot'(x) \wedge V(x)]$

ii) omow-'
$\lambda V_1^{<s,f(NP)} \lambda V_2^{<s,f(NP)>} \lambda V_3^{<s,\ f(NP)>}$ think' $(V_1)(V_2)(V_3)$

iii) baka to omow-'
$\lambda V_1^{<s,\ f(NP)>} \lambda V_2^{<s,f(NP)>}$ think'$(\lambda V_3^{<s,<e,t>>} \exists x[idiot'(x) \wedge V_3(x)])$
$(V_1)(V_2)$:S_{13}

iv) o' $\lambda V_1^{<s,f(NP)>} \lambda V_2^{<s,f(TV)>} V_2(V_1)$

v) Mary' $\lambda V^{<s,<e,t>>} V(m)$

vi) Mary-o' $\lambda V_1^{<s,f(TV)>} V_1(\lambda V_2^{<s,<e,t>>} V_2(V_1))$

vii) Mary-o baka to omow-'
$\lambda V_1^{<s,f(NP)}$ think'$(\lambda V_2^{<s,<e,t>>} \exists x[idiot'(x) \wedge V_2(x)])$
$(\lambda V_3^{<s,<e,t>>} V_3(m))(V_1)$:S_{10}

viii) ga' $\lambda\hat{V}_1^{<s,f(NP)}\ \lambda\hat{V}_2^{<s,\ f(IV)>}V_2(V_1)$

ix) Bill' $\lambda\hat{V}^{<s,<e,t>>}V(b)$

x) Bill-ga' $\lambda\hat{V}_1^{<s,f(IV)>}V_1(\lambda\hat{V}_2^{<s,<e,t>>}V_2(b))$:S_1

xi) Bill-ga Mary-o baka to omow-'

$\text{think}'(\lambda\hat{V}_1^{<s,<e,t>>}\exists x[\text{idiot}'(x)\wedge V_1(x)])(\lambda\hat{V}_2^{<s,<e,t>>}V_2(m))$
$(\lambda\hat{V}_3^{<s,<e,t>>}V_3(b))$:S_{10}

xii) ta' $\lambda\hat{V}^{<s,t>}H(V)$

xiii) Bill-ga Mary-o baka to omot-ta'

$H(\text{think}'(\lambda\hat{V}_1^{<s,<e,t>>}\exists x[\text{idiot}'(x)\wedge V_1(x)])(\lambda\hat{V}_2^{<s,<e,t>>}V_2(m))$
$(\lambda\hat{V}_3^{<s,\ <e,t>>}V_3(b)))$:S_7

xiv) Bill-ga Mary-o baka to omot-ta'

$H(\text{think}''(\hat{}(\check{}(\lambda\hat{V}_1^{<s,<e,t>>}\exists x[\text{idiot}'(x)\wedge V_1(x)]) = \check{}(\hat{V}_2^{<s,<e,t>>}V_2(m))$
$(\lambda\hat{V}_3^{<s,<e,t>>}V_3(b))$:MP_2

xv) Bill-ga Mary-o baka to omot-ta'

$H(\text{think}''(\hat{}(\check{}(\lambda\hat{V}_1^{<s,<e,t>>}\exists x[\text{idiot}'(x)\wedge V_1(x)]) = \check{}(\lambda\hat{V}_2^{<s,<e,t>>}V_2(m)))(b)$

:MP_1

Notice that in the derivation of (28b), namely (31), the expression baka to is not analyzed as a member of category X/Y, where X and Y are in Pred. This means that the expression and the verb 'omow-' will be kept intact, making its detachment impossible. Consequently, we will not have undesirable strings like (29).

Also notice that in the present analysis a subject expression and an object expression in structures like (28b) can be interchanged. This prediction is borne out by the grammaticality of example (33).

(33) Mary-o Bill-ga baka to omot-ta.
obj subj idiot Comp think-past

Double-ga constructions. Points (3k,l) are about two types of double-ga constructions and Scrambling.

(3k) is about the a double-ga construction, which has been dubbed Subjectivization by Kuno (1973). This process is stated in such a way that it converts a sentence initial NP marked by the genitive marker no into an NP marked by particle ga. Observe the following example.

(34) John no kodomo-ga sensei-ni sikar-are-ta (Whitman's (22a))
's child-subj teacher-by scold-passive-past
'John's child was scolded by the teacher.'

(35) John-ga kodomo-ga sensei-ni sikar-are-ta. (Whitman's (22b))
'the same interpretation as in (34)'

Applying Scrambling to (35), according to Whitman, will produce a bad result as shown in (36).

(36) *Kodomo-ga John-ga sensei-ni sikar-are-ta.

The validity of point (3k) depends on one's analysis of this particular double-ga construction. If there is a way to analyze double-ga sentence through a rule which fixes the position of the initial NP-ga expression, then strings like (36) will not be generated.

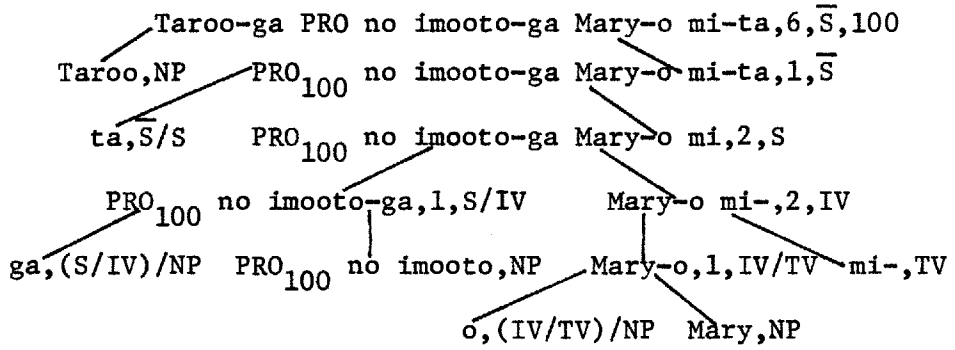
Kuno (1973) observes that the double-ga construction in question is only possible if and only if the initial ga marked NP is understood as transformationally derived from the left-most expression of the expression whose head is the second ga marked NP. We will adopt this and state the following rule.[17]

(37) S_{14}. If $\alpha \in P_{NP}$ and $\beta \in P_{\overline{S}}$, then $F_{6,n}(\alpha,\beta) \in P_{\overline{S}}$, where $F_{6,n}(\alpha, \beta)=\alpha\text{-ga}\gamma$, where $\beta=\beta_1\beta_2$, $\beta_1=PRO_n\delta \in P_{S/IV'}$ and γ is obtained from β by replacing all occurrences of PRO_n in β by PRO respectively, and $F_{6,n}(\alpha,\beta)$ translates as $\lambda V_n^{<s,f(NP)>}\ \beta\ (\hat{}\alpha')$.

Example (38) has derivation (39).

(38) Taroo-ga imooto-ga Mary-o mi-ta.
subj sister-subj obj see-past
'Taroo's sister saw Mary.'

(39)



Analysis tree (39) has the following semantic derivation.

(40)

i) o' $\lambda\hat{V}_1^{<s,\,f(NP)>}\,\lambda\hat{V}_2^{<s,\,f(TV)>}\,V_2(V_1)$

ii) Mary' $\lambda\hat{V}_1^{<s,<e,t>>}\,V(m)$

iii) Mary-o' $\lambda\hat{V}_1^{<s,\,f(TV)>}\,V_1(\lambda\hat{V}_2^{<s,<e,t>>}\,V_2(m))$:S_2

iv) mi-' see'

v) ga' $\lambda\hat{V}_1^{<s,\,f(NP)>}\,\lambda\hat{V}_2^{<s,\,f(IV)>}\,V_2(V_1)$

vi) PRO_{100} no imooto' $s'(\hat{V}_{100}^{<s,f(NP)>})(\hat{}sister')$

vii) PRO_{100} no imooto-ga $\lambda\hat{V}_1^{<s,\,f(IV)>}\,V_1(s'(\hat{V}_{100}^{<s,\,f(NP)>})(\hat{}sister'))$:S_1

viii) PRO_{100} no imooto-ga Mary-o mi-'

see' $(\lambda\hat{V}_1^{<s,<e,t>>}\,V_{1(m)})(s'(\hat{V}_{100}^{<s,\,f(NP)>})(\hat{}sister'))$:S_{10}

ix) ta' $\lambda\hat{V}^{<s,t>}\,H(V)$

x) PRO_{100} no imooto-ga Mary-o mi-ta'

$H(see'(\lambda\hat{V}_1^{<s,<e,t>>}\,V_1(m))(s'(\hat{V}_{100}^{<s,\,f(NP)>})(\hat{}sister')))$

xi) Taroo' $\lambda\hat{V}_1^{<s,<e,t>>}\,V_1(t)$

xii) Taroo-ga PRO no imooto-ga Mary-o mi-ta'

$H(see'(\lambda\hat{V}^{<s,<e,t>>}\,V(m))(s'(\hat{}Taroo')(\hat{}sister')))$:S_{14}

The final line in the above derivation expresses what example (38) means.

The present anlysis predicts that it is possible to dislocate the second ga marked NP as long as it does not cross-over the first NP-ga expression. This prediction will be borne out by examples in (41).

(41) a. Taroo-ga Mary-o imooto-ga mi-ta.
'Taroo's sister saw Mary.'

b. *Imooto-ga Taroo-ga Mary-o mi-ta.

Point (31) is concerned with another kind of double-ga construction.

In Japanese, logical objects of certain stative verbs are expressed by an NP marked by particle ga.

(42) Gombei-ga natoo-ga suki da. (Whitman's (25a))
soybeans like be

'Gombei likes (fermented) soybeans.'

Scrambling the two NP-ga expression will generally produce an awkward result.

(43) *Natto-ga Gombei-ga suki da. (Whitman's (25b))[18]

'ungrammatical only with the same interpretation as (42)'

Whitman states:

> .... it is clear that if Scrambling is allowed to apply (25a) [our (42)], it will produce (b) (our (43)]. It is not clear how this can be blocked. (p.349)

Kuno (1980a, b) proposes a functional constraint to block the application of Scrambling in structures like double-ga construction. I conjecture, however, that we might want to provide an explanation of the alleged unambiguity of structures like (43) from a point of view of parsing strategy.

Before we consider (31) directly, let us digress a bit and consider similar cases in English for which some explanation has been provided.

Frazier and Fodor (1978) propose a principle of minimal attachment to explain the preferred interpretations of (44)-(46).[19]

(44) Joe called the friend who had smashed his new car up. (F-F's (3))

(45) Joe bought the book for Susan. (F-F's (13))

(46) Joe bought the book that I had been trying to obtain for Susan. (F-F's (15))

Frazier and Fodor notes:

> The preference for low attachments is so strong that it persists even in unambiguous sentences where only a higher attachment would lead to a syntactically and semantically coherent phrase marker. Sentences (70 - (10) [our (47) - (50)] all tend to be misanalyzed on a first pass. (p.297)

(47) Joe looked the friend who had smashed his new car up.

(48) John read the note, the memo and the newspaper to Mary.

(49) I met the boy whom Sam took to the park's friend.

(50) The girl applied for the jobs that was attractive.

Returning to our example (43), why is it hard to obtain the non-silly reading of it? An answer to this question may vary depending on how one wants to treat the phenomenon exemplified by (43). From a point of view of parsing strategy, however, it is quite possible to provide an explanation parallel to the one that Frazier and Fodor give to the English cases. Suppose that the principle of minimal attachment is operating in Japanese. Then in order to cope with the ambiguity created by the homophony of the subject marker ga and the object marker ga for the stative verbs (like that of the dative for and the benefactive for in English), the principle will persuade the parser to analyze the second NP-ga (the one that is closer to the verb) as part of a lower node (i.e., the object phrase) rather than as part of a higher node (i.e., the subject phrase).[20] This explanation follows directly from the general assumption that the human parser is enriched with a mechanism which is assumed to function to minimize computation during parsing.

Reflexivization. Before concluding this paper, I would like to discuss briefly how to treat Reflexivization in the present analysis.

It is well-known that Scrambling does not affect the coreferential relation between the trigger NP and the reflexive form. In order to capture this fact, N. McCawley (1976) has formulated her rule of Reflexivization in such a way that it must refer to the underlying precedence of the trigger NP and is ordered prior to Scrambling. A parallel approach is not open for the present analysis because of the prohibition of the use of extrinsic ordering in the framework. So, in the following, I will offer a semantic treatment of the phenomenon, aiming at capturing the following two facts: (a) in a simplex sentence a reflexive form is coreferential with the subject NP of the sentence, and (b) Scrambling does not affect this relation.

We will make two working assumptions: (a) reflexive forms are base-generated, and (b) they translate into an NP type meaning containing a distinguished variable of type <e> (i.e., r for Reflexivization).

Using Cooper's (1978) obligatory binding of the stored meaning, we state the following convention for the retrieval of reflexive meaning.[21]

(51) Reflexive NP Retrieval:

Given an intentional logic expression, α

iff

i) $\alpha \in ME_{<f(IV)>}$

ii) α contains at least one occurrence of $\lambda V^{<s,<e,t>>} V(r)$

iii) the store contains $< \lambda V^{<s,<e,t>>} V(r), V_n^{<s,f(NP)>} >$

then there is an option to retrieve the stored meaning and replace α by

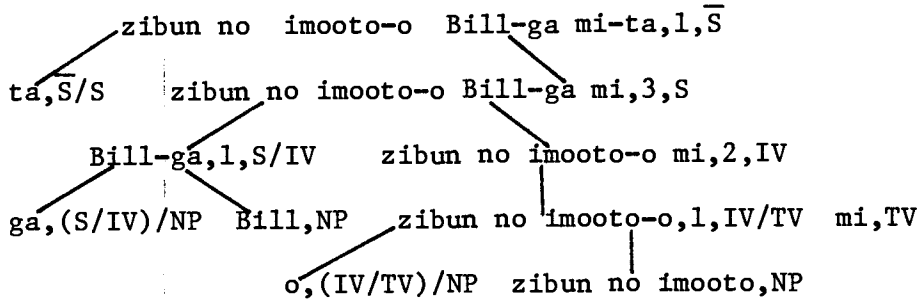
$$\lambda V_n^{<s,f(NP)>} V_n\{\hat{r}[\alpha\ \lambda V^{<s,<e,t>>} V(r))]\}$$

The subject antecedent condition is captured by (a) letting Reflexivization operate as a special variable binding at the IV type expression level --- condition (i) insures this, and (b) by formulating the translation with the use of distinguished variable r. Condition (i) has the same affect as the cyclic condition in transformational analysis of reflexives.[22]

How Reflexivization can be treated in relation to Scrambling in the present fragment is illustrated by the following example.

(52) Zibun no imooto-o Bill-ga mi-ta.
self 's sister-obj subj see-past
'John saw his own sister.'

(53)



Analysis tree (53) has the following semantic derivation.

(54)

i) o' $\lambda V_1^{<s,f(NP)>} \lambda_2^{<s,f(TV)>} V_2(V_1)$

ii) zibun no imooto'

$s'(\lambda\hat{V}^{<s,<e,t>>}V(r))(\hat{}sister')$
$< \lambda\hat{V}^{<s,<e,t>>}V(r),\ \hat{V}_{20}^{<s,\ f(NP)>} >$

iii) zibun no imooto-o'

$\lambda\hat{V}_1^{<s,f(TV)>}V_1(s'(\lambda\hat{V}^{<s,<e,t>>}V(r))(\hat{}sister'))$:S_{10}
$< \lambda\hat{V}^{<s,<e,t>>}V(r),\ \hat{V}_{20}^{<s,\ f(NP)>} >$

iv) mi-' see'

v) zibun no imooto-o mi-'

$see'(s'(\lambda\hat{V}^{<s,<e,t>>}V(r))(\hat{}sister'))$
$< \lambda\hat{V}^{<s,<e,t>>}V(r),\ \hat{V}_{20}^{<s,\ f(NP)>} >$

Reflexivization

zibun no imooto-o mi-'

$\lambda\hat{V}_{20}^{<s,\ f(NP)>}V_{20}\{\hat{r}[see'(s'(\lambda\hat{V}^{<s,<e,t>>}V(r)))$
$(\hat{}sister'))(\lambda\hat{V}^{<s,<e,t>>}V(r))]\}$

vi) ga' $\lambda\hat{V}_1^{<s,\ f(NP)>}\lambda\hat{V}_2^{<s,\ f(IV)>}V_2(V_1)$

vii) Bill' $\lambda\hat{V}^{<s,<e,t>>}V(b)$

viii) Bill-ga' $\lambda\hat{V}_1^{<s,\ f(IV)>}V_1(\lambda\hat{V}_2^{<s,<e,t>>}V_2(b))$:S_1

ix) zibun no imooto-o Bill-ga mi-'

$see'(s'(\lambda\hat{V}^{<s,<e,t>>}V(b))(\hat{}sister'))(\lambda\hat{V}^{<s,<e,t>>}V(b))$:S_{11}

x) ta' $\lambda\hat{V}^{<s,t>}H(V)$

xi) zibun no imooto-o Bill-ga mi-ta'

$H(see'(s'(\lambda\hat{V}^{<s,<e,t>>}V(b))(\hat{}sister'))(\lambda\hat{V}^{<s,<e,t>>}V(b))$:S_7

The final line expresses what example (52) means.

A reflexive form in various types of phrases can be handled using the same mechanism as the reader can easily verify.

Using a modified NP store mechanism, it is possible to treat Reflexivization semantically as a distinguished variable binding, which suggests that Reflexivization in Japanese is an identify mapping operation from $ME_{<f(IV)>}$ into $ME_{<f(IV)>}$.

Conclusion. I have presented a categorial treatment of Scrambling in Japanese. The key features of this analysis are: (a) the treatment of case marked NPs as functors and (b) the use of the property 'Pred', which is independently needed to express the verb final constraint. Some extensions of the initial fragment have been informally presented so that explanation can be provided for non-dislocatability of some expressions that appear in copular sentences, reduced clauses, or one type of double-ga sentences. Also proposed is a way to treat Reflexivization semantically, and it has been demonstrated that this analysis is capable of capturing the fact that the coreferential relation between a subject phrase expression and a reflexive expression in a scrambled sentence is the same as in its canonical form.

While the present fragment is not complete and still contains some shortcomings, it does seem to overcome all the objections that Whitman makes against the treatment of Scrambling as part of syntax proper. Furthermore, this analysis offers a rigorous semantic account of the truth functional equivalence among scrambled variants.

*I would like to thank Lauri Karttunen, Stan Peters, and Sue Schmerling for their help with this paper.

FOOTNOTES

[1]Chomsky (1980) also uses random case assignment in Japanese.

[2]To insure the extensionality of Subject, we have the following meaning postulate.

MP_1: $\forall V_1^{<f(IV)>} \exists V_*^{<e,t>} \forall V_2^{<f(NP)>} \Box [V_1(V_2) \longleftrightarrow V_3\{\hat{x}V_*(x)\}]$

[3]The concept of head is understood as in Robinson (1970).

[4]Bill-o mi-

β_1 β_2 β_3

[5]This does not mean, however, the forthcoming analyses are by no means complete.

[6]For a suggestion on how this can be done, see Cooper (1979).

[7]Henceforth, whenever a new category and a new expression are introduced, they are intended as additions to the lexicon previously defined.

[8] des- is syncategorimatic. It might be desirable to postulate a verb subcategory copular, instead, to avoid the syncategorimatic treatment of copulars. However, for the sake of simplicity, I will adhere to this treatment in this fragment.

[9] This rule is first proposed by Kuno (1976).

[10] This situation is somewhat parallel to Thomason's (1976) treatment of Raising verbs in English.

[11] Upon formulating the following rule, I have adopted Kuno's (1976) (also Whitman's) assumption that an expression that precedes to is an NP.

[12] to is treated syncategorimatically.

[13] We have the following meaning postulate.

MP_2: $\forall V_1^{f(NP)>} \forall V_2^{<f(NP)>} \forall V_3^{<f(NP)>} \Box[\alpha(V_3)(V_2)(V_1)$

$\longleftrightarrow \alpha'(\hat{}[\check{}V_3 = \check{}V_2])(V_1)]$, where $\alpha \in ME_{<f(TV_{NP})>}$ and

α' is a constant of intentional logic of type <<s,t>,f(IV)>.

[14] Incidentally, S_{13} captures that what is called Subject-to Object Raising is a lexically governed rule. There are verbs that allow only a non-raised version. Observe the following.

a. John-ga Mary-ga baka da to nagei-ta. (Kuno 1973:215)
   subj subj idiot is Comp deplore-past
   'John deplored that Mary was stupid.'

b. *John-ga Mary-o baka to nagei-ta.

[15] "think" is an intentional logic constant of type <<s,t>,f(IV)>.

[16] Kuno (1973: 70) states: '...this transformation [subjectivization] applies to sentences that maintain their basic order,...' In other words, the process applies to sentences whose left-most expressions are subject.

[17] PRO_n is a null pronoun. An enclitic (e.g., case marker or genitive particle no) will be deleted when preceded by a null pronoun. Rule S_{14} is stated just to handle a very small fragment.

[18] This grammatical judgment is Whitman's. The silly reading (i.e., 'Fermented soybeans like Gombei') is grammatical. Also cf.

a. John-ga Mary-ga suki da.
b. Mary-ga John-ga suki da.

[19]A different explanation of the phenomenon has been suggested by Wanner (1979).

[20]The same principle predicts that occurrences of homophonous ni particles in sentences like (i) will tend to yield a preferred reading where the NP-ni expression closer to the verb is parsed faster than the one that is further from it; note, however, the contrast between (i) and (ii):

(i) John-ga Bill-ni Mary-ni hon-o agesaseta.
'John caused Bill to give the book to Mary.'
? 'John caused Mary to give the book to Bill.'

(ii) Bill-ni John-ga Mary-ni hon-o agesaseta.
'John caused Bill to give the book to Mary.'
'John caused Mary to give the book to Bill.'

[21]Unlike Cooper (1978), the retrieval is triggered semantically.

[22]One byproduct of the present analysis is that it captures what Howard and Howard's (1976) Reflexive Coreference Constraint is designed to capture without stating the constraint.