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STRUCTURAL ANALYSIS OF THE JAPANESE LANGUAGE
USING MONTAGUE GRAMMAR

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to the University of London

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ABSTRACT

This thesis applies Montague's theory of grammar to a fragment of ordinary Japanese and aims to provide a foundation for an explicit semantics of Japanese. The typological or transformational studies will be presented first as data and the corresponding Montague grammatical analyses will be proposed. In Chapter 1, Montague's theory of grammar is discussed, comparisons being made with Davidsonian truth conditional semantics and Chomskyan transformational grammar. In Chapter 2, subjects, adjectives and adverbs are analysed, in Chapter 3, complementation, in Chapter 4 reflexives, passives, causatives, and in Chapter 5 negation and factive presupposition.

The main theoretical concern is the relation between a logical syntax and linguistic syntax. It is hoped that a new linguistic framework will be developed from this study.

The other important theoretical concern is the relation between semantics and pragmatics.

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**Chapter 1: Montague's theory of grammar
and its impact on philosophy
and linguistics**

1.0. Introduction

Development of Montague's theory of grammar did not end with his tragic death in 1971, but continued on. Montague's theory had a great impact on both philosophers and linguists by combining logical semantics with the study of natural languages. Montague challenged not only Chomskyan linguistics, which was influential among American linguists at that time, but also Davidsonian truth-conditional semantics which was at that time favoured by Anglo-American philosophers. Since good introductions to Montague grammar are available (Cf. R.H. Thomason: 1974; B.H. Partee: 1975; D. Dowty et al: 1980), I will limit my discussion to some of the salient points.

1.1. Truth Theory v. Model Theory¹

(i) Truth definition

Since Frege gave theoretical support to truth conditions, a relation between meaning and truth has been accepted by many philosophers, but the abstract notion of truth was not precisely defined until recently. It was Davidson (1967) who revolutionized truth-conditional semantics by introducing Tarski's notion of truth and satisfaction. He eliminated the intensional expression:

(1) *s* means that *p*

and replaced it by the T convention with the extensional connective;

(2) (T) *s* is T if and only if *p*

where *s* is a structural description of a sentence and *p* is a sentence itself, otherwise a translation of *s* in metalanguage.

This extensional semantics has been favoured by many philosophers, since it can sidestep the problem of analytic truth, but analytic truth has in its turn been severely attacked by Quine (1953). However, this is far from an adequate theory of meaning. For instance,

- (3) "Snow is white" is true if and only if
grass is green.

In (3) two true sentences are paired, and (3) is certainly a true sentence, but "Snow is white" does not mean that grass is green. To avoid this class of examples, Davidson had to add a formal and empirical constraint to his truth definition.

What is worse, this extensional semantics cannot handle modal notions such as those expressed in the following examples;

- (4) It is necessary that water is H_2O .
(5) It is possible that water is frozen.

Moreover,

- (6) Pegasus is flying
is meaningful but it has no truth conditions from the point of view of truth theory since it has no extension. Thus truth theory has difficulties in handling non-extensional constructions.

Truth theory defines truth as absolute truth, whereas model theory defines truth relative to a model (interpretation). Model theory is a branch of mathematical logic developed by Tarski and others. A model M for a language L is the structure of a form $\langle U, F \rangle$, where i) U is a non-empty set and ii) F is an interpretation function which assigns an element of U to

each of the proper names of L, a subset of U to each of the basic CN's and basic IV's and a set of pairs of elements of U to each of the basic TV's.²

Model theory was developed into possible world semantics by Kripke, Montague, Lewis and others. According to Montague (1974:145), Carnap proposed to identify a model with a possible world. However, the proponents of possible world semantics rejected this identity and took a possible world as a primitive. Hence truth is not only relative to a model but to the possible worlds. Then (4) is true in all possible worlds and (5) is true in some possible worlds. Meanings are defined by Montague (1974:228) as "functions of two arguments...a possible world and a context of use." This semantics can handle intensional phenomena such as modals, counterfactuals, much more easily.

(ii) Structurally valid inference

Structurally valid inference is an inference by virtue of its syntactic categories, i.e. due to the way in which the sentence is built. For instance, in the following pairs of examples, we can infer (b) from (a) not by virtue of the meaning but by virtue of the syntactic category.

- (7)a. John walks slowly.
b. John walks.
- (8)a. John is a clever man.
b. John is a man.
- (9)a. A friend of mine whose wife is old is nice to me.
b. A wife of a friend of mine is old.
- (10)a. There is a book on the desk.
b. There is a book.
- (11)a. John was killed by Mary.
b. John was killed.

Davidson (1970:144) suggests that a structurally valid inference can provide a powerful rationale of the principle of compositionality. To quote;

"By saying exactly what the role of (a certain recurrent element)³ is and what the roles of the other significant features of the sentence are, we will have a deep explanation of why one sentence entails the other; an explanation that draws upon a systematic account of how the meaning of each sentence is a function of its structure."

I am almost certain that this structurally valid inference is a universal semantic relation. For instance, Japanese has a tensed adjective, an example of which is given below.

- (12)a. Hanako wa utuku sikatta hito da
 beautiful-past person be

"Hanako is a person who was beautiful."

- b. Hanako wa hito da

"Hanako is a person."

Even in the above example of a tensed adjective, structurally valid inference holds. I have examined this inference using examples (7) and (8) in the following languages: Amari (Ethiopia), Arabic, Bengali, Chinese, Hausa, Hindi, Japanese, Korean, Malay, Thai and Persian. They all have this type of structurally valid inference.

There are some exceptions to this inference. Observe the following example:

- (13)a. This is a fake watch.
 b. This is a watch.

(13)b. does not logically follow from (13)a. Adjectives like "fake" "false" "possible" are excluded from this inference

but can be treated as sentence operators. Moreover, idiomatic expressions are excluded from this inference. Consider the following example.⁴

- (14)a. John is an old woman (= John is easily worried.)
 b. John is a woman.

Logicians say that (12)b. is a logical consequence of (12)a. and for many years they have been trying to provide a definition of logical consequence. The difficulty lies in its intensionality, but Tarski (1956) defines it by using model theory as follows;

The sentence X follows logically from the sentence of the class K if and only if every model of the class K is also a model of the sentence X.

Thus a model theory can account for structurally valid inference, whereas truth theory cannot show all of these inferences as valid. For instance, Evans (1976:208) points out that truth theory cannot account for the following inference, because it lacks discernment of "tall" in "taller than".

- (15) X is a tall man.
 Y is taller than X.
 Y is a man.

Therefore Y is a tall man.

This shows that in this respect truth theory is inadequate. A model-theoretic account of comparatives which derives "taller" from "tall" morphologically has been given by Kamp (1975) and Klein (1980).

(iii) Logical structure

Davidson (1970:145) says "to give the logical form of a sentence is to describe it as composed of the elements the theory isolates." Logical structure is the input to a theory of truth and it shows how to break up a sentence into parts. Davidson makes use of first-order predicate logic for his logical structure and extends it in his own way. He (1967) proposes that a sentence such as

(16) John walked uphill with a stick

should be rendered in the following logical form;

(17) $(\exists e) ((John\ walked\ e) \wedge (e\ was\ uphill) \wedge (e\ was\ with\ a\ stick))$

It means that there is an event e such that John walked \wedge e was uphill \wedge e was with a stick. The first problem is whether an event is an ontological primitive. Secondly, the logical form has more serious difficulties in handling intensional adverbs than prepositional phrases. For instance, (18) Mary wisely studied and passed the examination. (18) cannot have a logical form such that an event was wise, because the adverb "wisely" does not refer to the event but the subject. Thus Davidsonian logical forms fail with adverbs.

Montague rejects the existence of a theoretical difference between formal and natural languages and hence the surface syntactic structure turns out to be a logical structure. Montague's disambiguated language which "generates exactly one family of syntactic categories" can be identified with logical structure. It includes a set of syntactic categories, a set of syntactic rules and so on. This level can be translated into intensional logic of higher-order as in the

The Proper Treatment of Quantification in Ordinary English

(cf. Montague, 1974: henceforth PTQ). Montague (1974:263 fn) himself thought that the best approach is a direct interpretation with the help of a translation procedure, which was realized in his Universal Grammar (cf. Montague:1974: henceforth UG) but he added that "it would introduce slight complications that need not be considered in PTQ." Therefore, the level of higher-order intensional logic is an expository device to give a systematic account of truth conditions. For instance, (19) will be translated into (20).

(19) Mary deliberately failed.

(20) $\widehat{P} \left[P \left\{ \wedge_m \right\} \right] \left(\wedge_{\text{deliberately}}' \left(\wedge_{\text{failed}}' \right) \right)^5$

This can be simplified into (21) by a lambda conversion.⁶

(21) $\text{deliberately}' \left(\wedge_{\text{failed}}' \right) (m)$.

Then model theory interprets "deliberately" as denoting a function from the set of objects which failed to the set of objects which failed deliberately. Thus model theory analyses predicate adverbs as a function from properties of individuals to sets of individuals and can offer a richer semantics than truth theory.

(iv) Tense

Tarski was interested in formalized language, whereas Davidson (1969) attempts to construct a theory of truth for natural languages which include tense. Truth is a property of a sentence in formal languages, but Davidson makes truth a relation between a sentence, a speaker, and a time. Thus his general theory of truth for natural languages is defined as follows.

(22) Sentence s is true (as English) for speaker u at time t if and only if p .

Therefore,

(23) It is Tuesday.

(23) is true if and only if it is Tuesday at the time the speaker utters (23).

(24) John was tired yesterday.

(24) is true if and only if John is tired on the day before the speaker utters (24).

However, this notion of truth cannot capture the context-sensitivity of tense. For instance, the truth-value of

(25) John will come

changes depending on the context of use.

In the model-theoretic investigation of tense, which was carried out by Montague and his associates, truth is a property of sentence tokens not of sentence types.⁷ To take into account the possible contexts of use, Montague (1974) introduces indices which specify features which are relevant to the discourse. If the tense operator is the only indexical element in a sentence, the moments of time will be chosen as indices. If P is the one-place predicate "walk", the sense of $P(V)$ is a function from a moment i to the set of objects walking at i . Thus the model-theoretic approach can capture the context-dependency of tense better than truth theory.

Moreover if we extend model theory into a discourse model developed by Kamp (MS), tense can be treated as discourse referents (cf. L. Karttunen:1976). For instance, an indefinite noun phrase is considered to establish a discourse referent

"in case it justifies the occurrence of a coreferential pronoun or a definite noun phrase later in the text."

Examples are as follows;

(26) Bill has a car. It is black.

(27) Bill doesn't have a car. *It is black.

(28) There is a dog in a pond. The dog is swimming.

This thought was further extended into tense logic by Kamp, who suggests that tense should be determined in the discourse.

1.2 The notion of possible worlds.

The formal success of possible world semantics has attracted not only philosophers but also linguists. However, the notion of possible worlds seems to be a stumbling-block even to philosophers. One of the reasons is that there are disagreements about the fundamental notion of possible worlds among possible world semantionists themselves.

Lewis' realist view of possible worlds is one of the most famous, but many philosophers seem to disagree with it. Lewis (1973:84) states;

Ordinary language permits the paraphrase: there are many ways things could have been besides the way they actually are. On the face of it, this sentence is an existential quantification. It says that there exist many entities of a certain description, to wit 'ways things could have been.' I prefer to call them 'possible worlds.'

Lewis believes that possible worlds exist as concrete worlds in reality and our actual world only differs from possible worlds in its indexicality. This realism implies that there are more things than exist in this world and for example Pegasus should exist as a living creature in some possible worlds. The notion of possible worlds is ascribed to the German philosopher Leibniz (1646-1716), but his view of possible worlds was never realistic. According to Leibniz, God thought about all the possibilities of the universe before creation and he created this universe by actualizing the best one. This content of God's thought before creation is identified with possible worlds but after creation the possible worlds only existed as an idea. Therefore a possible world is not a real world, just as a picture horse is not a real horse, although we can say that there is a horse there so long as it is common knowledge that it is a picture.

Lewis (1968) also proposes a counterpart theory, while Kripke, Montague, and others maintain the method of transworld identities which claim that the same thing is allowed to be in several worlds. The counterpart relation is a relation of similarity, and hence your counterparts in other possible worlds resemble you closely in important ways, but they are not

exactly you. Therefore "I might have been a professor" means that my counterpart is a professor in some worlds.

Lewis' counterpart theory can avoid all the puzzles of transworld identity but it is also the source of some problems. Counterpart theory suggests that if an entity in another world is quite unlike me, it is not my counterpart. However, Feldman (1971) gives the following example;

(29) I could have been quite unlike what I in fact am,
which is translated into (30) by Lewis' theory

(30) I have a counterpart who is quite unlike me.

(30) contradicts counterpart theory, but Lewis would say my counterpart resembles me in important ways even if it is apparently unlike. And when does a counterpart become sufficiently different from me to be considered not my counterpart?

Kripke (1971) criticizes Lewis' view of possible worlds as taking the metaphor of possible worlds too seriously, and suggests that counterfactual situations should not be identified with possible worlds. When we talk about the counterfactual situations in which say Mrs. Thatcher is not a politician, we can still refer to the very same person Mrs. Thatcher. Namely the rigid designator designates the same object in all possible worlds where that object exists.

Kripke's view of possible worlds seems to be suitable. Kripke (1972:267) says:

A possible world isn't a distant country that we are coming across, or viewing through a telescope. Generally speaking, another possible world is too far away. Even if we travel faster than light, we won't get to it. A possible world is given by the descriptive conditions we associate with

Wiggins (1976) suggests that this postulational view would give a sounder foundation for possible world semantics.

Moreover, Kripke's arguments implies that possible worlds may exist. For instance,

(31) Water is H_2O .

(31) is a contingent identity statement of scientific discovery. Then Kripke (1971) argues that (31) is a necessary proposition because water is H_2O in all possible worlds. Certainly, if it is not H_2O but H_2O_2 then it is Hydrogen Peroxide. When an identity statement of scientific discovery is recognized as a definition, it turns out to be true in all possible worlds. If a contingent proposition turns into a necessary proposition, it cannot be denied that possible worlds may exist.

1.3. Transformational grammar and Montague grammar

(i) Universal grammar

The goal of transformational grammar was to reconstruct a native speaker's linguistic competence. Transformational grammarians believed that universal grammar was pre-programmed as "a cognitive structure with certain properties and principles." (Cf. N.Chomsky:1975;86) One of the reasons why transformational grammar attracted many linguists was not only its new methodology but its overall philosophy of language. Before this, structural linguists believed that languages were different in unpredictable ways, and at the same time Quinean empiricism was compatible with these linguistics. Then Chomsky proposed the innateness hypothesis and he asked us to adopt a rationalist philosophical point of view of the human mind, which claims that knowledge of a

language is not only a product of experience but also of innate universals of language.

However, some recent psycholinguistic research suggests that children acquire languages only through communication exchange. Namely speech which is not addressed to the child is not acquired. For instance, according to Todd (1972), a hearing child of deaf parents could use sign languages fluently but neither spoke nor listened to speech, although a television set had been on at home. This seems to suggest that children are born with strong expectation to communicate, and it is their active minds that achieve language acquisition through communication exchange. Now many psychologists believe that children bring certain operating principles which work on the process of learning languages regardless of the peculiarities of the languages. (Cf. D.I.Slobin:1973) These principles are considered to be closely related to linguistic universals, although some of them are language-specific.

Sir Karl Popper develops a similar view of language and mind. In the tradition of Western philosophy, the world consists of three sub-worlds; the first is the physical world; the second is the mental world; the third is the world of ideas in the objective sense and to which theories and languages belong. Philosophers like Plato regarded the third world as discoverable but beyond human intellect to construct, but philosophers like Locke believed that language is man-made and that language is a part of the first and second world. Popper (1972;159) takes the autonomy of the

third world and at the same time he admits that the third world is man-made. Therefore human languages are the product of human activity, although he does not specially deny inborn knowledge. According to Popper (1963:47), we are born with expectations to be fed, and to be loved. In the close relation between expectation and knowledge, we have an inborn knowledge. This knowledge is "psychologically or genetically a priori i.e. prior to all observational experience." And one of the most important expectations is that of finding regularity. This instinctive expectation seems to be important for language acquisition. What is inborn is not the knowledge of language but the instinctive expectation.

Popper (1972:206-255) also held the evolutionary theory of language which originates with his teacher, Karl Bühler. He thinks languages evolve from lower function to higher functions such as the descriptive, argumentative functions of language. Descriptive functions of language determine truth or falsity and argumentative functions handle validity. In his view of evolution each organism is "a growing hierarchical system of plastic controls" and it evolves by the process of trial and error. If the evolutionary theory of language is correct, the logical structure of language that is the result of evolution, must be universal in any advanced language.

Montague himself did not discuss his own view of philosophy of language and mind, but only expressed his view of grammar explicitly. He was dissatisfied with Chomsky/an linguistics because of its lack of semantic relevance,

but he said in the beginning of his "Universal Grammar":

"There is in my opinion no important theoretical difference between natural languages and the artificial languages of logicians; indeed, I consider it possible to comprehend the syntax and semantics of both kinds of languages within a single natural and mathematically precise theory. On this point I differ from a number of philosophers, but agree, I believe, with Chomsky and his associates. It is clear, however, that no adequate and comprehensive semantic theory has yet been constructed, and arguable that no comprehensive and semantically significant syntactical theory yet exists."

(Cf. Montague:1974;222)

Instead of merely discussing language as many philosophers do, Montague proposed to analyze the syntax and semantics of languages by using a precise mathematical formalism; and in this sense Montague was close to Chomsky and his associates. Montague's theory of grammar is a radical departure from the current philosophies of language.

However, the aim of his universal grammar is neither to seek for innate universals of language nor to support a rationalist view of the human mind. Montague aimed to construct a general theory of language which would provide an adequate and comprehensive semantic theory and a semantically significant syntactic theory. According to Montague, the basic aim of syntax is "to characterize the various syntactic categories." There are many different ways to do so, but that which Montague chose was a semantically significant syntax, i.e. one which can become a basis for semantic interpretations. And the one that Montague chose was a model-theoretic semantics "to characterize the notions of a true sentence (under a given interpretation) and of entailment."

(ii) Semantics

Among linguistic semantic theories, Katzian translational semantics seems to be closest to model-theoretic semantics. According to Seuren (1974:105) Katz, Fodor, and Postal were inspired by a model theory and the terms 'projection rule' and 'interpretation' were taken from a model theory. Thus both are compositional but Katzian semantics is not explicitly truth-conditional.

Katz (1972) is reluctant to refer to truth conditions and he states that the task of semantics is to account for synonymy, ambiguity, contradictoriness, entailment, etc. However, many people think that the first task of semantics is to give truth conditions and hence semantics without truth conditions is not semantics. Model-theoretic semantics not only gives truth conditions explicitly but also accounts for the above semantic relations. For instance, P is a contradictory of Q i.e. there is no possible world in which both are true and no possible world in which both are false. P follows from Q i.e. there is no possible world in which Q is true and P is false. P is equivalent to Q i.e. in each possible world, P and Q have matching truth-values. (Cf. R. Bradley and N. Swartz;1979:54-55). Moreover, if we incorporate intensional logic into model-theoretic semantics, synonymy can be accounted for.

Katz believes semantics is about the relation between language and its literal meaning and hence semantics is to translate natural languages into mock-formal languages i.e. semantic representations. However, other people believe that

semantics is about the relation between language and the world and hence the role of semantics is to assign denotations to each linguistic expression. Model-theoretic semantics is an adequate theory of reference in this respect and one which can connect the language with the world. In Montague's theory of grammar, translation is used as a mediating tool between natural languages and model-theoretic interpretations, whereas translation is the final stage of semantics in Katzian semantics. Thus from this point of view Katzian semantics is not incorrect but incomplete and hence it can be integrated into model-theoretic semantics (cf. M. Cresswell:1978).

The central feature of Katzian semantics is lexical decomposition. The lexicon is decomposed into a number of semantic markers such as (object) (physical) (human) etc. As Cresswell (1978:19) points out, model-theoretic semantics does not need to specially explain this sort of lexical decomposition in terms of entailment. When a native speaker knows that being a bachelor entails being a man, he naturally knows that in any world where X is a bachelor X is a man. Nevertheless, model-theoretic semantics is not incompatible with lexical decomposition. For instance, Montague (PTQ) gives a meaning postulate which defines seek in terms of try to find. Montague's theory of grammar is able to handle lexical semantics in this way, but the abundant use of meaning postulates complicates the semantic theory. Dowty (1979) suggests that formal semantics should be able to handle word meaning. However, some recent psycholinguistic research (cf. W. Marslen-Wilson and Welsh:1978; E.V.Clark and

H.H. Clark;1979) shows the necessity of integration of linguistic and contextual-pragmatic information in word comprehension.

(iii) Categories

Transformational grammarians determine syntactic categories by the application of transformations. Chomskyan linguists regard two items as belonging to different categories if any transformation treats them differently. For instance, Jackendoff (1972:100) makes a distinction between auxiliary verbs and main verbs because they behave differently in some transformations. On the other hand, Generative Semanticists regard two items as belonging to the same category if any transformation treats them alike. For instance, Ross (1969) regards adjective phrases as NP's because some transformations treat them alike. Thus the status of syntactic categories was brought into dispute.

J. McCawley (1977) argues for the non-existence of syntactic categories in transformational grammar. He suggests that "When linguists supposedly have been talking about syntactic categories; they really have been talking about something else," having noticed that the application of a transformation does not depend on the syntactic category. For instance, preposing does not always apply to the particles and prepositional phrases. Observe the following example from Jackendoff (cf. J. McCawley;1977):

(32) Into the opera house raced Harpo.

(33) Home raced Jack.

(34) Buried here lies the producer of "A night at the opera"

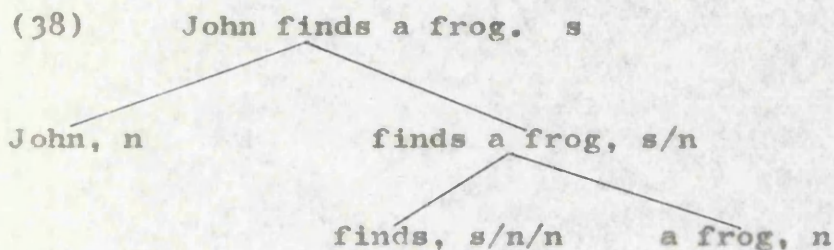
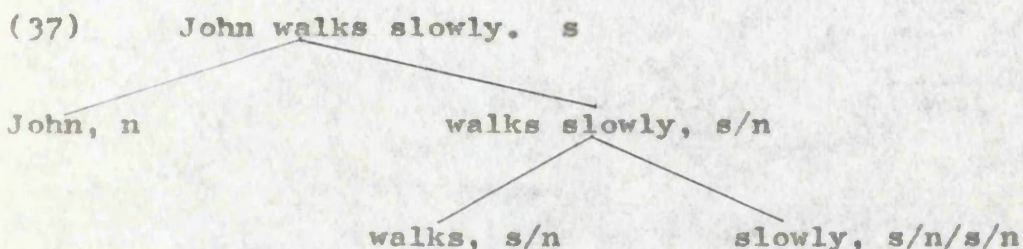
(35) Into the canyon rode John Wayne.

(36)* Into the canyon fired John Wayne.

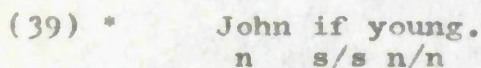
In (34), the preposed element is not a prepositional phrase, and in (36) the preposing of the prepositional phrase is not acceptable. Therefore the generalization that preposing applies to a certain syntactic category fails. Instead, J. McCawley suggests that it "appears to apply to expressions that give the location or direction of the subject." If correct, some applications of this transformation seem to depend on meaning and hence a transformational theory of syntactic categories is unreliable.

In contrast, Montague chose to have syntactic categories which are based on a categorial grammar. This has its origin in Edmund Husserl's "semantic categories," and was introduced into Polish logic by Lesniewski and developed into a more accessible version by Adjukiewicz (1935). A categorial grammar as well as Russell's theory of types (cf. B. Russell; 1903:523)⁸ can provide a solution to the problem of syntactic connection - the condition under which a word pattern is syntactically connected. Semantic categories are divided into two kinds, i.e. basic categories and functor categories. Adjukiewicz had two basic categories - the name category "n" and sentence category "s". Functor categories are derived from the combination of the name category and sentence category, and assigned a fractional index as follows. An index "s/n" is

assigned to intransitive verbs which form a sentence with a name and an index "n/n" to attributive adjectives which form a name with a name. Consider the following analysis trees.



As in algebra, we find a cancellable relation between indexes and the cancellation which is applied from the bottom and goes to the top will yield "s" as the final derivative. The following example which is not syntactically connected does not have a single index as the final derivative.



Thus we note; (i) syntactically connected expressions can be divided into parts which can go to the nth order; this parts to whole relation is generally called the Fregean principle of compositionality, (ii) in every level a cancellation rule will apply, (iii) the final derivative is a single index. A number of logicians have been attracted to this Polish logical form, (a) because of its formal elegance in its recursive definition of categories, (b) because

its mechanical procedure of testing syntactic connection,
(c) because of the isomorphism between syntax and semantics.

Both categorial grammar and phrase structure grammar are mathematically oriented and they proved to be identical (cf. Y. Bar-Hillel et al., 1960). Namely every language represented by a categorial grammar can also be described by a phrase structure grammar. However, one of the advantages of categorial grammar is that it is semantically conceived i.e. based on Russell's theory of types, and hence its syntactic category can be systematically translated into the semantic type. Montague (1974:260) formulates the following translation rules.

$$F(e) = e,$$

$$F(t) = t,$$

$$F(A/B) = F(A//B) = \langle \langle S, F(B) \rangle, f(A) \rangle$$

whenever $A, B \in \text{Cat.}$

Chomsky's phrase structure grammar is based on the autonomy of syntax and its labels such as NP and VP, but these are nothing but unanalyzable symbols which have no semantic relevance. Thus a categorial grammar is preferable as underlying semantic structure.

Footnotes

1. I am indebted to the Bedford seminars for this.
2. A fuller description of set theory is given in Robert Wall's Introduction to Mathematical Linguistics (1972).
3. This is expanded by G. Evans (1976).
4. This example is given by J.E. Buse (personal communication).
5. We can write either $\lambda x \{ \dots x \dots \}$
or equivalently $\bar{x} \{ \dots x \dots \}$
6. The rule is that a formula of the form $\lambda \{ \dots x \dots \}(a)$ may be converted to a logically equivalent formula of the form $\{ \dots a \}$ by the principle of lambda conversion (cf. A. Church:1941).
e.g. $\lambda x \{ K(B(x))(M(x)) \}(j) \rightarrow K(B(j))(M(j))$
(cf. D.R.Dowty:1978b).
7. A sentence type is an abstract entity which is independent of its use, while a sentence token is "an occurrence of a sentence type in a particular context of use."
(Cf. P. Halvorsen and W. Ladusaw:1979:212).
8. "Every propositional function $\phi(x)$ - so it is contended - has, in addition to its range of truth, a range of significance, i.e. a range within which x must lie if ϕx is to be a proposition at all, whether true or false. This is the first point in the theory of types;"
(Cf. B. Russell;1903,523).

Chapter 2: Japanese as a Formal Language

2.0. Introduction

During the last two decades, Japanese syntax has been exhaustively examined by generative grammarians and a number of interesting linguistic facts discovered. However, the area of semantics was largely ignored, or the problems of semantics were pushed into the area of syntax. This thesis applies Montague's theory of grammar to a fragment of ordinary Japanese and aims to provide an explicit semantics for Japanese. Since it cannot be assumed that the readers are familiar with Japanese, its typological characteristics are introduced. This presentation owes a great deal to Kuno's work (1973, 1978a).

(i) Japanese as an SOV language

Japanese has a basic word order of S(ubject) - O(bject) - V(erb). Except for the rigid constraint that verbs must come at the sentence-final position, word-order is relatively free.

- (1)a. Taroo ga Hanako o hometa.¹ "Taro praised Hanako."
 Taro sub Hanako obj praised.
 b. Hanako o Taroo ga hometa.
 *c. Hometa Taroo ga Hanako o.

(ii) The notion of subject in Japanese

One of the traditional grammarians, Mikami (1972), claimed that there was no subject in Japanese and that the particle ga was the nominative case-maker. One of the reasons for his claims was that Japanese has no subject-verb agreement as found in European languages. But Shibatani (1978) pointed out that the process of subject-honorification and reflexization

which are triggered by one particular NP (Subject) is comparable to subject-verb agreement.

Generative grammarians syntactically define the subject as the first NP. Quoting the following example which includes two case-markers ga,

- (2) John ga Mary ga sukida
John sub Mary obj like

"It is John who likes Mary."

Kuno (1978a) stated that the fact that (2) cannot mean that Mary is fond of John shows that the first NP is a subject. This notion of subject considerably clarified analysis of the Japanese language and has practical advantages.

(ii) Subjectless constructions

Japanese subjects are often omitted but most of them are recoverable from the context. For example, observe the following:

- (3) Utukusiinaa!
"Beautiful!"

If (3) is uttered when the speaker is viewing Mt. Fuji, the subject of (3) must be Mt. Fuji. However, there are some subjectless constructions whose subjects are not recoverable from the context. For example,

- (4) Kaji da!
"Fire!"

- (5) Koocha da!
"Tea, please."

(iv) Wa and ga

An English sentence "The sea is blue" can be translated into either (6) or (7).

- (6) Umi wa aoi (generic reading)
 sea blue
- (7) Umi ga aoi (event reading)
 sea blue

That is, Japanese morphologically distinguishes where English need not.

The various uses of wa and ga were surveyed by Kuno (1973) and reduced to:

Wa has thematic or contrastive use and the thematic wa is either generic or anaphoric.

- (8) Kuzira wa honyuu-doobutu da
 whale mammal be
 "A whale is a mammal." (generic)

- (9) Ah, inu ga hasitteiru. Ano inu wa Taroo no da.
 Look dog running That dog Taro's be.
 (anaphoric)

"Look.' A dog is running. The dog is Taro's."

- (10) Taroo wa Kitaga, Hanako wa Konakatta
 came but did not come

"Taroo came, but Hanako did not." (contrastive)

Ga has both descriptive and exhaustive-listing use.

"Only the subject of action verbs, existential verbs, and adjectives/nominal adjectives that represent changing states" (Cf. S.Kuno:1973;49-50) can take the descriptive ga, while there are no such restrictions in the use of the exhaustive-listing ga.

- (11) Ame ga hutteiru.
 rain falling.
 "It is raining." (descriptive)

- (12) Sora ga akai.
 sky red
 "Look! The sky is red." (descriptive)

(11) is a neutral description of some action, and (12) is a neutral description of some temporary state.

In the following examples, ga has exhaustive-listing interpretations, otherwise they are ungrammatical.

- (13) Inu ga hoeru
dogs bark "It is dogs which bark."
- (14) Taroo ga Hanako ga sukida.
like
"It is Taro who likes Hanako."

The semantic function of wa and ga are described by Mikami (1963) as follows:

	unstressed	stressed
wa	thematic	contrastive
ga	descriptive	exhaustive-listing

(v) Japanese as a postpositional language

Being a SOV language, Japanese is a postpositional language. Case markers follow noun phrases including common nouns and proper nouns, quantifier-like particles which correspond to English "even" and "only" follow noun phrases, and conjunctions follow sentence-final verbs. Moreover, there are some sentence-final particles which express the speaker's attitude.

- (15) Tori ga tondeiru (case marker)
bird flying
"A bird is flying."
- (16) Tori sae uttateiru (quantifier-like particle)
bird singing
"Even a bird is singing."
- (17) Taroo wa seikoo sitaga, Hanako wa sippaisita (conjunction)
succeed failed
"although Taro succeeded, Hanako failed."
- (18) Kore wa hon desu yo. (sentence-final particle)
this book be
"I am telling you that this is a book."

(vi) Nominal phrases

As one of the SOV languages, nominal modifiers which include adjectival, genitive expressions, relative clauses, demonstratives, numerals, classifiers, etc., precede nouns.

- (19)
- omosiroi
- hon (adjective)

"an interesting book."

- (20) watasi
- no
- hon (genitive)

"my book"

- (21)
- Kono
- hon (demonstrative)

"this book"

- (22)
- ni-satu
- no hon (numeral; classifier)

"two books"

- (23)
- watasi ga Kaita
- hon (relative clause)

"the book which I wrote"

Note that relative clauses do not require relative pronouns in Japanese.

(vii) Pronouns and demonstratives

Some traditional Japanese grammarians do not recognize pronouns as a part of speech. One of the reasons is that pronouns are derived from nominal expressions: boku 'servant' - I, kimi 'lord' - you, watakusi 'personal' - I, otaku 'your house' - you.

Unlike English, they can regularly be modified by adjectives.

- (24)a. ookii kare
 * big he
 b. sutekina anata
 * nice you.

Moreover, anaphoric pronouns do not appear on the surface.

Kuroda (1965b, published in 1979) named them "zero-pronouns"

(28)a. Mary has children and John beats them.

b. Mary ni wa kodomo ga aru sosite
children have and

John wa sono kodomo o utu
those children beat

(Lit.) "Mary has children and John beats those children."

As this is a general construction, we conclude that there are neither "pronouns of laziness" nor E-type pronouns in Japanese.

In addition, Japanese has three kinds of demonstrative;

(29)	pronoun	determiner	place
nearer to the speaker	kore	kono	koko
nearer to the hearer	sore	sono	soko
far from the speaker and the hearer	are	ano	asoko

(viii) Verbs

Japanese verbs are neutral in person, number, or gender, but they are inflected for tense, mode, and subordinating types;

(30) Verb 'eat'

non-past	tabe-ru
past	tabe-ta
intentional	tabe-yoo
imperative	tabe-ro-yo
subjunctive	tabe-reba
gerundive	tabe-Ø
continuative	tabe-te

Verbs can be followed by a series of auxiliaries as in the following example.

(31) Taroo wa nori o tabe-sase-rare-tai
seaweed obj eat-cause-passive-desiderative

"Taro wants to be made to eat seaweed."

There is a constraint of the ordering of auxiliaries and hence the following sequence is ungrammatical.

(32) * tabe-tai-rare-sase.

Verbs can be divided into transitive and intransitive, with the transitive and intransitive counterparts having a morphological contrast.

(33)	intransitive	transitive
"open"	aku	akeru
"change"	kawaru	kaeru
"wail"	matu	matasu
"drop"	otiru	otosu

(ix) Adjectives

N.V. Smith (1980) states that it is part of the folklore of linguistics that Japanese has no adjectives. This seems to have resulted from the fact that some Japanese adjectives do not require copulas to form predicates. For instance,

(34) Taroo wa wakai
 young "Taro is young."

This kind of adjective is called an "i-adjective", because it ends with /i/ in non-past forms. However, some adjectives are followed by copulas:

(35) Taroo wa genki da "Taro is fit and well."

This kind of adjective is called a "nominal adjective", or a "na-adjective", because it behaves like a nominal and its attributive form ends with /na/.

Thus Japanese has two kinds of adjectives and they are inflected as follows:

(36)		i-adjective	na-adjective
non-past	attributive	wakai	genkina
"	predicative	wakai	genkida
past	attributive	wakakatta	genkidatta
"	predicative	wakakatta	genkidatta
subjunctive		wakakerebe	genkinaraba
gerundive		wakaku	genkide, -ni
continuative		wakakute	-

We will demonstrate that these forms are not only morphologically but also syntactically distinct from verbs and nouns. Namely there are some syntactic processes which differentiate adjectives from verbs. For instance, only verbs can occur with the following predicates.

(37)	verb "taberu"	adjective "waka"
-masu "polite"	tabemasu	*wakamasu
-simau "perfective"	tabetesimau	*wakasimau
-rareru "passive"	taberareru	*wakarareru
-tai "desiderative"	tabetai	*wakatai

(a) Unlike verbs, adjective stems can function as adverbs, when i-adjectives stems take /ku/ and na-adjective stems take /ni/.

(38) kodomo wa tanosiku asobu
children pleasantly play
"The children play pleasantly."

(39) Taroo wa sinkenni kangaeru
seriously think
"Taro thinks seriously."

(b) Adjective stems turn into nouns, taking the suffix /mi/, /sa/, /ke/. Na-adjectives take only the suffix /sa/.

(i-adjective)	tanosi	——	tanosimi	"pleasure"
"	sabisi	——	sahisisa	"loneliness"
"	samu	——	samuke	"coldness"
(na-adjective)	sizuka	——	sizukasa	"quietness"
"	yutaka	——	yutakasa	"affluency"

Traditionally included among na-adjectives are words of Chinese origin such as kenkoona "healthy" which do not take the suffix /sa/, and have stems that can still function as nouns.

(40) kenkoona hito wa siawaseda
 healthy person happy
 "A healthy person is happy." (attributive)

(41) kodomo wa kenkooda
 children healthy
 "The children are healthy." (predicative)

(42) kenkoo ga mottomo taisetuda
 health most important
 "Health is most important." (noun)

In (42), kenkoo is followed by the case marker and functions as a noun, whereas sizuka is not followed by the case marker.

(43) *sizuka ga mottomo taisetuda
 "Quietness is most important."

Thus na-adjectives of Japanese origin can be treated as adjectives, but what have traditionally been called na-adjectives should be excluded from the adjectival class when of Chinese origin.

Other interesting characteristics of Japanese adjectives are summarized below.

(a) Adjectives can modify pronouns and proper names

(44)a. isogasii kare *busy he
 b. isogasii Taroo ?busy Taro

(b) Not only predicative but also attributive adjectives are tensed.

(45)a. utukusikatta hito *beautiful - past person
 beautiful-past person
 b. atukatta natu *hot - past summer
 hot-past summer

(c) Adjectives are not inflected for the comparative and superlative. They add yori "than" to form the comparative and mottomo "most" or itiban "first" to form the superlative.

(46) Hanako wa Mariko yori wakai
 than young

"Hanako is younger than Mariko."

(47) Hanako wa itiban wakai
 first young

"Hanako is the youngest."

(x) Adverbs

(a) Morphology of adverbs

Many adverbs derive from adjectives, when i-adjective stems take /ku/ and na-adjective stems take /ni/.

(48)a. utukusii ————— utukusiku
 beautiful beautifully

Some adverbs are of nominal origin:

(49)a. dan-dan "gradually"
 b. zen-zen "at all"

Japanese has many onomatopoeic adverbs:

(50)a. siku-siku "sobbingly"
 b. sito-sito "quietly"

Many manner adverbs are often followed by the suffix to.

(51)a. yukkurito "slowly"
 b. hakkirito "clearly"
 c. nombirito "without haste"

Sentential adverbs are often formed from adjectives, and followed by the exclamatory particle mo.

(52) Negekawasikumo Taroo wa jisatusita
 regrettably committed suicide
 "Regrettably, Taro committed suicide."

(53) Saiwainimo, Hanako wa gookakusita
 fortunately passed exam
 "Fortunately, Hanako passed the exam."

Subject-oriented adverbs, which express some additional information about the subject (cf. R.S. Jackendoff;1972), are also followed by the particle mo.

- (54) Ziroo wa kasikokumo osoku kita
wisely late came

"Jiro wisely came late."

(b) Syntax of adverbs

Japanese sentence adverbs come at the beginning of the sentence and subject-oriented adverbs come after the subject. In distinction from English, predicate adverbs precede verbs. Observe the following examples.

- (55) Kanarazusimo hito wa sinu.(sentence adverb)

"Necessarily a person dies."

- (56) Taroo wa orokanimo uso o tuita.(subject-oriented adverb)

"Taro stupidly told a lie."

- (57) Harako wa dan-dan futtota.(predicate adverbs)

"Harako put on a weight gradually."

2.1. The Japanese particles wa and ga

It is well known that some English sentences can be translated into Japanese in either of two ways. For example, the sentence

- (58) The sea is blue

is ambiguous between a generic reading and an event reading.

In Japanese the generic reading is translated into a wa-sentence and an event reading into a ga-sentence as in the following examples.

- (59)a. U.mi wa aoi.
sea blue

- b. U.mi ga aoi
sea blue

There are many other uses of wa and ga, but here I am concerned with the above semantic distinction.

Following Kuroda (1972), I define the generic usage of wa in a far wider sense than that generally used in philosophy. I call a statement "generic" when it refers to a "general, habitual, or dispositional state of affairs." Examples involving generic wa are as follows:

- (60)a. Inu wa hasiru.
 dog run "Dogs run."
 b. Taroo wa hasiru.
 Taro run "Taro runs."
 c. Taroo wa kasikoi
 Taro wise "Taro is wise."

I regard a statement as having an event reading when it refers to "a particular occurrence of an event or a process," and in Japanese it takes the descriptive ga. Examples are as follows:

- (61)a. Inu ga hasitteiru
 dog running "Some dogs are running."
 b. Sora ga akai
 sky red "Look! The sky is red."

In transformational grammar, an attachment transformation was proposed by Kuroda (1965) to handle wa-sentences, and a thematic NP node was postulated by Kuno (1973) in the deep structure to handle thematic wa-sentences which include the above generic sentences. However, neither Kuroda nor Kuno presented an explicit semantics for wa and ga.

The use of Montague grammar in Japanese was pioneered by the Japanese philosopher Sakai (1979). In his work he excludes the contrastive wa and considers the thematic ga and the generic wa only. He compares the following ga-sentence with the corresponding wa-sentence,

- (62)a. Ie ga katamuiteiru.
house leaning "The house is falling down."
b. Ie wa katamuiteiru.
house leaning "The house is leaning over."

and suggests that wa-formations "put the whole sentence into a modal mood, that is, necessity." (Cf. H. Sakai:1980;35)

If the corresponding ga-sentence is represented as s , the wa-sentence is translated as

- (63) $\Box \{s\}_t$.

This means that s is necessarily true and hence s is true in all possible worlds. This works for some limited cases of generic sentences, as for instance,

- (64) Inu wa doobutu da.
dog animal be "Dogs are animals."

where dogs cannot be human beings but are animals in all possible worlds. However, if Sakai is right,

- (65) Sora wa aoi
sky blue "The sky is blue."

(65) should mean that necessarily the sky is blue. However, I often find the sky grey, especially in England. Sakai proposes to re-interpret "necessity" as "understandable for" or "able to fix up a general agreement of all those who partake in the situation in which the sentence in case is uttered," and he claims that this is a unique Japanese way of thinking.

However, no matter how possible worlds are interpreted, necessary truth is objective truth in all possible situations as in

- (66) Mizu wa H_2O da
water H_2O be "Necessarily water is H_2O ."

The following wa-sentence cannot be true in all possible worlds.

- (67) Inu wa hoeru.
dog bark "Dogs bark."
- (68) Otoko wa onna o aisuru.
men women love "Men love women."
- (69) Kyooju wa atarasii kangae o umidasu.
professors new ideas generate
"Professors generate new ideas."

In (67) it is not difficult to find a non-barking dog, and in (68) there are some men that do not love women. And it is arguable whether all professors produce new ideas.

Therefore I conclude that not all of the wa-sentences can be translated into necessary truth, and hence I cannot accept Sakai's translation. I will exclude generic identity statements such as (64) and Kripke's (1972) statements of theoretical identification such as (66) from the remainder.

My analysis was suggested by analogy with Carlson's (1977) unified analysis of the bare plural. Some bare plurals require universal quantification but some bare plurals require existential quantification. Observe the following examples of Carlson's.

(70) Doctors are wise.

(71) Doctors tried to save the dying boy.

Some people say that bare plurals are ambiguous between universal and existential quantification, but Carlson proposes to treat the bare plural as a proper name. This is not a new idea among linguists, Postal (1969) having already noticed the striking similarity between the bare plural and a proper name in the following examples.

- (72)a. Slim is so-called because of his slender build.
 b. Cardinals are so-called because of their colour.
 c. Machine guns are so-called because they fire mechanically.

In these examples, the so of so-called denotes slim, cardinals, machine guns respectively and the bare plural functions as a name.

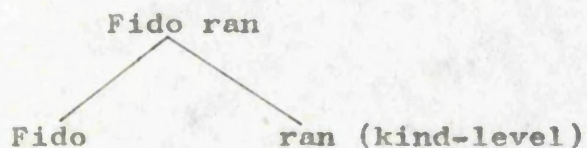
However, the bare plural does not always behave exactly like a proper name. For example, consider the following sentences whose interpretations were given by a native speaker of southern England.

- (73)a. Dogs ran. (generic)
 b. Fido ran. (generic or event)

According to Carlson, both (73a) and (73b) are ambiguous. However, the native speaker of southern England did not have an event reading for (73a). Therefore it is interesting how far we can identify the bare plural with a proper name. On the other hand, Carlson's analysis of (73b) seems to be less controversial than his analysis of the bare plurals.

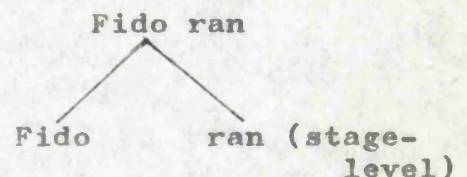
His analysis notes the ambiguity between generic and event readings as follows: the predicate "run" is ambiguous between a kind-level predicate and a stage-level predicate.

(74)a. Generic reading



Fido: $\lambda P^v P(f)$
 ran: run"
 translation: run"(f)

b. Event reading



Fido: $\lambda P^v P(f)$
 ran: $\lambda x \exists z \{R(z, x) \& \text{run}'(z)\}$
 translation (reduced):
 $\exists z \{R(z, f) \& \text{run}'(z)\}$

Here $R(z, x)$ means that z is a stage of x and Carlson regards a stage as a time-slice portion of existence. Then in the event reading what is running is not the individual but a stage of the individual.

However, many philosophers have a different viewpoint on this matter.² There is an extensive philosophical literature dealing with 'events.' Among these I find Von Wright's (1963) definition of events to be more natural than Davidson's (1967). Von Wright defines an event as "an ordered pair of two states of affairs." Then the event is "the change or transition from the state of affairs which obtains on the earlier occasion to the state of affairs which obtains on the latter occasion." The first state of affairs is called the initial-state and the second the end-state. The event of opening a window consists of the initial-state when the window is closed and the end-state when the window is open. Kamp (1980) regards an event as a change from one state p into another state q which is incompatible with p .³ On the other hand, Davidson regards an event as an ontological primitive, and claims that most action sentences do not refer to the initial-state.

However, some linguistic evidence supports the temporal segmentability of an event. For instance, Freed (1979) demonstrates that English aspectual verbs refer to the particular time segments of events named in the complement. According to her, keep, continue, stop, quit and cease can refer to the ongoing part of events, but start refers to the initial state and in contrast begin refers to the ongoing part of the event. Observe the following examples given by her.

- (75)a. Barbara began to study for her exams
and she did some studying.
- b. Barbara started to study for her exams
last week, but then she didn't do any studying.

However, not all native speakers of English agree with her intuition and hence the distinction between start and begin is arguable.⁴

Now I would like to point out that some Japanese verbs refer to the initial-state, which is considered to be a preparatory stage. Observe the following Japanese examples.⁵

- (76)a. Taroo wa e o kakikaketaga, kekkyoku wa
picture of draw-start after all
though

nani mo kakanakatta.
anything draw-not-past

"Taro half-started drawing a picture, but
he did not do any after all."

- b. Taroo wa kushami o sikaketaga, kekkyoku wa sinakatta
sneeze do-start after all did not
though

"Taro half-started sneezing, but did not after all."

Thus at least in Japanese there is linguistic evidence which supports the initial-state. Therefore Von Wright's definition of events is preferable.

If some events are temporally segmentable, the individual that can be involved in events must have the temporal dimension. I regard this temporal dimension of the individual as a stage, which is a particular state of the individual at a particular time. According to Dana Scott (1970), these particulars form some kind of abstract object, in which case stages cannot perform actions and hence cannot be predicated. Although linguists can tolerate Carlson's formulation of an event reading as a tool for linguistic analysis,⁶ it seems to pose a problem to philosophers.

Next let us consider a generic reading, Carlson (1977:451) defines a 'generic sentence' as any sentence that attributes a property to the individual that serves as the subject of the sentence. The first question is whether or not a generic statement has a truth-value. Von Wright (1963:23) makes a distinction between generic and individual propositions, and says, "the individual proposition has a uniquely determined truth-value, it is either true or false, but not both. The generic proposition has, by itself, no truth-value. It has a truth-value only when coupled with an occasion for its truth or falsehood; that is, when it becomes 'instantiated' in an individual proposition." He seems to suggest that there is a truth-value link (cf. J. McDowell;1978) between a generic and individual proposition.

However, a generic proposition does not always have a truth-value automatically when coupled with an individual proposition. It seems to me that the generic proposition is linked to the individual proposition by memory, thought, or knowledge. For instance, if I am asked whether sealions bark or not, I will go back to my memory and confirm that I have heard sealions barking in Regent's Park Zoo. This link is not always direct. I have not heard whales singing, but I say I know that whales sing. Thus the truth or falsity of the generic proposition depends on our stored knowledge. Thus this process is not logical but cognitive.

The next question is what decides whether a proposition is generic or individual. According to Von Wright (1963:23), it is not the occurrence of individuals among its constituents but the logical nature of the concept of the predicate.

That Brutus killed Caesar is an individual proposition, because a person can be killed only once, whereas that Brutus kissed Caesar is a generic proposition, because a person can be kissed by another more than once. It is arguable whether that Brutus kissed Caesar is a generic proposition. However, what decides whether a proposition is generic or individual seems to depend on the semantics of the predicate. In the case of "Fido ran," which is ambiguous between a generic reading and event reading, the ambiguity ought to result from the predicate "ran" rather than the individual "Fido."

Although the semantics of generic statements is still an unsolved problem, Carlson's later development of a G predicate operator seems to be in the right direction. He posits a G predicate operator which maps predicates that apply to stages of individuals to predicates that apply to individuals, and regards this process as a cognitive process of generalization. I diverge slightly from this, namely I take a Generic predicate operator as mapping from predicates of basic expression to kind-level predicates. This is because I think a stage cannot be predicated and hence predicates ought not to apply to stages of individuals. Therefore "dogs bark" would be translated as follows.

$$(77) \quad \lambda P^{\vee} P(d) (\wedge G^{\wedge} \text{bark}') = G(\wedge \text{bark}') (d)$$

This Generic predicate operator has no morphological form in English but Carlson (1980) suggests that seventy languages represent it morphologically in the surface.

We can now reconsider a previously given Japanese example of a generic sentence (78),

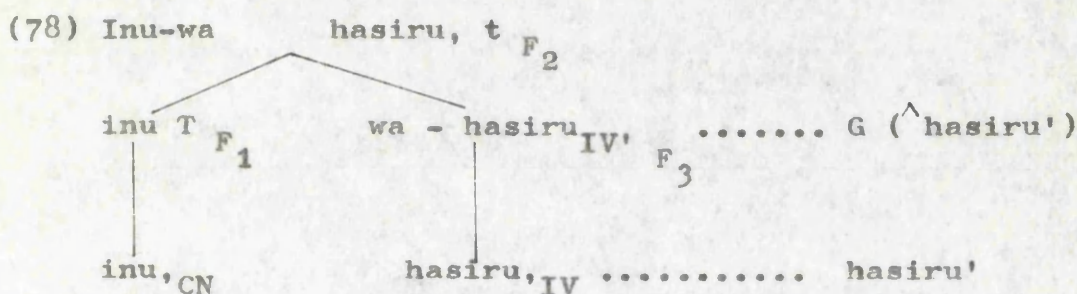
(78) Inu wa hasiru
dog run "Dogs run."

Because the common noun inu is referring to all natural kinds of dogs it is not difficult to consider it denoting an individual. Thus the rule which converts CN (common nouns) into T (terms) will have to be formulated as follows.

S.2. If $\alpha \in P_{CN}$, then $F_1(\alpha) \in P_T$, where $F_1(\alpha) = [\alpha]_T$

T.2. If $\alpha \in P_{CN}$ and translates as α' , then $F_1(\alpha)$ translates as $\lambda P^{\vee}P(i) \chi^{\kappa} \forall z^o \square [R'(z^o, \chi^{\kappa}) \leftrightarrow \alpha'(z^o)]$

Then sentence (78) will be analyzed as below.



inu = $\lambda P^{\vee}P(i)$

hasiru = hasiru'

wa - hasiru = $G(^{\wedge}\text{hasiru}')$

Here we notice that wa corresponds to a Generic predicate operator and that it can be regarded as a surface reflex of it. The rule which converts a predicate of basic expressions into a kind-level predicate is formulated as follows.

S.4. If $\alpha \in P_{IV}$, $F_3(\alpha) \in P_{IV'}$, where $F_3(\alpha) = \underline{\text{wa}} - [\alpha]_{IV'}$

T.4. If $\alpha \in P_{IV}$ and translates as α' , $F_3(\alpha)$ translates as $G(^{\wedge}\alpha')$.

In addition, we need the following rule which combines T with IV (intransitive verbs) and form a sentence.

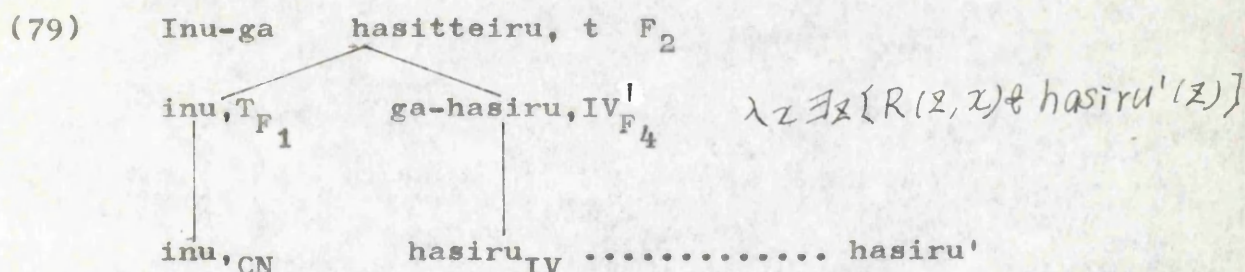
S.3. If $\alpha \in P_T$, and $\beta \in P_{IV}$, $F_2(\alpha, \beta) \in P_t$.

T.3. If $\alpha \in P_T$, $\beta \in P_{IV}$, and α, β translate as α', β' respectively, then $F_2(\alpha, \beta)$ translate as $\alpha'(\wedge \beta')$.⁷

In the following sentence which has an event reading, the common noun inu can be interpreted as a dog or more than one dog, depending on a context.

(79) Inu ga hasitteiru "A/Some dogs are running."
dog running

Since (79) requires existential quantification, it can be considered to derive from an event-level predicate as follows; — the consideration of tense and aspect is excluded here.



Here we notice that the descriptive ga functions as a predicate operator and hence it might be considered to be an Event predicate operator which maps a predicate into an event-level predicate. This process is a purely logical one, and the following rule can be formulated for it.

S.5. If $\alpha \in P_{IV}$, $F_4(\alpha) \in P_{IV}$, where $F_4(\alpha) = \underline{ga}[\alpha]_{IV}$,

T.5. If α translates as α' , $F_4(\alpha)$ translates as $\lambda z \exists x \{R(z, x) \wedge \alpha'(x)\}$

The problem in this analysis is that there is a discrepancy between logical syntax, which is based on truth conditions and linguistic syntax, which is based on phonology. Linguistic syntax predicts the following parsing in (78) and (79).

(78) /inu-wa/hasiru/

(79) /inu-ga/hasitteiru/

To fill the gap between logical syntax and linguistic syntax, it is necessary to postulate morphological rules which act on syntactic rules and yield the actual surface expression. Morphological rules can handle any linguistic regularity which relates to the phonological word or phrase. The following morphological rules which apply to the syntactic rule S.3 are formulated;

M.1. (+ S.3) If $\alpha \in P_T, \beta \in P_{IV}$ and β has a Generic IV-operator, $F_{G_n}(\alpha, \beta) = \alpha - \underline{wa} \beta$,
where the particle wa is attached to α .

M.2. (+ S.3) If $\alpha \in P_T, \beta \in P_{IV}$ and β has an Event IV-operator, $F_{E_v}(\alpha, \beta) = \alpha - \underline{ga} \beta$,
where the particle ga is attached to α .

This process might be called 'subjectivization', because it creates a syntactic subject. Since this area concerns the interrelationships between phonology, morphology, syntax, semantics, and pragmatics, it should be one of great interest for linguists. For instance, Haraguchi (1977) in his autosegmental phonology of Japanese treats the subject marker ga as an enclitic, where the unaccented form of a word phonologically attaches to the preceding adjacent word. An enclitic is neither a true suffix nor an independent element. It has the external

characteristics of the suffix (or bound form) and the internal feeling of the word (or free form). (Cf. E. Sapir; 1930-31).

The general rule of the enclitic in Japanese is given by Haraguchi as follows. The abstract accent marker is represented as a star.

If a starless enclitic follows a starred word, the enclitic has an Low tone, and if it follows a starless word, it has a High tone.

Thus consider the following cases:

- (80) a. yu k ^{*}1 "snow" yu ki ^{*}-ga
- b. ^{*}i nu "dog" ^{*}i nu -ga
- c. mi zu "water" mi zu -ga

Since this kind of tone rule can be added to morphological rules, this enclitic rule seems to support the attachment rules M.1. and M.2.

2.2. Japanese adjectives

This analysis of Japanese adjectives considerably diverges from that of the philosopher Sakai's (1979) pioneering work on Japanese Montague grammar. Firstly Sakai (1979;64) defines a sentence as a linguistic expression which is true or false in a discourse context. Hence he regards all of the following examples as sentences:

- (81) Tanaka wa 1940 non 11 gatu 22 niti ni umareta
 Tanaka year month day on born past
 "Tanaka was born on 22nd November 1940. "
- (82) Hana ga saiteiru
 flower blooming
 "Flowers are blooming."

- (83) Otoko ga onna o nagutteiru
men women beating "Men are beating women."
(84) Utukusii
beautiful
(85) Naguru
beat
(86) Nagurareru
be beaten

and he takes both (84) and (85) as a basic atomic sentence *t*. But we should note that then *t* with his definition loses the recursiveness of natural languages. From a linguist's point of view, the subjects in (84), (85) and (86) are recoverable from the context, and considered to be contextually deleted. This is not a specific phenomenon to Japanese, for the following English examples can have truth-values in some contexts.

- (87) Beautiful
(88) Better had
(89) Com-ing.

As Montague explicitly points out in UG, we must make the distinction between a sentence type and a sentence token. A sentence type is an abstract entity which is independent of its use, while a sentence token is "an occurrence of a sentence type in a particular context of use." (Cf. P. Halvorsen and N. Ladusaw:1979;212). Truth is a property of sentence tokens not of sentence types. Therefore when utukusii is used by itself as an expression in a certain context, it may have a truth-value but then it is not a sentence type but a sentence token. Thus,
(90) Hanako wa utukusii. "Hanako is beautiful."
beautiful

(90) can be regarded as an ordinary subject-predicate form and a sentence type, while utukusii is an intransitive verb which forms a sentence with a term. Moreover if utukusii is a sentence as Sakai says, it is difficult to understand why sentence adverbs such as kanarazusimo "necessarily" can not be combined with this sentence. Therefore Sakai's analysis will not be followed.

Secondly, Sakai claims that there is no distinction between adjectives and verbs in Japanese and treats both of them as declarative sentences. However, from a linguist's point of view, morphological and syntactic distinctions between adjectives and verbs can not be ignored, as was discussed in 2.0. Moreover, a non-extensional verb such as sagasu 'look for' does not behave like a non-extensional adjective ookii 'big'. Therefore I maintain the two distinct categories adjectives and verbs. Adjectives of Chinese origin are excluded here.

$$\begin{aligned}
 B_{IV} &= \begin{array}{cc} \text{hasiru} & \text{aruku} \\ \text{run} & \text{walk} \end{array} \\
 B_{adj} &= \begin{array}{cc} \text{utukusii} & \text{genkida} \\ \text{beautiful} & \text{fit} \end{array}
 \end{aligned}$$

Thirdly, the theory which relates to adjectives that Sakai adopts seems to be close to Siegel's (1976). Namely, he divides adjectives into extensional and intensional; for instance, (91) is acceptable but (92) is not.

(91) Utukusi; hito wa utukusii (extensional)
beautiful person beautiful

"A beautiful person is beautiful."

(92) ? Ookii nomi wa ookii (intensional)

"A big flea is big."

He then incorporates a new variable into the intensional adjectives as a parameter and derives prenominal adjectives of both kinds by RII and RIII.

(93) RII Sentence S \longrightarrow adjective phrase

RIII Adj.phrase P + common noun phrase C \longrightarrow common noun phrase.

Where predicative adjectives are concerned, he treats extensional adjectives as sentences but translates intensional adjectives into

(94) $\langle \text{theme} \rangle^{\wedge}$ ($\langle \text{adj.phrase} \rangle^{\wedge}$ (essential property of theme))

This analysis is based on the logical equivalence between the following sentences:

(95) John is excellent.

(96) John is (an) excellent CN.

However, this theory of adjectives is not applicable to Japanese. Observe the following examples.

(97) Hanako wa utukusikatta
beautiful-past

"Hanako was beautiful."

(98) Hanako wa utukusikatta hito da
beautiful-past person

"Hanako is a person who was beautiful."

Note that Japanese adjectives are tensed even in a prenominal position. (98) implies that Hanako is not beautiful at the moment of utterance, but not (97).

Therefore (98) is not logically equivalent to (97) and hence this theory of adjectives is untenable in Japanese.

In addition, Japanese does not seem to conform to Siegel's doublets theory of adjectives at all. Siegel (1979) claims that the following adjectival phrase is ambiguous between intersective and subsective reading.⁸

(99) Marya is a beautiful dancer.

In the subsective reading, Marya is a dancer who dances beautifully, although she might not be beautiful to look at, while in the intersective reading Marya is beautiful and she is a dancer. However, I am informed by native speakers of English that the intersective reading is possible only in a special context. To handle the ambiguity she finds in (99), Siegel proposes to classify most English adjectives as "doublets" which have both subsective and intersective reading. However, the Japanese adjective utokusii "beautiful" does not have subsective reading but only intersective reading. Observe the following example.

(100) Mariko wa utokusii odoriko da.
beautiful dancer is

"Mariko is a beautiful dancer."

(100) simply means that Mariko is beautiful and that she is a dancer. To have subsective reading, we must substitute migotona "beautiful" for utokusii as follows.

(101) Mariko wa migotona odoriko da.

"Mariko is a beautiful dancer."

(101) can only mean that Mariko dances beautifully. This suggests that Japanese does not require a "doublet" theory of adjectives. Moreover, the intersective reading of the English adjective "beautiful" can be considered to be due to a pragmatic influence.⁹

The theory of adjectives I prefer is Kamp's (1975) predicate theory of degree adjectives. Japanese adjectives of Chinese origin which function as nouns should be excluded from here. Degree adjectives are adjectives which can be modified by degree modifiers such as very and fairly. The

predicate theory claims:

- (i) Degree adjectives are predicated.
- (ii) The interpretation of degree adjectives in predicate position is context-dependent.
- (iii) The interpretation of degree adjectives in prenominal positions can be accounted for by context-dependency as predicates.

This theory is based on the observations that the determination of truth-value of those examples crucially depends on the context of use. This theoretically means that semantics is not autonomous with pragmatics. Observe the following examples.

(102) Mary is a remarkable pianist.

(103) John is a small man.

(104) This is an old clock.

(102) could be true when it is uttered intending comparison with amateur pianists but could be false when it is uttered at the Festival Hall. (103) could be true in the West but could be false in the East. (104) could be true at home but could be false in antique shops.

This context-dependency of the interpretation of degree adjectives was formulated by Kamp (1975) model-theoretically and he says that

John is a small man is true in c if and only if
John is small is true in that context c' where
 the comparison class¹⁰ for small is the set of men.

(Cf. E.H.Klein;1977;51)

This proposal cannot easily be incorporated into the PTQ framework, because intensional logic cannot represent that N is contextually relevant to A. Therefore adjectives will be excluded from this fragment.

2.3. Japanese adverbs

(i) Sakai (1979) regards a verb like hasiru "run" as a sentence and hence a manner adverb yakkurito "slowly" is translated into the type ((s,t), t). The following adverbs are included in his fragment:

kinoo "yesterday", kippari "decidedly", utukusiku "beautifully", yukkurito "slowly", kineini "neatly" etc.

but we note that no sentence adverbs are included.

Since we treat a verb hasiru "run" as IV (intransitive verbs) we can distinguish predicate adverbs IV/IV from sentence adverbs t/t. Montague's semantic theory of adverbs was explicitly formulated by Thomason and Stalnaker (1974) who stated that one of the convincing tests to distinguish predicate adverbs from sentence adverbs was to apply "It is Q-ly true that" for the sentence containing adverbs. For instance,

(105)a. Necessarily bachelors are unmarried.

b. It is necessarily true that bachelors are unmarried.

(106)a. John walks slowly.

*b. It is slowly true that John walks.

The unacceptability of (106b) suggests that slowly should not be a sentence adverb but a predicate adverb.

We will now apply this test to Japanese adverbs.

(107)a. Kanarazusimo 9 wa kisuu da
necessarily 9 odd be

"Necessarily 9 is odd."

b. 9 ga kisuu dearu koto wa kanarazusimo hontoo da.
odd is that necessarily true be

"It is necessarily true that 9 is odd."

kanarazusimo "necessarily" must be a sentence adverb.

- (108)a. Ainiku Taroo wa byooki da
 Unfortunately ill

"Unfortunately Taro is ill."

- b. Taroo ga byooki dearu koto wa ainiku hontoo da.
 ill that unfortunately true

"It is unfortunately true that Taro is ill."

Ainiku "unfortunately" must be a sentence adverb.

- (109)a. Sibasiba Taroo wa byookini naru
 often ill become

"Taro often becomes ill."

- *b. Taroo ga byookini naru koto wa sibasiba hontoo da
 ill become often true

"It is often true that Taro becomes ill."

A frequency adverb sibasiba "often" must be a predicate adverb.

- (110)a. Taroo wa kasikokumo osuku kita
 wisely late came

"Taro wisely came late."

- *b. Taroo ga osoku kita koto wa kasikokumo hontoo da
 late came that wisely true

"It is wisely true that Taro came late."

A subject-oriented adverb kasikokumo "wisely" must be a predicate adverb.

- (111)a. Taroo wa hakkirito kotaeta
 clearly answered

"Taro answered clearly."

- *b. Taroo ga kotaeta koto wa hakkirito hontoo da.
 answered that clearly true

A manner adverb hakkirito "clearly" must be a predicate adverb.

As in English, the negative sentences containing sentence adverbs imply the negative sentences without adverbs, and the negative sentences containing predicate adverbs imply the corresponding affirmative sentences without adverbs. However, some subject-oriented adverbs, which are semantically predicate adverbs, behave like sentence adverbs. Consider the following examples, where a implies b.

- (112)a. Taroo wa kasikokumo yakusoku o wasurenakatta
wisely promise forget-not-past

"Taro wisely did not forget a promise."

- b. Taroo wa yakusoku o wasurenakatta.

"Taro did not forget a promise."

- (113)a. Taroo wa wazato terebi o minakatta.
on purpose television watch-not-past

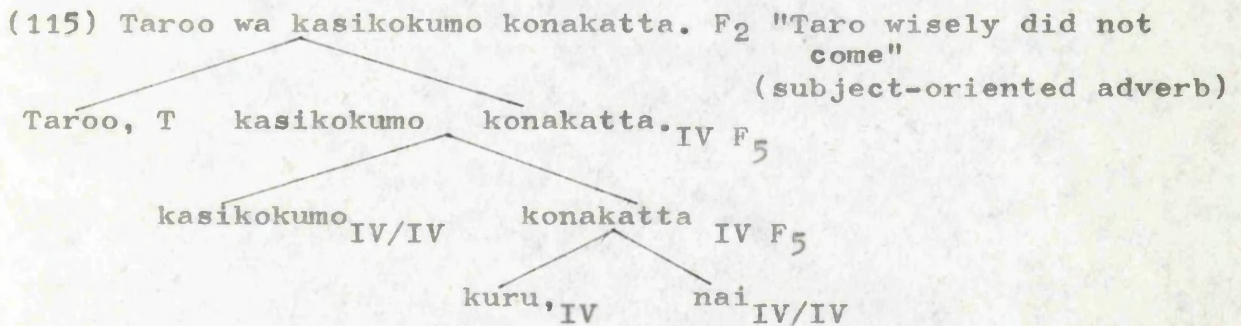
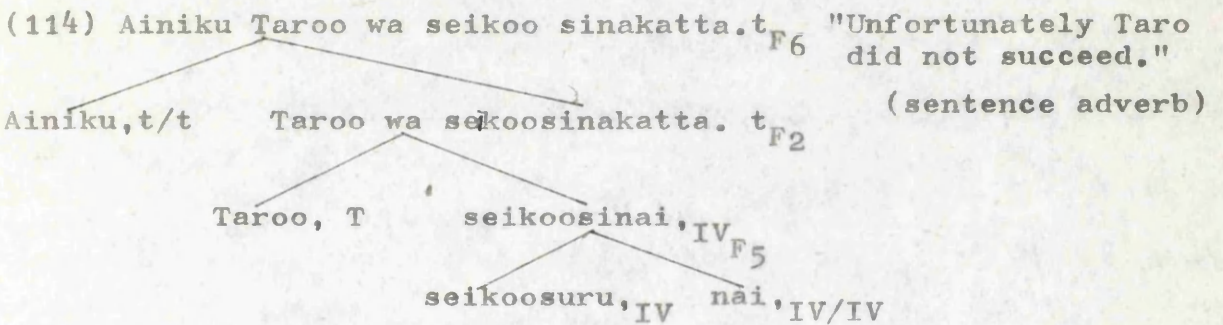
"Taro did not watch television on purpose."

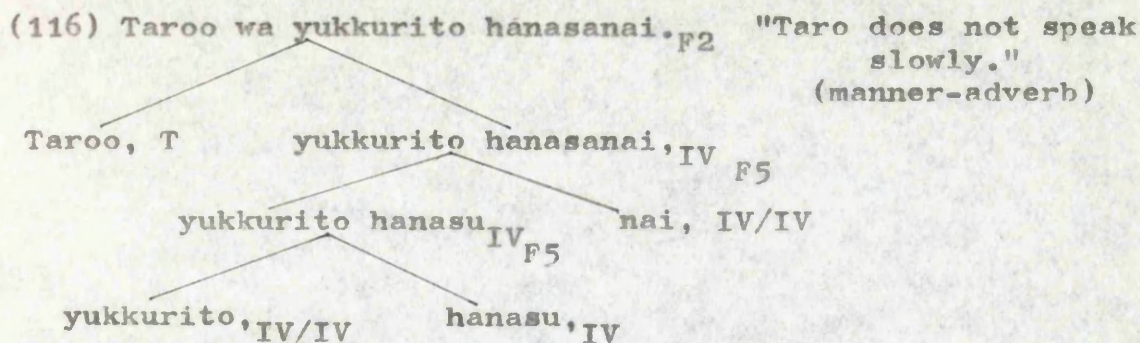
- b. Taroo wa terebi o minakatta.

"Taro did not watch television."

Therefore we assume that negation will apply before a sentence adverb and a subject-oriented adverb are formed, while negation will apply after a manner adverb is formed.

Three kinds of adverbs are roughly analyzed as follows.





Therefore, we need two kinds of rules of adverbs, S.6. and S.7. as follows:

S.6. If $\alpha \in P_{IV/IV}$, $\beta \in P_{IV}$, $F_5(\alpha, \beta) \in P_{IV}$
 where $F_5(\alpha, \beta) = \alpha\beta$

T.6 If α, β translates as α', β' , $F_5(\alpha, \beta)$ translates as $\alpha'(\wedge\beta')$

S.7. If $\alpha \in P_{t/t}$, $\beta \in P_t$, $F_6(\alpha, \beta) \in P_t$,
 where $F_6(\alpha, \beta) = \alpha\beta$

T.7. If α, β translates as α', β' , $F_6(\alpha, \beta)$ translates as $\alpha'(\wedge\beta')$

T.1. (b) Kanarazusimo translates as $\hat{p}[\Box^v p]$
 "necessarily"

2.4. Japanese quantifier-like particles

Some particles such as wa, mo, koso, sae, demo, sika, were called kakarijosi, "modifying particles", by the traditional grammarian Yamada, who analyzed these particles as attaching to the predicate and influencing it. Kuroda (1969) was the first to notice the quantifier-like character of these particles.

Let us concentrate on the particle sae "even".

Kuroda gives the following logical form (117b) for (117a):

(117)a. John wa s.s. sae yonda. "John read even s.s."

b. \forall (John \exists s.s.)

T.8. If α, β translates as α', β' , $F_7(\alpha, \beta)$ translates as $\alpha'(\hat{x}_n \beta')$

S.9. If $\alpha \in P_T$, and $\beta \in P_t$, then $F_{sae}(\alpha, \beta) \in P_t$,
where $F_{sae}(\alpha, \beta)$ comes from β by replacing the
first occurrence of a variable x_n by α sae

T.9. If α, β translates as α', β' , $F_{sae}(\alpha, \beta)$ translates as $\alpha'(\hat{x}_n \beta')$

Not all the kakarijosi can be handled as above, but the
contrastive wa rule can be formulated in the same way as
the sae rule.

S.10. If $\alpha \in P_T$, and $\beta \in P_t$, $F_{wa}(\alpha, \beta) \in P_t$,
where $F_{wa}(\alpha, \beta)$ comes from β by replacing the
first occurrence of a variable x_n by α wa.

T.10. If α, β translates as α', β' , $F_{wa}(\alpha, \beta)$ translates
as $\alpha'(\hat{x}_n \beta')$.

The anaphoric use of wa and exhaustive-listing ga are
excluded from this fragment. To handle the anaphoric wa,
we need to adopt a discourse model.

Footnotes

1. Sinnihonsiki Romanization is used to transcribe Japanese examples.
2. This was pointed out to me by Hide Ishiguro in a personal communication.
3. The principle of incompatibility asserts that at the time of change from p to q neither p nor q obtains.
4. This was pointed out to me by J.E. Buse in a personal communication.
5. The Japanese suffixal verb dasu seems to correspond to English verb start and hajimeru to English verb begin, but kakeru does not have any simple corresponding English verb.
6. This was pointed out to me by E.H. Klein during the LAGB Autumn meeting (1980).
7. $\alpha'(^{\wedge}\beta')$ denotes the application of the function to the intension of β' .
8. Adjectives which denote an intersective function are called intersective, and the denotation of subsective adjectives is a function that assigns subproperties to a property.
9. The comparison class is related to a 'topic of conversation'. It is a subset of the universe of discourse which the speakers and hearers pick up in relation to the conversation.

Chapter 3: Japanese complementation

3.0. Introduction

The notion of embedding or complementation has been introduced into Japanese linguistics by transformational grammarians. They not only regard some subordinate clauses as complements but also postulate complements in the deep structure and relate them to surface non-sentential elements by the applications of transformations.

This chapter re-examines the transformational mechanisms of complementation and attempts to propose a non-transformational analysis of Japanese complementation by applying Montague's theory of grammar. Transformational grammarians rely heavily on semantic evidence in postulating deep structure. However, their semantics is undefined and it relies heavily on the native speaker's rather vague intuition. It is hoped that Montague's grammatical analysis, which is based on truth conditions, will be able to clarify the semantics of Japanese complementation, and simplify the syntax considerably.

Transformations are defined as the mapping between two full sentence structures but Montague grammar defines syntactic rules as the mapping between expressions of any syntactic category. It is an interesting problem whether or not a grammar without transformations can be adequate.

3.1. The Japanese sentential nominalizer no

According to Nakau (1973), who has made an exhaustive study into the transformational syntax of Japanese complementation, there are three kinds of sentential nominalizers no, koto, and tokoro in Japanese. Matrix verbs

can be subcategorized according to which of the sentential nominalizers appear in the object complement. For instance, factive verbs can take either no or koto at the end of the object complement but verbs such as those of learning, ordering and proposing only require koto. The sentential nominalizer no is required not only by verbs of perception, which can also take tokoro, but also by verbs of stopping, helping, meeting and waiting.

Many traditional grammarians of the Japanese language regarded sentential nominalizers as syncategorematic, i.e., having no substantial meaning but just a grammatical function as a place-holder. It was Kuno (1973) who first pointed out a meaning difference between the sentential nominalizers koto and no. He says: "No represents a concrete action, state, or event directly perceived by any of five (or six) senses, while koto represents a more abstract concept.... One can see or hear a concrete event, but not an abstract concept." His insight is admirable, but it is regrettable that he did not provide a precise definition of "event" nor any direct formalism. Moreover, contrary to his prediction about no, the following complements do not represent an event directly perceived:-

- (1) Taroo wa [hitoride kangaeru]_s no o yameta
 Taro alone thinking nom. stopped
 "Taro stopped thinking alone."
- (2) Taroo wa [Hanako ga keikaku o tateru]_s no o tetudatta
 Taro Hanako plan make nom. helped
 "Taro helped Hanako make a plan."
- (3) Taroo wa [Hanako ga akirameru]_s no o matteiru
 Taro Hanako giving up nom. waiting for
 "Taro is waiting for Hanako to give up."

These verbs of thinking, planning and giving up are verbs of mental events which cannot be directly perceived, but we must add that they are still referring to an event of an event. or some temporal segments/ I define an event as a change from a state p to a state q which is distinguishable from p . For example consider the sentence "It is raining"; in this event there is clearly a start, before which it is not raining.

Now let us concentrate for a while on Japanese verbs of perception and attempt to provide an explicit semantics for them by applying Carlson's version of Montague grammar. Carlson (1978) points out that the ambiguity which is found in "Bill ran" can be accounted for by distinguishing an event-level predicate "run" (stage-level predicate in Carlson's term) from a kind-level predicate "run". Event-level predicates refer to an event or some temporal segments of events, but kind-level predicates describe a generic property of an object. Carlson's event-level predicates are directly perceived.

Observe the following examples of verbs of perception.

- (4)a. Taroo wa Hanako ga aruiteiru_s no o mita
Taro Hanako "walking" nom. saw
"Taro saw Hanako walking."
- b.* Taroo wa Hanako ga kasikoi_s no o mita
intelligent
- c.* Taroo wa Hanako ga bijindearu_s no o mita
to be a beauty
- d.* Taroo wa Hanako ga soozoo suru_s no o mita
to have imagination

This shows that verbs of perception cannot operate on

kasikoi "intelligent", bijin dearu "be a beauty" and soozoo

suru "imagine". We note that being intelligent and being a beauty are not events but states of affairs, but imagining is a mental event which cannot be directly perceived. Therefore, we conclude that verbs of perception operate on events except mental events. Verbs of meeting do not operate on mental events, either.

Next let us consider the verb "stopping" examples of which are given below.

- (5)a. Taroo wa osieru_s no o yameta
 Taro teaching nom. stopped
 "Taro stopped teaching."
- b.* Taroo wa kasikoi_s no o yameta
 wise stopped
- c. Taroo wa soozoosuru_s no o yameta
 imagine
 "Taro stopped imagining."
- d. Taroo wa kangaeru_s no o yameta
 think
 "Taro stopped thinking."

This shows that the verb of stopping cannot operate on the state of affairs of being intelligent but can act on the state of affairs of verbs of mental events such as imagining and thinking. Since verbs of helping and waiting behave like verbs of stopping, we conclude that verbs which require the sentential nominalizer no operate on event-level predicates which refer to an event or some temporal segments of an event. Most of these verbs refer to the ongoing part of an event, but the verb of helping can refer to the whole event. The fact that the verbs of perception reject verbs of mental event needs to be explained separately.

We have more supporting evidence for the above conclusion. For instance, generic sentences cannot be embedded into sentences whose matrix verbs require the sentential nominalizer no. Observe the following sentence.

- (6)* Taroo wa /kujira ga honyuudoobutu dearu/ _s no o mita.
 Taro whale mammal be nom. saw
 *"Taro saw whales mammals."

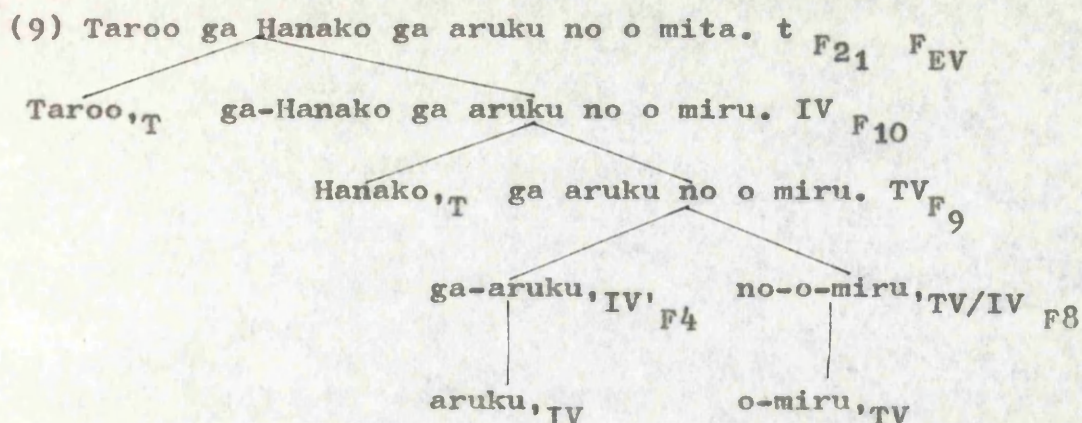
Note that when generic sentences are embedded, the generic particle wa is regularly changed into ga. Moreover, in the following sentence, the embedded sentence can have an event reading only.

- (7) Taroo wa inu ga hoeru no o kiita.
 Taro dog bark nom. heard.
 "Taro heard dogs bark."

To analyze the syntax of the sentences which take the verbs of perception, let us convert them into the passive. Then we notice that the complement s no cannot be passivized as a whole but the complement subject can become a subject of the passive sentence. For instance, (8a) cannot be converted into (8b) but forms (8c).

- (8)a. Taroo wa Hanako ga aruiteiru no o mita.
 Taro Hanako walking nom. saw.
 "Taro saw Hanako walking."
 *b. Hanako ga aruiteiru no ga Taroo niyotte mirareta
 Hanako walking Taro by was seen
 "Hanako's walking was seen by Taro."
 c. Hanako wa aruiteiru no o Taroo niyotte mirareta.
 Hanako walking nom. Taro by was seen.
 "Hanako was seen walking by Taro."

This suggests that the complement s should not be the object complement but Hanako should be the object. Thus we analyze the following sentence as follows.



Note that the operation from aruku IV to ga-aruku IV' was formulated in chapter 2, and ga was suggested to be an Event predicate operator. Here verbs of perception which take a sentential nominalizer no are categorized as TV/IV in contrast to transitive verbs of perception TV. Then there is a systematic category-changing relation between no-o-miru and o-miru, and hence a lexical rule which changes TV into TV/IV is proposed. Lexical rules, which were first suggested by Dowty (1978a) for Montague grammar, differ from syntactic rules. They do not contribute to the compositional semantics but they relate two basic expressions belonging to two different categories. They do not operate on a whole sentence but on an individual category, and replace lexically governed transformations. The following lexical rule is formulated for the verb miru.

L.11. If $\alpha \in P_{TV}$, $F_8(\alpha) \in P_{TV/IV}$, where $F_8(\alpha) = \text{no} - \alpha$.

T.11. If α translates as α' , $F_8(\alpha)$ translates as

$$\lambda Q \lambda P \lambda x^i \lambda y^j P(\lambda u^s \exists u^s \{ R(w, x) \& R(u, y) \& \alpha'(w, u) \& {}^v Q(u) \})$$

(Cf. G. Carlson:1978:126)

Now we can translate sentence (9) as follows:

$$(10) \exists w \exists u \lambda R(w, \text{Taroo}) \& R(u, \text{Hanako}) \& \text{miru}'(w, u) \& \text{aruku}'(u)$$

There are more elaborate formal approaches developed by Usberti (1977) and Barwise (1980). For the sake of simplicity, we will exclude the more detailed analysis of verbs of perception and maintain the above simple semantics for verbs of perception.

What is peculiar from the point of view of linguists is the sequence o-miru and no-o-miru. We have deliberately chosen this parsing, because choice between an object marker o and a sentential nominalizer no depends on the verb. Phonologically they are enclitic. The enclitic rule will work for the sequence of the complement verb and no-o.

The following two rules are necessary to generate sentence (9).

S.12. If $\alpha \in P_{TV/IV}$ and $\beta \in P_{IV}$, then $F_9(\alpha, \beta) \in P_{TV}$,
where $F_9(\alpha, \beta) = \llbracket \beta \alpha \rrbracket_{TV}$.

T.12. If $\alpha \in P_{TV/IV}$ and $\beta \in P_{IV}$ and translates as α', β' respectively, then $F_9(\alpha, \beta)$ translates as $\alpha'(\wedge \beta')$.

S.13. If $\alpha \in P_{TV}$ and $\beta \in P_T$, then $F_{10}(\alpha, \beta) \in P_{IV}$.
where $F_{10}(\alpha, \beta) = \llbracket \beta \alpha \rrbracket_{IV}$

T.13. If $\alpha \in P_{TV}$ and $\beta \in P_T$, and translates as α', β' respectively, then $F_{10}(\alpha, \beta)$ translates as $\alpha'(\wedge \beta')$.

Thus I conclude that the verbs which take the sentential nominalizer no operate on event expressions, but no behaves as a predicate operator in this semantics. The event is defined as a change from a state p to a state q which is distinguishable from p . This definition does not distinguish between mental and physical events. However, the verbs of perception which take the sentential

nominalizer no do not act on expressions of mental events. Therefore only the verbs of perception can be analyzed by using Carlson's event-level predicates.

3.2. Japanese subject raising

In transformational literature, two kinds of subject raising are discussed, that is, subject to subject raising and subject to object raising. Inoue (1978;32) claims that there is no subject to subject raising in Japanese, by quoting the following English examples and comparing them with the corresponding Japanese translations.

- (10)a. For my brother to be involved in this incident
is most unlikely.

—————→ Subject to subject raising

- b. My brother is most unlikely to be involved
in this incident.

- (11) Watasi no kyoodai ga jiken ni maki komareteiru
my brother incident involved

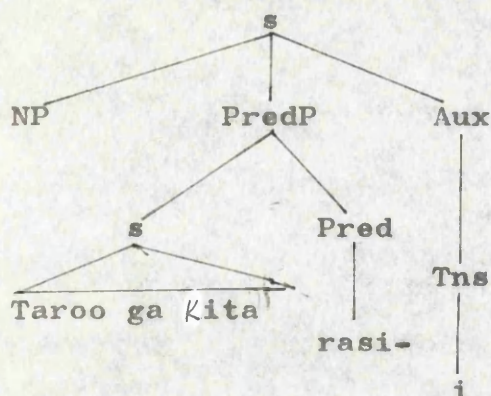
Kanoosei wa mattaku nai.
possibility at all not

"For my brother to be involved in this incident
is most unlikely."

Inoue points out that the Japanese example (11) does not have the corresponding subject to subject raising version.

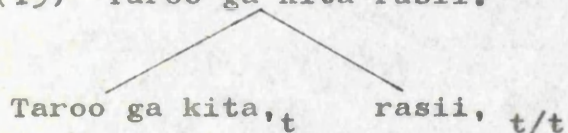
However, Nakau (1973) claims that subject to subject raising (in his terms "complement subject raising") is necessary for the class of predicates such as rasii "likely", kamosirenai "might" (epistemic), nitigainai "must" (epistemic). He assumes that this class of predicates have the following subjectless deep structure and hence require subject to subject raising. Note that the complement predicate is tensed.

- (12) Taroo ga kita rasii
Taro came likely "It is likely Taro came."



Analysis using Montague's grammar does not have any postulate such as subjectless deep structure but analyses rasii in terms of a sentence operator. Since other items such as kamasirenai "might" and nitigainai "must" are modal sentence operators, we can generalize Nakau's complement subject raising as the process of combining a sentence with a sentence operator. Thus there is no need of subject to subject raising in Japanese. Therefore example (12) can be analyzed as follows in Montague grammar.

- (13) Taroo ga kita rasii. "It is likely Taro came."



Translation of (13): $\text{rasii}' (\wedge \lambda P^v P(t) (\wedge \text{kita}'))$

Since the rule of sentence adverb has already been formulated in Chapter 2, S.7, and it can be used in this example, it is not necessary to formulate a new rule, although the following special translation rule must be added to Japanese formal language -

T.1. (c) kamos;renai "might" translates as $\hat{p} \neg \square \neg [^V p]$

(cf. M. Bennett:1976;131).

Another topic of controversy has been that of subject to object raising with two of the main protagonists being Chomsky (1973) and Postal (1974). Kuno (1976) in his analysis of Japanese subject-raising found evidence to support Postal's viewpoint that this was a syntactic device. Namely Kuno claimed that (14a) derived from (14b) by the application of subject to object raising.

- (14)a. Taroo wa Hanako o bakada to omotteita.
Taro Hanako stupid thought.

"Taro thought Hanako to be stupid."

- b. Taroo wa Hanako ga bakada to omotteita.
"Taro thought that Hanako was stupid."

However, in contrast with English subject raising, Japanese subject raising is lexically limited to verbs of thinking and feeling (Cf. S.Kuno;1976;43) and it is to be noted that there is no need of de-finitization. Although Postal (1974) formulates raising in terms of a grammatical relation such as

- (15) Promote the subject of a complement and
de-finitize the complement

whether or not this rule has a universal status is dubious.

From the point of view of Montague grammar, it is necessary to pay attention to the fact that Japanese subject raising is very much lexically governed. Moreover, there is a systematic semantic relation between proposition-taking raising verbs and IV-taking raising verbs, which has been called "semantic lowering" by Thomason (1976). These facts can be captured by using Dowty's lexical rule as follows.

L.14. If $\alpha \in P_{IV/t}$, then $F_{11}(\alpha) \in P_{TV/IV}$.

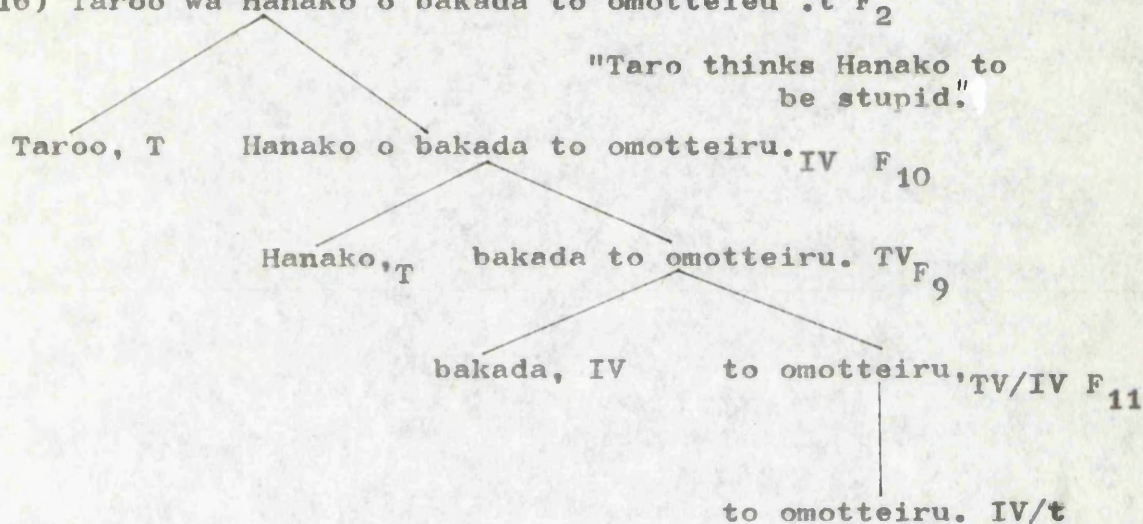
T.14. If α translates as α' , then $F_{11}(\alpha)$ translates as
 $\lambda P \lambda \beta \lambda x [\alpha'(\wedge \{P\{P\}\})(x))]$

(Cf. D. Dowty:1978a;416)

Note that β is a variable of type $\langle s, f(T) \rangle$, which denotes properties of properties of individuals and P is a variable $\langle s, f(IV) \rangle$, which denotes a set of individuals.

Then (14a) will be analyzed as follows.

(16) Taroo wa Hanako o bakada to omotteiru .t F_2



Translation of (14a):

$omotteiru' (\wedge \lambda P' P(h) \{bakada\} _7) (\lambda P' P(t))$

3.3. Japanese verb raising

Like other agglutinative languages, Japanese makes extensive use of derivational suffixation which has the effect of producing complex predicate expressions. Some are exemplified in the following sentences.

- (17)a. Taroo wa nihongo ga hanaseru.
Taro Japanese speak-can

"Taro can speak Japanese."

- b. Boku wa sake ga nomitai.
I sake drink-want

"I want to drink sake."

- c. Hanako wa hon o yomitagaru
Hanako book read-want

"Hanako wants to read a book."

- d. Taroo wa aru kidasita
Taro walk-started

"Taro started walking."

- e. Ziroo wa nakihajimeta
Ziro cry began

"Ziro began to cry."

- f. Hanako wa hon o yomioeta
Hanako book read-finished

"Hanako finished reading a book."

- g. Ziroo wa e o kakituzaketa
Ziro picture draw-continued

"Ziro kept drawing a picture."

- h. Taroo wa ame ni hurareta
Taro rain fall-passive-past

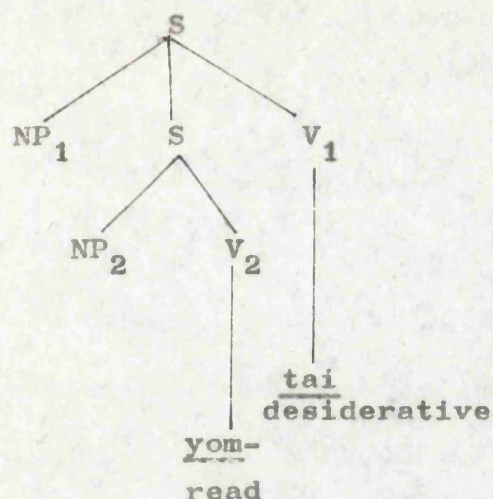
"It rained on Taro."

- i. Taroo wa Hanako o hatarakaseta
Taro Hanako work-cause-past

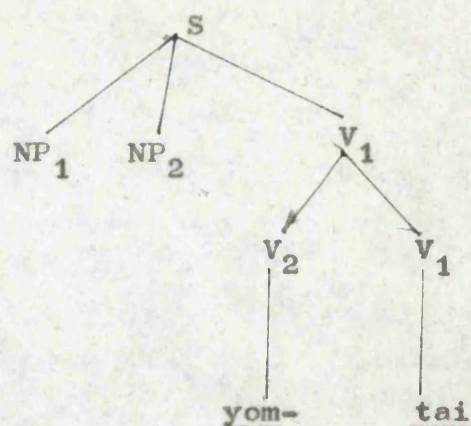
"Taro made Hanako work."

Transformational grammarians consider that these expressions derive from the complex deep structure through verb raising. This transformation raises the tenseless verb of the embedded sentence up to the left of the next higher verb by way of the Chomsky-adjunction. This can be illustrated as follows.

(18)a.



b



One of the problems in verb raising is that it requires a tenseless verb. Since the tense is the obligatory part of embedded sentences, Kuno (1973:333) proposed Aux Deletion which is a transformation that deletes the tense auxiliary in the embedded sentence. Its application is obligatory before verb raising in the second cycle of the following derivation (cf. S. Kuno; 1973:336).

(19) Boku ga hon ga yomitai. "I want to read a book."

a. Deep structure: Boku $\overline{\text{boku hon yom-ru}}_s \text{ta-i}$
 I I book read want

b. First cycle;

(i) Subject Marking: Boku $\overline{\text{boku ga hon yom-ru}}_s \text{ta-i}$

(ii) Object Marking: Boku $\overline{\text{boku ga hon o yom-ru}}_s \text{ta-i}$

c. Second cycle;

(i) Equi-NP Deletion: Boku $\overline{\emptyset \text{ hon o yom-ru}}_s \text{ta-i}$

(ii) Aux Deletion: Boku $\overline{\text{hon o yom-}\emptyset}_s \text{ta-i}$

(iii) Verb raising: Boku hon o yom-ta-i

(iv) Subject Marking: Boku ga hon o yom-ta-i

(v) Object Marking: Boku ga hon o ga yom-ta-i

(vi) Ga/O Deletion: Boku ga hon \emptyset ga yom-ta-i

On the other hand, in Montague grammar, if we follow Partee's (1979) well-formedness conditions which attempt to maintain the spirit of Montague's direct decomposition, obligatory syntactic rules are not allowed and hence both Aux Deletion and Verb raising will be avoided. Then the VP yomitai "want to read" can be analyzed in Montague Grammar as the concatenation of the gerundive form of yomu and the desiderative morpheme tai. Most of the verb raising morphemes should belong to the category of IV/IV, which is the same as predicate adverbs. However, they differ from predicate adverbs syntactically, that is, they follow IV phrases in Japanese. Since Montague regards the categories A/B and A//B as "playing the same semantical but different syntactic roles," (Cf. R. Montague: 1974:249) we make use of his new device of A//B and classify verb raising morphemes as belonging to the category IV//IV. Thus the sequences such as aruki-dasi-hajimeru "begin to start walking" and aruki-tuzuke-tai "want to continue walking" are analyzed as the concatenation of IV/IV//IV. IV//IV. Note that there must be an ordering constraint between these morphemes because this combination is not a free-order. Observe the following analysis tree.

- (20) Hanako wa arukidasihajimeta.^t "Hanako began to
F2 start walking."
Hanako,_T arukidasihajimeru._{IV}
arukidasi,_{IV//IV}_{F12} hajimeru._{IV//IV}
aruki,_{IV} dasi,_{IV//IV}

Translation of (20): $\lambda P^v P(h) (\wedge \text{hajimeru}^1 (\wedge \text{dasi}^1 (\wedge \text{aruki}^1)))$

Then the following rule is formulated:

S.15. If $\alpha \in P_{IV//IV}$ and $\beta \in P_{IV}$, $F_{12}(\alpha, \beta) \in P_{IV}$,
where $F_{12}(\alpha, \beta) = [\beta\alpha]_{IV}$.

T.15. If $\alpha \in P_{IV//IV}$ and $\beta \in P_{IV}$, and translates as α', β' respectively, then $F_{12}(\alpha, \beta)$ translates as $\alpha' \wedge \beta'$

Next let us concentrate on the desiderative morpheme /tai /. When it is preceded by a transitive verb, the object marker o can be changed into ga, without changing meaning. Note /tai / requires the first person subject in the reportive style, although the third person subject can be taken in the non-reportive style. Observe the following examples.

- (21)a. Watasi wa hon { o } yomitai.
I book { ga } read-want
"I want to read a book."
- b. Watasi wa mizu { o } nomitai.
I water { ga } drink-want
"I want to drink water."
- c. Watasi wa Hanako { ni } aitai.
I Hanako { *ga } meet-want
"I want to meet Hanako."
- d. Watasi wa isha { ni } naritai.
I doctor { *ga } become-want
"I want to become a doctor."

- e. Watasi wa sora $\left\{ \begin{smallmatrix} o \\ *ga \end{smallmatrix} \right\}$ tobitai
 I sky fly-want
 "I want to fly in the sky."
- f. Watasi wa reizooko $\left\{ \begin{smallmatrix} o \\ *ga \end{smallmatrix} \right\}$ tabernono de ippai ni sitai
 I refrigerator food with full want
 "I want to fill the refrigerator with food."
- g. Watasi wa hon $\left\{ \begin{smallmatrix} o \\ *ga \end{smallmatrix} \right\}$ gakkoo e motteikitai.
 I book school take-want
 "I want to take books to school."
- h. Watasi wa Taroo $\left\{ \begin{smallmatrix} o \\ *ga \end{smallmatrix} \right\}$ isha ni sitai
 I Taro doctor make-want
 "I want to make Taro a doctor."

According to Kuno's transformational analysis of case-marking, object marking ga applies in the late stage of derivation when the verb is stative. This is already illustrated in (19) as follows:

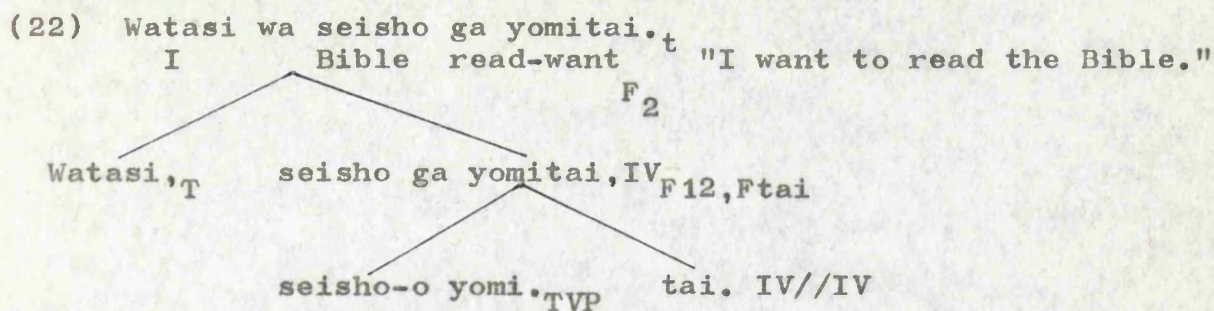
- (iv) Boku ga hon o yom-ta-i
 I book read-want

—————→ Object marking

- (v) Boku ga hon o ga yom-ta-i

However, this transformational case-marking cannot explain why object-marking ga does not apply to (20f), (20g) and (20h).

We note that what is common to examples (20c), (20d), (20e), (20f), (20g), (20h), which do not undergo object-marking with ga, is that the verbs which precede /tai/ are not passivizable. This indicates that a sort of passivization is possible in the formation of ga...tai. Thus examples (20a) and (20b) can be analyzed by adding a rule which includes a sort of passivization to the simple concatenation of the category IV and IV//IV. Observe the following analysis tree.



Translation of (22): $\lambda P^V P (\mathcal{Z}_0) (\hat{\wedge} \text{tai} (\hat{\wedge} \text{yomi}^1 (\hat{\wedge} \lambda P^V P(s)))$

Here TVP stands for a transitive verb phrase which can undergo pure passivization. This is a syntactically defined phrasal category which was first suggested by Bach (1980). However, it seems to be difficult to concatenate TVP with IV//IV and hence the above analysis is untenable.

**Chapter 4: Japanese Reflexive, Passive, and
Causative Construction**

4.0. Introduction

This chapter is an attempt to analyze Japanese reflexives, passives, and causatives by applying Montague's theory of grammar. The reflexive coreference condition which includes the notion of an experience¹ is proposed for Japanese reflexivization. However, since Montague grammar cannot handle the notion of an experiencer, this condition is not applicable to Montague grammar. Concerning direct passives, a lexical rule is adopted. However, this approach cannot handle the scope ambiguity of attitudinal adverbs. Concerning o-causatives, neither a lexical rule nor a syntactic rule is adopted, but a lexical syntactic operation is proposed. This approach requires the o-ni rule, which is considered to correspond to the surface structure constraint. This chapter reveals limitations in PTQ grammar.

4.1 Japanese reflexivization

4.1.1. The study of Japanese reflexivization has been largely ignored by traditional grammarians, and it was left to transformational grammarians to discover a number of interesting facts about Japanese reflexivization. Let us first consider the properties of the reflexive zibun.

- (i) Zibun is used for all persons, genders and numbers.

Compare the Japanese sentences (1a) (2a) and (3a) with the corresponding English sentences (1b) (2b) and (3b).

- (1)a. Watasi wa zibun o semeta.
 I self blamed
 b. I blamed myself.
- (2)a. Taroo wa zibun o semeta.
 Taro self blamed.
 b. Taro blamed himself.

- (3)a. Otokotati wa zibun o semeta.¹
 men self blamed

b. The men blamed themselves.

- (ii) The antecedent of the reflexive must be human:
 (the humanness condition)

- (4)* Ryuukoo wa zibun o kurikaesu.
 fashion self repeat.

"Fashion repeats itself."

Instead of (4), Japanese normally put this into a passive form as follows:

- (5) Ryuukoo wa kurikaesareru
 fashion repeat-passive

"Fashion is repeated."

- (iii) The antecedent of the reflexive must be the subject
 of the sentence (subject-antecedent condition)

- (6) Taro_i wa Jiro_j ni zibun no koto o hanasita
 Taro_i Jiro self_j's matter told.

- (7) "Taro_i told Jiro_j about himself_{ij}."

The antecedent of himself in English sentence (7) could be either Taro or Jiro, whereas in the Japanese sentence (6) zibun refers unambiguously to the subject of the sentence, Taro.

- (iv) Zibun does not have to be a clausemate of its antecedent. In the following examples, zibun is coreferential with the matrix subject.

- (8) Taro_i wa [zibun ga yasumitai tokini_s] yasumu.
 Taro_i self_i rest-want when rest

"Taro takes a rest, when self_i wants."

- (9) Hanako_i wa [zibun ga unda_s] kodomo o kawaigaru.
 Hanako_i self_i gave birth child love

"Hanako_i loves the child whom self_i gave birth to."

- (v) Zibun must be commanded by its antecedent
(the command condition)²

In (10a) zibun is commanded by Hanako and coreferential with it, while in (10b) the command condition is not met, if we interpret zibun as coreferential with Hanako.

- (10)a. Zibun ga ima sundeiru ie o Hanako wa uritagatteiru
self_i now living house Hanako_i sell-show a sign of
"Hanako_i shows signs of selling the house where
self_i is living now."

- (10)b. *Hanako_i ga ima sundeiru ie o zibun_i wa uritagatteiru
now living house self_i sell-show a
sign of
"Self_i shows signs of selling the house where
Hanako is living now."

4.1.2. Transformational grammarians first assumed a transformational derivation of the reflexives under the above conditions and especially the subject-antecedent condition was used to justify the complex deep structure. For instance, Kuno (1973:303-4) postulates a complex deep structure for the indirect (or adversity) passive because of the ambiguity when zibun is included within it. Observe the following examples.

- (11) Taroo wa Hanako ni zibun no uti de sinareta
Taro_i Hanako_j by self's_{ij} house at die-passive-past
"Taro_i was affected by Hanako's_j death at self's_{ij} house."
(12) Taroo wa Hanako ni zibun no jikka e kaerareta
Taro_i Hanako_j self's_{ij} family house return-passive-past
"Taro_i was affected by Hanako's_j returning to self's_{ij}
family house."

Here zibun can be coreferential with the subject of the sentence or non-subject element. Kuno explains this ambiguity by postulating the following two complex deep structures for (11).

- (13)a. Taroo ga $\overline{\text{Hanako}}$ ga Taroo no uti-de sinu _s rare-ta.
 Taro's house at die passive-past
- b. Taroo ga $\overline{\text{Hanako}}$ ga Hanako no uti de sinu _s rare-ta.
 Hanako's house at die passive-past.

Similarly, causative constructions yield an ambiguity with zibun. In the following example, zibun can be coreferential either with the subject of the sentence or with the causee.

- (14) Taroo_i wa Hanako_j ni zibun_{ij} o hihansaseta.
 Taro_i Hanako_j self_{ij} criticize-cause-past
 "Taro_i made (or let) Hanako_j criticize self_{ij}."

As above, a similar deep structure that has Hanako as the subject of the embedded sentence can be assigned to (14) as follows;

- a. Taroo ga $\overline{\text{Hanako}}$ ga Taroo o hihansuru_s sase-ta
 criticize cause-past
- b. Taroo ga $\overline{\text{Hanako}}$ ga Hanako o hihansuru_s sase-ta
 criticize cause-past

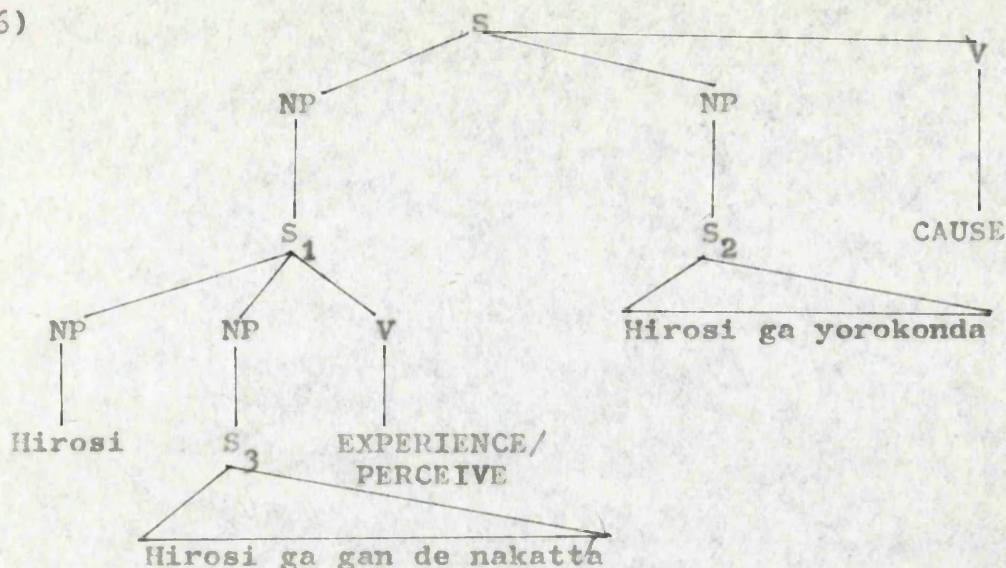
Then it was discovered that this purely syntactic approach was not sufficient to deal with all examples of Japanese reflexivization. N. McCawley (1976) suggested the necessity of lexical decomposition to account for backward reflexivization. Observe the following example given by N. McCawley, where the antecedent of the reflexive is not a subject but an object.

- (15) $\overline{\text{zibun}}$ ga gan de nakatta_s koto ga Hiroshi o yorokobaseta.
 self_i cancer not-past that Hiroshi_i please-past.

"That self_i did not have cancer pleased Hiroshi_i."

N. McCawley argues that the object of sentence (15) must be a perceiver or experiencer of events, so that these emotive verbs should be decomposable into the abstract verb EXPERIENCE/PERCEIVE. She posits the following deep structure for (15).

(16)



Being inspired by Kuroda's (1973a) work on reflexivization, which requires the consideration of style, Kuno (1972) claimed that the awareness of the referent of the reflexive about the state or action represented by the constituent sentence is responsible for the difference of grammaticality. He explains that in the example which led N. McCawley to propose lexical decomposition, the complement clause represents the experiencer's direct internal feeling, although counter-examples are given to the awareness theory of the referent of the reflexive by Kuroda (1973b). There is, however, general agreement on the matter of the antecedent of the reflexive in the above sentence as the experiencer of an event.

As a result, Inoue (1976a) proposed a number of post-cyclic interpretive rules for Japanese reflexivisation. The reflexive zibun is treated as a sub-class of nouns and generated in the base. Her interpretive rules (1976a:161) can account for most examples, but they are very complex. For instance, they include the additional condition that the head noun is coreferential with zibun to account for

reflexivization in relative clauses as well as the notion of $\overline{\text{Like Subj}}$ to account for the ambiguity of reflexives in causative constructions such as (14). Her interpretive rules all apply to the surface (or shallow) structure, because they are based on autonymous syntax.

4.1.3. There are two approaches to reflexivization in Montague grammar, one by Montague, who suggested incorporating reflexivization into the rule of quantification which was later achieved by Bennett (1976), the other by Thomason (1976), who incorporates reflexivization into the rule of subject and predicate. Since Japanese has the subject-antecedent condition, Thomason's theory works for Japanese reflexivization to a certain extent. However, it cannot account for reflexivization that crosses a sentence boundary, for instance, sentences (8) (9) and (15). Moreover, since Partee's (1979) well-formedness constraints prohibit us from incorporating abstract verbs into Montague syntax, we can not adopt N. McCawley's device of lexical decomposition. Thus we will not incorporate reflexivization into the rule of subject and predicate.

It was pointed out by Inoue (1976bII:215) that there are some examples which do not satisfy the subject-antecedent condition. Observe her examples.

- (17) Taro wa Ziroo_i ni zibun_i no sippai o satoraseta
 Taro Jiro self's failure realize-cause-past
 "Taro made Jiro_i realize his own_i failure."
- (18) Taro wa Ziroo_i ni zibun_i-no sigoto o tanosimaseta.
 Taro Jiro self's work enjoy-cause-past
 "Taro made Jiro_i enjoy his own_i work."

What is more interesting is this: if we change sentence (18) into (19), where the subject Taro is an experiencer, an ambiguous interpretation of zibun is possible.

- (19) Taroo_i wa ukkarisite Ziroo_j ni zibun_{j,i} no sippai o
 Taro_i carelessly Jiro_j self's_{j,i} failure
 satorasetesimatta.
 realize-cause-modal-past.

"Taro_i made Jiro_j realize his own_{i,j} failure carelessly, which should not have happened."

This suggests that whether the antecedent is an experiencer or not is as important as the subject-antecedent condition.

Experiencer is a semantic notion whose referent unintentionally experiences events or emotions, and is underlined in the following sentences.

- (20)a. Taroo wa jisin ni Kiga tuita
 Taro earthquake noticed.
 "Taro noticed an earthquake."
- b. Hanako wa atama ga itai
 Hanako head painful
 "Hanako has a headache,"
- c. Taroo wa Ziroo o sinaseta
 Taro Jiro die-cause-past.
 "Taro let Jiro die."
- d. Hanako wa zibun no tosi o wasuretesi matta
 Hanako self age forget-modal-past
 "Hanako has forgotten her own age, which should not have happened."

Model-theoretically, experiencer is not different from the agentive case. One of the weak points of Montague grammar is that it cannot distinguish agentive from non-agentive. (This was independently pointed out by N.Ostler (1980a).) However, the notion of experiencer must be marked in Japanese grammar. According to J.E.Buse (personal

communication), there are some languages which mark experiencers morphologically or grammatically.

Now to stay within the framework of Montague grammar, it is possible to treat zibun as a pronoun and postulate a reflexive coreference condition to account for the coreference of the reflexive. Let us first consider the reflexive zibun_n as belonging to a phrase of the category term. Pronouns such as watasi "I" or kare "he" also belong to this category. Thus we must add the following special translation rule to Japanese formal language.

T.(1)d. Zibun_n, watasi_n, kare_n translates as $\lambda P^VP (\lambda_n)$.

The referents in the indexical use of pronouns are specified in Montague grammar with respect to the context of use. Namely "He walks" could correspond to the proposition "John walks" in one context of use, but in another context of use it could correspond to the proposition "Taro walks." Instead of the context of use, the referent of zibun_n can be considered to be specified with respect to the following condition:-

- (21) The term phrase controls reflexivization in IV or S, if and only if it is an experiencer or the highest human subject.

However, this condition cannot be incorporated into Montague grammar, which cannot handle the notion of an experiencer. In spite of this fact, this condition can handle the coreference of Japanese reflexivization which poses a serious difficulty for any syntactic approach.

- (22) Taro_i wa zibun_i ga yasumitai toki ni yasumu.
Taro_i self_i rest-want when rest.

"Taro_i takes a rest when self_i wants to."

Taroo is a highest human subject in S.

- (23) Taroo wa Ziroom_i ni zibun_i no sippai o satoraseta
 Taro Jiro self's failure realize-cause-past
 "Taro made Jiro_i realize his own_i failure."

As Inoue (1976a:129) points out, some native speakers allow ambiguous readiness in (23), but they prefer the above reading. This suggests that this reading is much stronger than the other possible reading.

Ziroom is an experiencer and Taroom is a human subject.

If we add simatta (modal) to (23), both Taro and Jiro are experiencers. Then ambiguity arises as follows.

- (24) Taroom wa Ziroom ni zibun no sippai o satorasetesimatta
 Taro_i Jiro_j self's_{ij} failure realize-cause-modal-pas
 "Taro_i made Jiro_j realize his own_{ij} failure, which should not have happened."

- (25) Sono keiken wa Mary ni zibun ga bakadearu koto o osieta.
 The experience Mary_i self_i fool is that taught.
 "The experience taught Mary_i that self_i is a fool."
 (Cf. S. Kuno:1972 (117a))

Mary is an experiencer, but sono keiken is not a human subject.

- (26) Mary ga zibun o hinan sita koto ga John o utinomesita
 Mary self_i accused that John_i beat up-past
 "That Mary accused self_i bowled John_i over."

We can simply explain this coreference by regarding John as an experiencer.

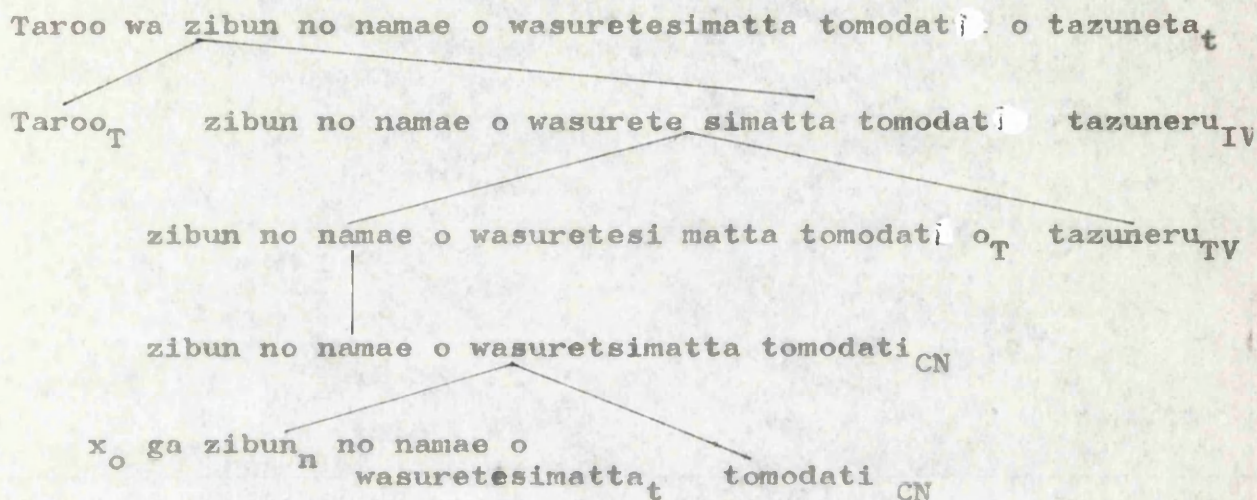
Moreover, where reflexives in relative clauses are concerned, the following additional condition is suggested by Inoue's surface interpretive rules is unnecessary.

- (27) The human head noun can control reflexivization in relative clauses.

Unlike surface interpretive rules, the reflexive coreference condition should be applicable in the process of derivation.

and hence the subject-antecedent condition is sufficient to handle reflexivization in relative clauses.

- (28) Taroo wa zibun no namae o wasuretesimatta
 Taro_j self's_{ji} name forget-completive-past
 tomodati o tazuneta
 friend visit-past
 "Taro_j visited a friend_i who had forgotten his_{ij} name."



Variable binding and deletion of relative clauses take place between X_o and the head noun tomodati, so that zibun_n is not bounded in the earliest stage. If the reflexive coreference condition applies before relative clause formation, zibun_n is coreferential with the subject X_o , that is, tomodati. If the reflexive coreference condition applies at a later stage, zibun_n is coreferential with the subject Taroo.

Next let us consider the following example of the relative clause, where zibun is only coreferential with the head noun.

- (29) Taroo wa zibun no oya ga sindesimatta kodomotati o atumeta
 Taro self's_i parents die-completive children_i gather
 past
 "Taro gathered children whose parents had died."

grammar cannot distinguish agentive from non-agentive, the reflexive coreference condition which includes the notion of an experiencer is not applicable to Montague grammar. One limitation of Montague semantics lies here.

Here I will formulate the rule of relative clause formation as follows:

S.16. If $\alpha \in P_{cN}$, $\beta \in P_t$ and β includes a free variable

$F_{13}(\alpha, \beta) \in P_t$,

where $F_{13}(\alpha, \beta) = \ulcorner \beta \alpha \urcorner_t$

T.16. If $\alpha \in P_{cN}$, $\beta \in P_t$

and α, β translates as α', β' respectively, then

$F_{13}(\alpha, \beta)$ translates as $\hat{x}_n \{ \alpha' (x_n) \wedge \beta' \}$

(Cf. Montague:1974;261)

4.2. Japanese passivization

4.2.1. It is well known that there are two types of passives in Japanese. One is the direct (or simple) passive, which has a corresponding active sentence just like an English passive. Note that the Japanese passivemorpheme is /rare/.³

(31)a. Taroo wa Hanako ni homerareta.

Taro Hanako by praise-passive-past.

"Taro was praised by Hanako."

b. Hanako wa Taroo o hometa.

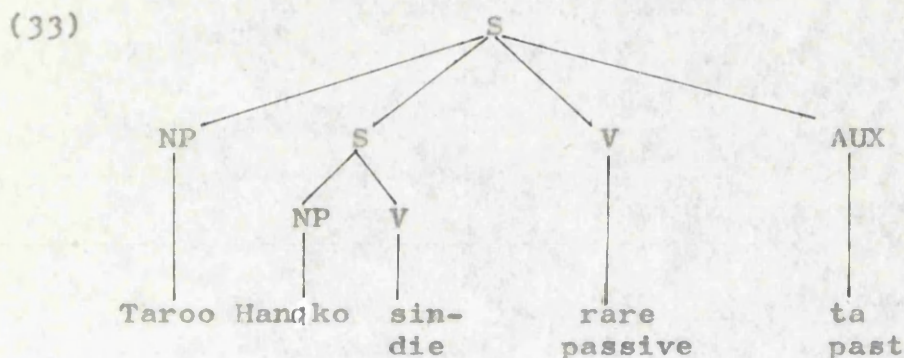
Hanaka Taro praised.

"Hanako praised Taro."

The other is the indirect (or adversity) passive, which has no corresponding active sentence. Note that not only transitive but also non-stative intransitive verbs may be passivized.

- (32)a. Taroo wa Hanako ni sinareta.
 Taro Hanako by die-passive-past.
 "Taro was affected by Hanako's death."
- b. Hanako wa sinda.
 Hanako died.
 "Hanako died."

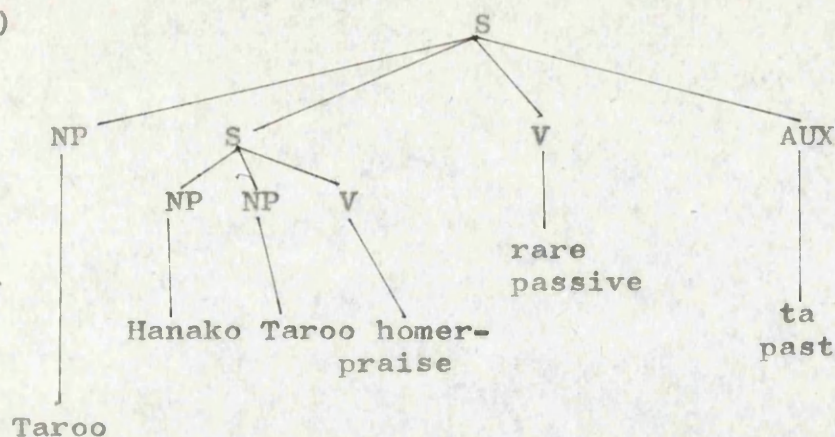
Among transformational generative grammarians, there is controversy over Japanese passives which based on uniform versus non-uniform theories. Both positions are essentially in agreement over the deep structure of the indirect passive. Both of them assume a complex deep structure of the form



The morpheme /rare/ is regarded here as a matrix verb that takes an S as its object .

However, they disagree on the deep structure of the direct passive. Non-uniform theorists (Kuno;1973; N.McCawley:1972; Harada, 1973) believe that the direct passive has a simpler deep structure and that a transformational rate of permutation yields the surface structure. On the other hand, uniform theorists (Kuroda, 1965a; Hasegawa, 1968; Makino, 1973; Howard and Niyekawa-Howard, 1976) claim that the direct passive derives from the complex deep structure. For instance, Kuroda assumes the following deep structure for (31a):

(34)



Now for both viewpoints there are crucial counter-examples. Non-uniform theory cannot account for the scope ambiguity of attitudinal adverbs in the direct passive. This was first pointed out by Makino (1973). He claims that the adverb unambiguously refers to the subject of the sentence in the active sentence (35a) while it can refer to either the subject or the agent in the direct passive sentence (35b).

(35)a. Taroo wa Hanako o iyaiya syootai sita
 Taro Hanako unwillingly invite did
 "Taro unwillingly invited Hanako."

b. Hanako wa Taroo ni iyaiya syootai sareta,
 Hanako Taro unwillingly invite do-passive-past
 "Hanako was unwillingly invited by Taro."

On the other hand, uniform theory can account for the above ambiguity by postulating a complex deep structure for the direct passive. Namely, the non-ambiguity of reflexives in sentence (36) can not be accounted for by Kuroda's uniform analysis.

(36) Taroo wa Hanako ni zibun no uti de kōrosareta
 Taro Hanako self's house kill-passive-past.
 "Taro was killed by Hanako in self's_i house."

To remedy this, Howard and Niyekawa-Howard (1976) propose a Reflexive coreference constraint. However, Kuno (1978)b presents a number of counter-examples to this constraint. Thus an adequate analysis of the Japanese passive still awaits discovery.

4.2.2. Next let us consider the problem of passives from the Montague grammar point of view. There is presently disagreement over English passive formations among Montague grammarians as to whether they are lexical or syntactic (cf. D. Dowty:1978a; E. Bach, 1980). I would like to consider whether the formation of the Japanese direct passive should be by a lexical rule or a syntactic rule in Montague grammar.⁴

If we take a lexical approach, passivization is a category-change from a transitive verb into an intransitive verb. Hence passive verb phrases such as homerare "be praised" should be listed as a subclass of an intransitive verb among the basic expressions. The following lexical rule might be formulated:

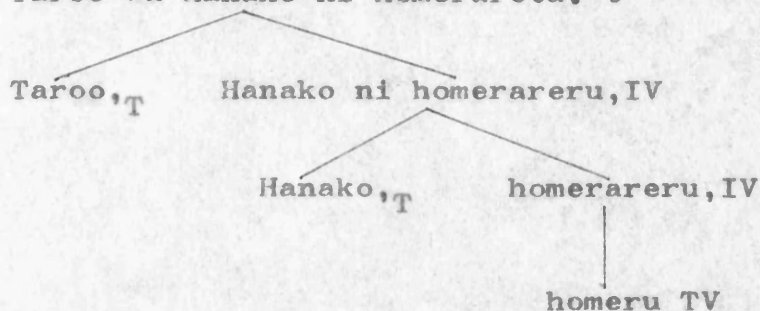
(37) λ_1 If $\alpha \in P_{TV}$, $F_{\lambda_1}(\alpha) \in P_{IV}$, where $F_{\lambda_1}(\alpha) = \alpha - \underline{\text{rare}}$

λ_1 If $\alpha \in P_{TV}$, α translates as α' , then

$F_{\lambda_1}(\alpha)$ translates as $\lambda x \exists y \{ \alpha' (\wedge \lambda P' P(z)) \} (y)$

Then the direct passive (31a) will have the following analysis tree.

(38) Taroo wa Hanako ni homerareta. t

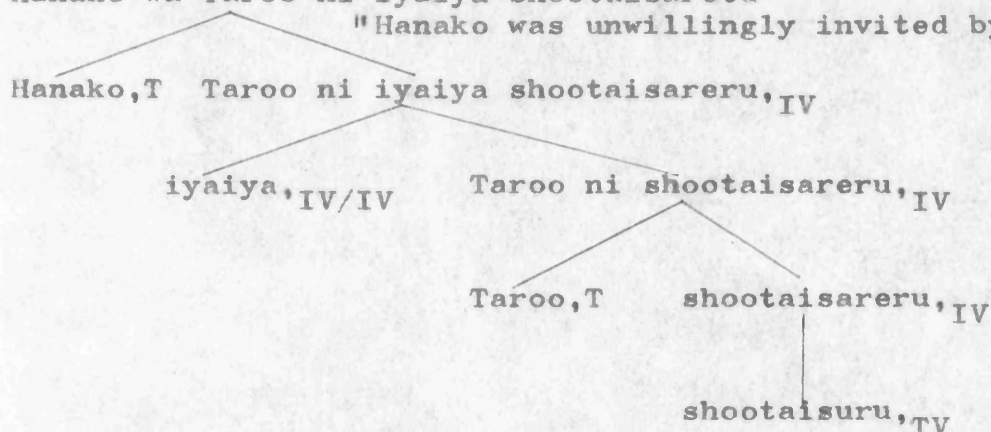


This analysis can account for the non-ambiguity of the reflexive zibun in the following example, since Taroo is the only subject in (39).

(39) Taroo wa Hanako ni zibun no uti de homerareta
 Taro Hanako self's house praise-passive-past
 "Taro_i was praised by Hanako in self's_i house."

However, it cannot account for the scope ambiguity of adverbs which was first discussed by Makino (1973). As the following analysis tree shows, a predicate adverb iyaiya can modify the IV phrase but cannot modify the TV phrase because the TV phrase should be among the basic expressions.

(40) Hanako wa Taroo ni iyaiya shootaisareta
 "Hanako was unwillingly invited by Taro."



Therefore, the lexical approach is inadequate to handle the Japanese direct passive. Moreover, the direct passive formation is lexically governed.

If we take a syntactic approach, passivization is a concatenation of a term and a transitive verb phrase.

Passive verb phrases such as homerare are not listed among the basic expressions but formed by a syntactic rule. The rule might be formulated as follows; and the example of the analysis tree is given in (42).

(41) S.17. If $\alpha \in P_T$, $\beta \in P_{TVP}$, then $F_{14}(\alpha, \beta) \in P_{IV}$,

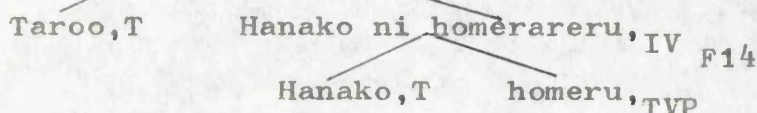
where $F_{14}(\alpha, \beta) = \alpha$ -ni β -rare.

T.17. If $\alpha \in P_T$, $\beta \in P_{TVP}$, then $F_{14}(\alpha, \beta)$ translates as

$\lambda x \{ \alpha' (\hat{\gamma} (\beta' (^\wedge \lambda PVP(x))) (\gamma)) \}$

(42) Taroo wa Hanako ni homerareta t. F_2

"Taro was praised by Hanako."



This analysis can also account for the non-ambiguity of the reflexive zibun in (39), but it cannot handle the scope ambiguity of adverbs. A revision will be necessary to account for the scope ambiguity of the above adverb in the example (40).

As Kuno (1973) points out, some intransitive verbs can undergo the direct passive formation, and hence a lexical rule could be a better option. However, the passivization cannot be formalized as the category change from TV to IV. One possible solution could be to treat passivization as the category change from TVP to IV. TVP differs from TV; TV is listed among the basic expressions, while TVP means "a phrase which works syntactically and semantically like a transitive verb." (Cf. E. Bach, 1980:299) Then the passive rule can be formulated as below.

L.17. If $\alpha \in P_{TVP}$, $F_{14}(\alpha) \in P_{IV}$, where $F_{14}(\alpha) = \alpha$ -rare

4.3. Japanese causativization

4.3.1. The Japanese causative morpheme /sase/ was regarded as an auxiliary verb by traditional grammarians, while transformational grammarians treated it as a main verb which takes the embedded sentence as its object. They also divide Japanese causatives into O-causatives and Ni-causatives and postulate different deep structures for them. The two types of causatives are illustrated as follows.

(43)a. O-causatives with intransitive complements

Taroo wa Hanako o ikaseta.
Taro Hanako go-cause-past

"Taro made Hanako leave."

b. Ni-causatives with intransitive complements.

Taroo wa Hanako ni ikaseta.

"Taro let Hanako leave."

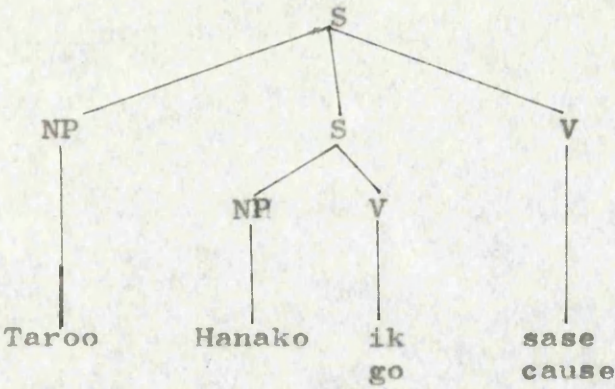
c. Causatives with transitive complements (which are ambiguous between O and Ni-causatives)

Taroo wa Hanako ni sakana o tabesaseta
Taro Hanako fish eat-cause-past

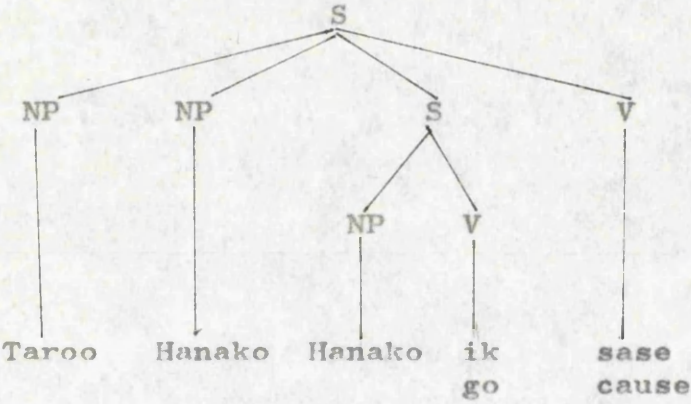
"Taro made (or let) Hanako eat a fish."

There are two conflicting transformational analyses of causatives. One of them is called the Ni-Extra analysis which postulates an extra NP in the matrix sentence of the Ni-causative deep structure, whereas the other, the O-Extra NP analysis, postulates an extra NP in the matrix sentence of the O-causative deep structure. The former was proposed by Nakau (1973) and supported by Inoue (1976b) and Tonoike (1978), and the latter was proposed by Kuroda (1965a) and followed by Kuno (1973), Shibatani (1975) and Harada (1973). The two types of deep structures are illustrated as follows.

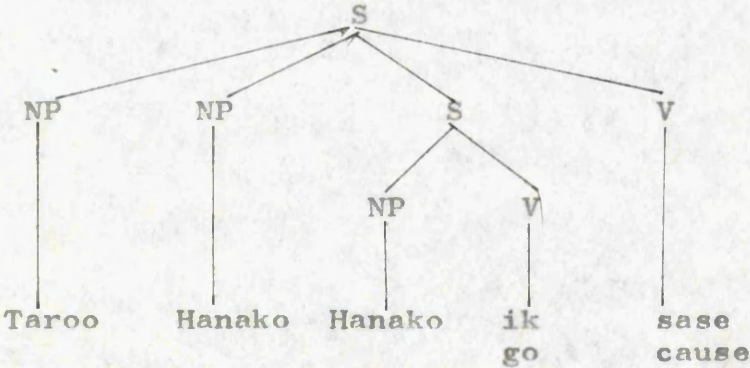
(44)a. Ni-Extra NP analysis (O-causative)



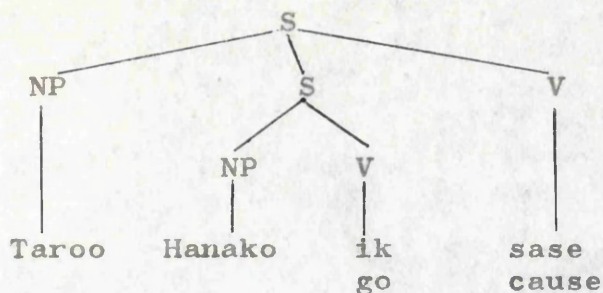
b. Ni-Extra NP analysis (Ni-causative)



(45)a. O-Extra NP analysis (O-causative)



b. O-Extra NP analysis (Ni-causative)



Although Tonoike (1978) strongly argues for the Ni-Extra NP analysis, Kuno (1978b) points out that there is insufficient evidence to choose between the two conflicting analyses. Thus this problem is still unsolved.

What is missing in both the existing analyses seems to be an explicit semantics. When a deep structure is postulated, there is a heavy reliance on semantic evidence, but the semantics is undefined and far from truth conditional semantics. Let us review the semantics of Japanese causatives as studied by transformational grammarians.

Kuroda (1965a) states that Ni-causatives are characterized by involving the willingness of the causee and the O-causative by being indifferent to it. What is semantic is not defined and his vague intuition seems to be a guide to his method of judgment. Observe the following examples given by Inoue (1976b I:70). They clearly show that Kuroda's semantic distinction is not always maintained.

(64) Kare wa iyagaru imooto ni beddo de nesaseta
 he reluctant sister bed sleep-cause-past

"He made his reluctant sister sleep in the bed."

- (47) Kare wa iyagaru tuma ni hatarakaseta
 he reluctant wife work-cause-past
 "He made his reluctant wife work."

In these examples the causees are not willing to perform the action. Kuno (1973) follows Kuroda's semantic definition of Ni-causatives but adds that the causee of O-causatives is forced into the action denoted by the complement. His claim is falsified by Kitagawa's (1974) following examples.

- (48) Taroo wa yasai $\left\{ \begin{array}{l} o \\ *ni \end{array} \right\}$ kusaraseta
 Taro vegetable spoil-cause-past
 "Taro let the vegetable spoil."

- (49) Isha ga byoonin $\left\{ \begin{array}{l} o \\ *ni \end{array} \right\}$ sinaseta
 doctor patient die-cause-past
 "The doctor let the patient die."

In these examples the causees are not forced to do the actions. If we substitute tatu "stand" for sinu "die" in (49), the causee is forced to stand. Observe the following example.

- (50) Isha ga byoonin o tataseta.
 doctor patient stand-cause-past
 "The doctor made the patient stand."

This suggests that the apparent semantic distinction between the O-causative and the Ni-causative should come from lexical semantics. Although transformational grammarians postulate dualistic syntactic deep structure to account for the meaning difference between the O-causative and Ni-causative, logical syntax, which is based on truth conditions, does not assume a semantic difference between them.

What has not been refuted by transformational studies of Japanese causatives is Harada's (1973) and Kuno's (1973) observations on the self-controllability of the complement verbs of Ni-causative. They both claim that the complement of Ni-causatives must be self-controllable. Note that self-controllable predicates coincide with predicates which can form imperatives. Observe the following examples: where Ni-causatives are unacceptable, because the complement verbs are not self-controllable.

- (51)a. Taro wa Hanako o komaraseta.
Taro Hanako annoy-cause-past.

"Taro annoyed Hanako."

- *b. Taro wa Hanako ni komaraseta.

"Taro allowed Hanako to be annoyed."

- (52)a. Taro wa Hanako o kanasimaseta.
Taro Hanako grieve-cause-past.

"Taro made Hanako grieve."

- *b. Taro wa Hanako ni kanasimaseta.

"Taro let Hanako grieve."

- (53)a. Taro wa ame o huraseta.
Taro rain fall-passive-past.

"Taro made it rain."

- *b. Taro wa ame ni huraseta.

"Taro let it rain."

- (54)a. Taro wa bakudan o bakuhatumaseta.
Taro bomb explode-cause-past.

"Taro made a bomb explode."

- *b. Taro wa bakudan ni bakuhatumaseta.

"Taro let a bomb explode."

This suggests that the Ni-causative is a subset of the O-causative involving self-controllable action. From the point of view of Montague grammar, the Ni-causative, which is lexically governed, should not be generated by logical syntactic rules.

4.3.2. Let us consider this problem in Montague grammar. Dowty (1976) formalizes Comrie's (1976) PARADIGM CASE of causative constructions into three category-changing lexical rules. These are summarized as follows.

- (55) 1. If the embedded verb is intransitive, then the embedded subject becomes a direct object in surface structure.
- a. If $\alpha \in B_{IV}$, then $F_c(\alpha) \in B_{TV}$.
2. If the embedded verb is transitive, the embedded subject becomes an indirect object.
- b. If $\alpha \in B_{TV}$, then $F_c(\alpha) \in B_{TV/T}$.
3. If the embedded verb is a three-place verb, then the embedded subject assumes another oblique case or becomes the object of a preposition.
- c. If $\alpha \in B_{TV/T}$, then $F_c(\alpha) \in B_{(TV/T)/T}$

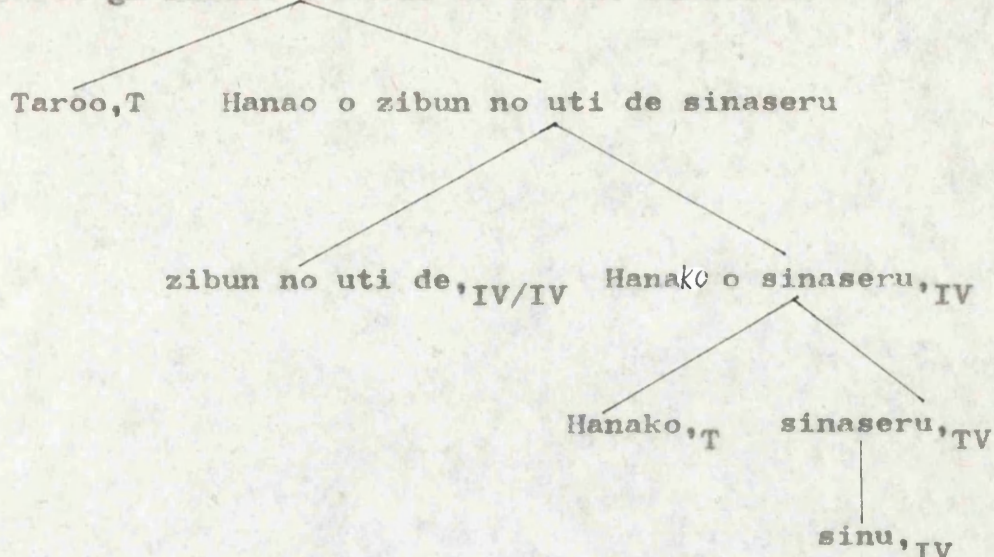
These lexical rules are not applicable to Japanese causatives. Firstly the O-causative formation is not lexically governed in contrast to the Ni-causative formation. Secondly, if we take a lexical approach, we cannot account for the ambiguity of the scope of adverbs, the ambiguity of reflexives, soo suru replacement and sentence pronominalization. These ambiguities of productive causatives are discussed by Shibatani (1976:245-251) who compares them with lexical causatives.

For instance, if the O-causative formation were due to lexical rules, it could not account for the ambiguity in the following O-causatives.

- (56) Taroo_i ga Hanako_j o zibun_{ij} no uti de sinaseta.
 Taro Hanako self's house die-cause-past.
 "Taro_i let Hanako_j die in self's_{ij} house."

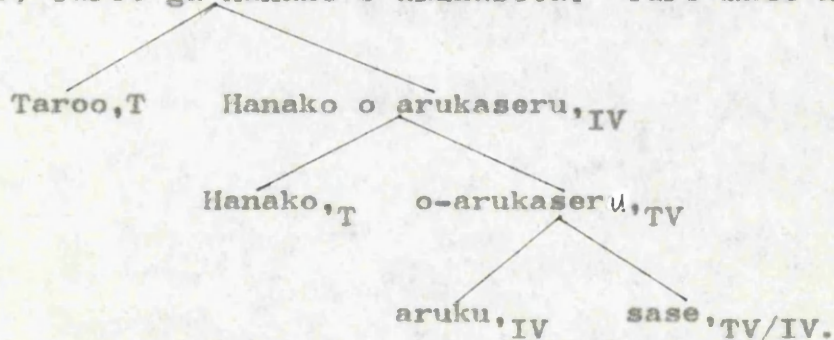
(56) will have the following analysis tree, if we take a lexical approach.

(57) Taroo ga Hanako o zibun no uti de sinaseta.



The reflexive coreference condition (21) predicts zibun is only coreferential with the subject Taroo. Therefore a lexical approach will be abandoned. Moreover, the above ambiguity suggests that Hanako must be the subject somewhere in the derivation and so the syntactic approach is not taken either. The following analysis tree might be constructed for a syntactic approach.

(58) Taroo ga Hanako o arukaseta. "Taro made Hanako walk."



I propose to analyze Japanese O-causatives by a lexical syntactic operation, which takes a formula containing a free variable and yields non-sentential phrase as its output. Not only the above ambiguities pointed out by Shibatani but also the relation of logical consequence must

be accounted for by logical syntax and semantic analysis. In all of the examples of causatives, the interpretation includes the proposition. For instance,

- (59)a. Taroo ga Hanako o hasiraseru.
Taro Hanako run-cause

"Taro makes Hanako run."

- b. Hanako ga hasiru.
Hanako run

"Hanako runs."

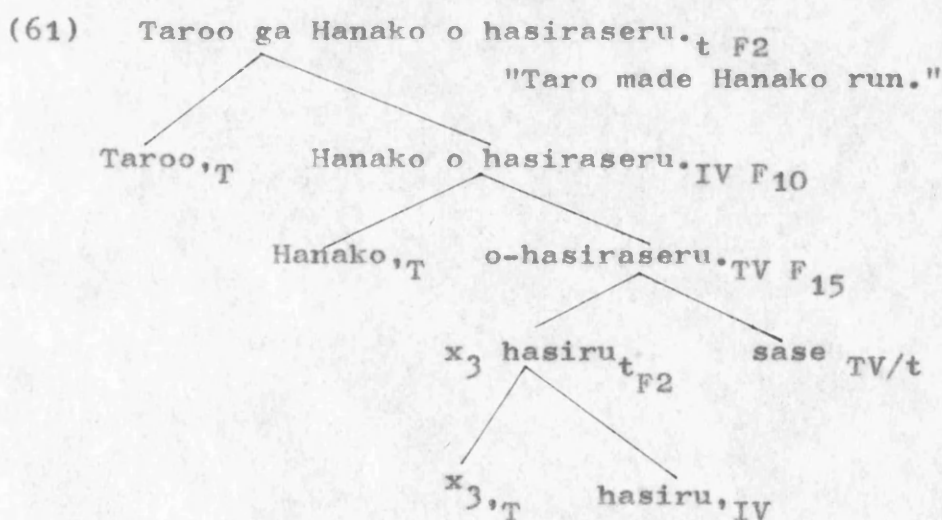
- (60)a. Taroo ga Hanako ni Kutu o hakaseru.
Taro Hanako shoes wear-cause

"Taro makes Hanako wear shoes."

- b. Hanako ga kutu o haku.
Hanako shoes wear

"Hanako wears shoes."

In both examples, Hanako is a semantic subject that performs an action. Therefore, logical syntax invites us to analyze Hanako as the subject somewhere in a derivation. Then (59a) will have the following analysis tree.



The causative morpheme /sase/ is treated as a phrase of a category of TV/t, which takes a formula containing a free variable and forms a transitive verb. The following rule must be formulated:

S.18. If $\alpha \in P_{TV/t}$, $\beta \in P_t$, and β has the form $x_n \gamma$, then

$$F_{15}(\alpha, \beta) \in P_{TV},$$

$$\text{where } F_{15}(\alpha, \beta) = \alpha\beta$$

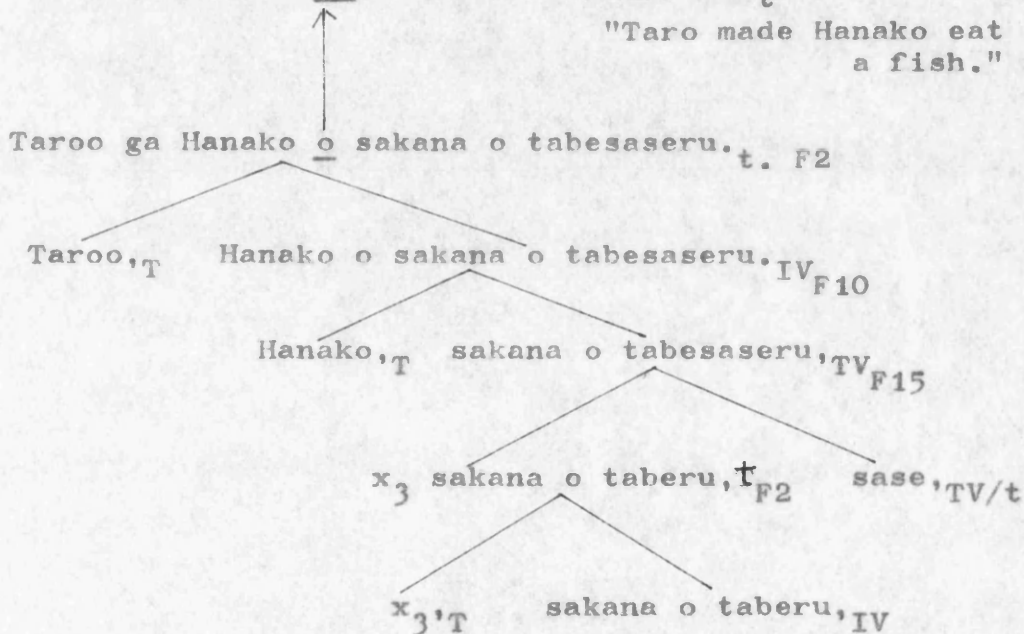
T.18. If $\alpha \in P_{TV/t}$, $\beta \in P_t$, and β has the form $x_n \gamma$,

then $F_{15}(\alpha, \beta)$ translates as $\lambda P \lambda \gamma \{ \text{CAUSE}(\wedge \{ \text{BEC}(\wedge \{ \text{P}(\gamma) \}) \}) \}$ ⁵
(γ)

This rule also can handle the o-causative with transitive complements as in (60a). However, it seems to require a rule which converts o into ni. Observe the following analysis tree.

(62) Taroo ga Hanako ni sakana o tabesaset_a._t

"Taro made Hanako eat a fish."



This rule falls under the o-ni rule which is said to correspond to a Japanese surface structure constraint by Shibatani (1975). This surface structure constraint prohibits the double occurrence of the accusative o in a sentence. Ostler (1980b) claims that the rule generates the following surface case arrays: the upper figure giving the maximum, the lower the minimum number of instances.

(63) NOM₁ⁿ DAT₀² ACC₀¹

This seems to suggest that logical syntax is inadequate to handle Japanese case relations which are purely syntactically induced.

There is a fine difference of meaning between O-causatives and Ni-causatives. However, it seems to me that the meaning difference between them comes from a non-logical part of meaning. We might be able to say that in the O-causatives the causee is an experiencer, while in the Ni-causatives the causee is not an experiencer but a self-controllable agent. This distinction should be captured by lexical semantics. In the translation of O-causatives the operator BECOME is included. This primitive might be better deleted for Ni-causatives due to self-controllability.

To handle purely syntactically induced case relations such as a surface structure constraint, it seems necessary to incorporate the level of a linguistic syntax. One of examples for Japanese is Ostler's (1980b) phrase structure grammar whose NP's are marked with case markers. This is given below.

(64) Phrase structure of simple sentences

$$a. \quad S \longrightarrow \left(\left[\begin{array}{c} NP \\ NOM \end{array} \right] \right) \left(\begin{array}{c} S \\ V'' \end{array} \right)$$

$$b. \quad V'' \longrightarrow \left(\left(\left[\begin{array}{c} NP \\ DAT \\ P' \end{array} \right] \right) \right) V'$$

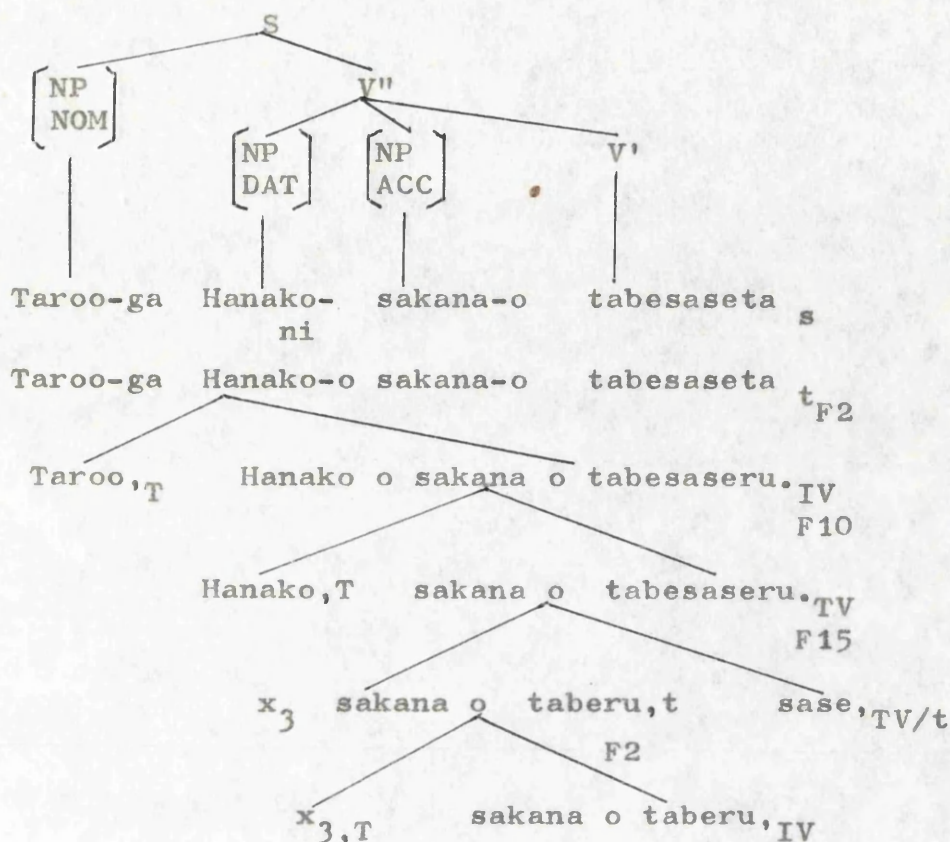
$$c. \quad V' \longrightarrow \left(\left(\left[\begin{array}{c} NP \\ DAT \\ P' \end{array} \right] \right) \right) \left(\left[\begin{array}{c} NP \\ ACC \end{array} \right] \right) V$$

$$d. \quad P' \longrightarrow NP \quad P$$

These phrase structure rules can handle Ni-causatives as follows:

(62) Taroo ga Hanako ni sakana o tabesasetta.

"Taro made Hanako eat a fish."



This suggests that linguistic syntax and logical syntax should be distinct fields of investigation, and that the interaction between them are most revealed in morphology. To develop Montague's theory of grammar into a linguistic theory, it is necessary to incorporate the level of a linguistic syntax which is based on phonology.

Although the linguistic framework given above is not meant for a processing model, it is not far from the recent suggestions of psychologists such as Marslen-Wilson.

and Welsh (1978) and Johnson-Laird (1981). For instance, Johnson-Laird says:

The theory assumes that there are two main stages in comprehension. First, utterances are translated into a mental code that provides a direct linguistic representation of them. This stage concerns the identification of speech sounds, the recognition of words, and the recovery of superficial syntactic structure. Secondly, the linguistic codes may be used as part of the basis for the inferential construction of a mental model of the state of affairs that the utterance describes.

Footnotes.

1. Zibuntati is a plural form of zibun, but plural suffixation is not obligatory in (3a).
2. Langacker (1969) says: "For NP¹ to command NP², it must be the case that the S-node which most directly dominates NP¹ also dominates NP²."
3. According to Kuroda (1965a), the initial consonant "r" of the morpheme /rare/ drops when preceded by a consonant.
 e.g. home-rare-ru → homerareru "to be praised".
 omow-rare-ru → omowareru "to be thought of".
4. The form of niyotte passives as shown below are excluded from this fragment. Kuroda (1979) claims that they are transformationally formulated.
 (i) Taroo wa Hanako niyotte homerareta
 Taro Hanako by praise-passive-past
 "Taro was praised by Hanako."
5. I am indebted to R.H. Thomason (personal communication) for the formulation of intensional logic.

Chapter 5: Japanese Negation and Presupposition

5.0. Semantics and pragmatics

Is there a clear-cut distinction between semantics and pragmatics? It is said semantics studies truth conditions and pragmatics studies speakers' meaning. Some linguists believe in a clear-cut distinction between semantics and pragmatics and exclude pragmatics from linguistics because of its unpredictability. However, the formalization of pragmatics has been advanced not only by philosophers, psychologists, and computer scientists but also by linguists such as Gazdar (1979) and Sperber and Wilson (1980). It cannot be denied that pragmatics is now a fashionable topic in linguistics.

I am convinced that pragmatics is part of linguistics not only through my studies of Japanese grammar but also from my experience as a non-native speaker of English. It is difficult for a non-native speaker of English to find not only semantic ambiguity but also pragmatic ambiguity, implication, and stylistic ill-formedness. Katz (1972:443) excludes pragmatics from linguistics, because he believes that pragmatics does not "reflect pure grammatical competence." It is not an issue here whether or not a theory of grammar is a theory of competence, but the ability to detect pragmatic ill-formedness seems to belong to the native speakers' competence. Hence linguistics which aims to characterize the knowledge of language should include pragmatic rules.

Since Morris (1938) established the foundations of semiotics, the trichotomy between syntax, semantics and pragmatics has been basic to the studies of sign systems,

which include logic, mathematics, linguistics, aesthetics, etc. According to Morris, semantics studies the relation of signs to objects, pragmatics the relation of signs to the interpreter, and syntax the relation of signs to other signs. If pragmatics studies the relation of signs to the interpreter, the relation between the personal pronoun "I" and the speaker must be pragmatic. Influenced by Bar-Hillel (1954), Montague used the term "pragmatics" for his model-theoretic research on indexicality, which involves personal pronouns, demonstratives, modals, tenses, contextual ambiguity and so on. For instance,

(1) This is a book.

(1) cannot be considered true or false until the context of use is specified. Since most sentences are tensed, truth conditions must be determined at the level of pragmatics. However, this statement has been criticized by some logicians and replaced by the term "indexical semantics." I think what matters is not to argue whether indexicals are semantic or pragmatic but to decide whether or not there is an interaction between semantics and pragmatics. I will reject the Davidsonian view that truth conditions are independent of the context of use, and take the view that truth values are determined contextually. Hence a theory of truth should belong to pragmatics.

The Gricean principle of conversational implicature has been widely accepted by linguists as a theory of pragmatics in the broader sense of involving background assumptions between speakers and hearers. According to Grice (personal communication), Gricean maxims are rules

of how to talk which transcend individual cultures and hence they are not the result of cultural evolution. Grice (1975) gives the following maxims for the rules of conversation.

- (a) Quantity Make your contribution as informative as is required.
- (b) Quality Make your contribution one that is true.
- (c) Relation Be relevant.
- (d) Manner Be perspicuous.

However, Gazdar (1979) suggests that the Gricean rules of conversation might not be universal. It is an interesting problem as to how far Gricean rules are universal.

Moreover, since they are expressed vaguely, they need re-formulation.

It is necessary to develop a theory of pragmatics suitable for use within Montague's universal grammar. Stalnaker's (1978) pragmatic principles are presented model-theoretically and although they are insufficient as a theory of pragmatics, they seem to work for Japanese discourse as well as English. He states the principles as follows:

1. A proposition asserted is always true in some but not all of the possible worlds in the context set.¹
2. Any assertive utterance should express a proposition, relative to each possible world in the context set and that proposition should have a truth value in each possible world in the context set.
3. The same proposition is expressed relative to each possible world in the context set.

The first principle helps to disambiguate sentences contextually and the second principle concerns truth value

gaps which result from presupposition failure or vagueness. The third principle is useful for interpreting indexicals or proper names.

The other important advance is Kamp's discourse model. "The truth of a bit of discourse D in a model M is defined as the existence of a proper embedding into M of the representation of D." The discourse model consists of discourse representations and discourse referents. The discourse representations or DR's, are formed in response to the discourse and their formations operate on the syntactic structure. For instance, the first sentence of (2) induces the following DR:

(2) Pedro owns a donkey. He beats it.

M₁

U	V
.	.
Pedro owns a donkey	
U = Pedro	
U owns a donkey	
donkey (V)	
U owns V	

The complete DR of (2) becomes:

M₂

U	V
.	.
Pedro owns a donkey	
U = Pedro	
U owns a donkey	
donkey (V)	
U owns V	
<hr/>	
He beats it	
U beats is	
U beats V	

(2) "is true in the model M provided there is an element of U_M such that $\langle F_M, (\text{Pedro}), d \rangle$ belongs to both F_M (own) and F_M (beats); and furthermore d is a donkey in M formally $d \in F_M$ (donkey), if we assume that common nouns are interpreted in the model by their extensions." There is a problem as to whether the truth of the discourse model is pragmatic or semantic, but still how can we demarcate semantics from pragmatics? The present tendency in linguistic pragmatics is to reanalyze logical properties as pragmatic properties, but this seems to have been recently taken to the extreme. One example is a scopeless analysis of negation and quantifiers. This chapter will deal with negation and presupposition in English and in Japanese, and argue against some recent research which suggests that all the presuppositional phenomena should be handled at the level of pragmatics.

5.1. Logical structure of English and Japanese negation

(3) The present king of France is not wise.

This sentence has been one of the most discussed sentences amongst philosophers and linguists since it was first questioned by Russell (1905). Russell's theory of descriptions predicts that this sentence entails the existence of an unique king of France and that it is semantically ambiguous between the narrow-scope predicate negation and the wide-scope sentence negation as follows.

(4)a. The present king of France is non-wise.

b. It is not the case that the present king of France is wise.

Russell would say that (3) has two distinct truth conditions; when (4a) is true, there must be a unique king of France and he is not wise, when (4b) is true, either there is no king of France or there is more than one king of France, or there is a unique king of France who is not wise. Thus truth conditions of (4b) are disjunctive and non-specific. The truth conditions of (4a) are included in (4b) and hence (4a) and (4b) have understandings that are privative oppositions.

This has been widely accepted among logicians, but Atlas (1977) argues that (3) is not ambiguous between (4a) and (4b) but semantically general (Quine) and that the logical structure of (3) should be (4b) alone, since he believes that (3) fails standard ambiguity tests. However, as Zwicky and Sadock (1975) explicitly say, their ambiguity tests fail to test privative oppositions, it is no wonder that (3) fails standard ambiguity tests. Therefore there is no convincing evidence which supports Atlas' claim.

We are now in a position to consider the logical structure of Japanese negation. The following sentence (4a) is not ambiguous because the Japanese language syntactically distinguishes predicate negation and sentence negation. (4a) has a predicate negation reading only, (4b) sentence negation reading only, and (4c) shows that we cannot negate the existence of reference but (4d) can.

(4)a. Genfuransuoo wa kasikokunai.

PKF wise not

"The present king of France is non-wise."

b. Genfuransuoo ga kasikoi wake wa nai.

PKF wise not the case

"It is not the case that the present king of France is wise."

- c. *Genfuransuoo wa kasikokunai, nazenara
PKF wise not because

sonzaisinaikara
exist not

"The present king of France is non-wise, because
there is no king of France."

- d. Genfuransuoo ga kasikoi wake wa nai, nazenara
PKF wise not the case because

sonzaisinaikara
exist not

"It is not the case that the present king of France
is wise, because there is no king of France."

When we consider the logical relation of Japanese predicate negation and sentence negation, (4a) entails (4b) but (4b) does not entail (4a). Therefore (4a) and (4b) are not logically equivalent and hence Japanese predicate negation differs from sentence negation not only syntactically but also semantically.

Japanese sentence negation can be interpreted in a similar way to English contradiction negation discussed by Karttunen and Peters (1979:49). The following examples are given by them.

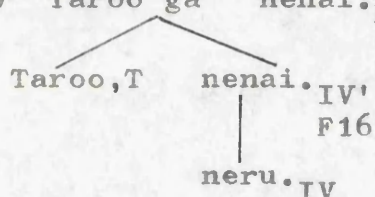
- (5)a. John didn't fail to arrive. He wasn't supposed to come at all.
b. Bill hasn't already forgotten that today is Friday, because today is Thursday.
c. Mary isn't sick, too. Nobody else is sick besides her.

These English negative sentences are best translated into Japanese sentence negation ".... wake wa nai", or "..... hazu wa nai." Just as English contradiction negation affects the total meaning including conventional implicature (presupposition), Japanese sentence negation includes the

problem of use. Then there must be some interaction between semantics and pragmatics. For instance, it has been suggested by Kamp that sentence negation should be handled by a discourse model, which is one possible approach to handle this aspect of meaning.

I will here only formulate predicate negation for JFL, within which the negative morpheme /nai/ is a predicate operator that maps the predicate into predicate negation. An example of predicate negation is as follows.

(6) Taroo ga nenai._{F2} t "Taro does not sleep."



S.19. If $\alpha \in P_{IV}$, then $F_{16}(\alpha) \in P_{IV}$,
 where $F_{16}(\alpha) = \alpha' - \underline{\text{nai}}$, where α' is a stem-form
 of α .

T.19. If $\alpha \in P_{IV}$, α translates as α' ,
 where $F_{16}(\alpha)$ translates as $\lambda x_n [\neg \alpha'(x_n)]$.

5.2. Arguments against an entailment approach

The proponents of an entailment approach, who claim that a single category of entailment is sufficient for semantics, have further extended their analysis of the definite description to include examples like (7), (8), and (9).

- (7) John doesn't regret having married.
a. because he is happy.
b. because he is a bachelor.
- (8) John doesn't stop beating his wife.
a. because he hates his wife.
b. because he is unmarried.
- (9) It isn't John who is married to Mary.
a. because Peter is married to Mary.
b. because Mary is unmarried.

They insist that (7) (8) and (9) entail their complement clauses because of the acceptability of the coordination with (7b) (8b) and (9b) respectively. However, in Japanese which syntactically distinguishes sentence negation and predicate negation, the translation of (7) (8) and (9) can be disambiguated as follows. Namely only (10b), (11b) and (12b) in translation have sentence negation and can have the reading of (7b) (8b) and (9b) as follows.

- (10)a. Hanako wa kekkonsita koto o kookaisinakatta nazenara
 married regret did not because

 siawase dakara.
 happy
- "Hanako did not regret having married, because
she was happy."
- b. Hanako ga kekkonsita koto o kookaisita wake wa nai,
 married regret not the case

 nanzenara mikondakara.
 because unmarried.
- "It is not the case that Hanako regretted having
married, because she is unmarried."

- (11)a. Taroo wa tuma o utu no o yamenakatta, nazanara
 wife beat stopped not because
 tuma o nikundeita kara.
 wife hated

"Taro did not stop beating his wife, because
 he hated his wife."

- b. Taroo ga tuma o utu no o yameta wake wa nai,
 wife beat stopped not the case
 nazenara mikon dakara.
 because unmarried

"It is not the case that Taro stopped beating
 his wife, because he is unmarried."

- (12)a. Hanako to kekkonsiteiru no wa Taroo janai,
 married not
 nazenara Ziroo ga Hanako to kekkonsiteirukara.
 because married

"It is not Taro who is married to Hanako, because
 Jiro is married to Hanako."

- b. Hanako to kekkonsiteiru no ga Taroo dearu wake ga nai,
 married not the case
 nazenara Hanako wa mikondakara
 because unmarried

"It is not the case it is Taro who is married
 to Hanako, because Hanako is unmarried."

What is more interesting, the examples of predicate
 negation cannot negate the truth of a subordinate clause
 in any context. Note that the corresponding English
 sentences are acceptable in some situations.

- (13) * Hanako ga kekkonsita koto o kookaisita koto wa nai,
 nazenara mikon dakara.

"Hanako has not regretted being married because she
 is unmarried."

- (14) * Taroo wa tuma o utu no o yameta koto wa nai
 nazenara mikondakara.

"Taro hasn't stopped beating his wife, because
 he is unmarried."

- (15) * Hanako to kekkonsiteiru no wa Taroo janai,
 nazenara Hanako wa mikondakara.

"It is not Taro who is married to Hanako, because
 Hanako is unmarried."

If the entailment approach were correct, the above examples should be all acceptable in Japanese. Wilson (1975:4) defines entailment as follows: a sentence S entails another P if and only if S is true P must also be true, and if P is false S must also be false----and the negation of S will be true.----(the last line is added later on p.8.) Because "the negation of S" is unspecified and unmarked negation in Language is internal (cf. T. Givon:1978:89), the negation of S ought not to be held to exclude internal negation. If the entailment approach is to be adequate even in Japanese, the predicate negation of (13) (14) and (15) must be true. The unacceptability of them clearly shows that the entailment approach is inadequate in Japanese. .

5.3. Arguments against pragmatic presupposition

One of the most important presuppositional logics was proposed by van Fraassen (1966, 1969), but as he himself admits it seems to be inadequate to handle all the presuppositional phenomena in natural languages. However, it cannot be denied that it had a great impact on linguistic research of that time. Van Fraassen (1969:69) defines logical presupposition in terms of "necessitation" as follows:

(16) A presupposes B if and only if $A \models B$ and $\neg A \models B$ and draws the following distinction:

- (a) choice negation: (not-A) is true iff A is false.
- (b) exclusion negation: (not-A) is true iff A is not true and false otherwise.

In his system, the connective "and" is defined symmetrically; if A and B is false, then B and A is false.

A \ B	B		
	T	F	*
T	T	F	*
F	F	F	F
*	*	F	$\begin{Bmatrix} * \\ F \end{Bmatrix}$

where $\begin{Bmatrix} * \\ F \end{Bmatrix}$ stands for "false" if A and B is a contradiction in the classical two-valued system, otherwise $\begin{Bmatrix} * \\ F \end{Bmatrix}$ stands for $\begin{Bmatrix} * \end{Bmatrix}$. However, the symmetry is not always maintained in natural languages. A and B may be false, while B and A lack a truth-value. For instance,

(17) All of Jack's children are bald and Jack has children.

(18) Jack has children, and all of Jack's children are bald.

(19) Jack has children.

when (19) is false, (17) lacks a truth-value because (17) presupposes (19), while (18) does not. The corresponding Japanese examples behave in the same way as follows, though (20) is not acceptable because it is a tautology.

(20) * Taroo no kodomo wa minna hageda sosite Taroo ni wa
Taro's children all bald and Taro
kodomo ga aru.
children has.

"All of Taro's children are bald and Taro has children."

(21) Taroo ni wa kodomo ga aru sosite Taroo no kodomo
wa minna hageda.

"Taro has children, and all of Taro's children are bald."

(22) Taroo ni wa kodomo ga aru.

"Taro has children."

Then Stalnaker (1974) denied that "the simple conjunction and is governed by mysteriously complicated rules" and suggested that we should introduce pragmatic presupposition to explain this phenomena and retain a truth-functional account of "and". He suggested that the following sentence (23) presupposes (19) pragmatically:

(23) All of Jack's children are bald.

Pragmatic presuppositions are considered to be the background assumption between speakers and hearers and hence the speaker can cancel the presupposition since it is purely pragmatic.

However, presupposition cannot be purely pragmatic in the following Japanese example of predicate negation.

(24)* Taroo no kodomo wa minna hage ja nai, Taroo ni
Taro's children all bald not and
kodomo ga nai
children not

"All of Taro's children are non-bald, (they all have hair) and Taro has no children."

Moreover, the unacceptability of (20), which is due to the tautology, cannot be explained pragmatically. I agree that presupposition linked with counterfactual conditionals or the particle "even" are pragmatic, but I do not think that we can remove all of presuppositions from semantics.

5.4. Factive presupposition in English and Japanese

The notion of factive presupposition was first advanced by P. Kiparsky and C. Kiparsky (1971) in their paper "Fact" and their object was to examine the relation between syntax and semantics in the English complement system. They claimed that in the following sentence (25a) "the

speaker presupposes that the embedded clause expresses a true proposition and makes some assertion about the proposition" (cf. P. Kiparsky and C. Kiparsky:1971;348) but in the sentence (25b) the speaker does not so presuppose:

- (25)a. I regret that it is raining. (factive)
 b. I think that it is raining. (non-factive)

One of the characteristics of a factive sentence is that presuppositions are constant under negation. In the negation of (25a), the speaker is still presupposing the truth of the embedded sentence but not in the negation of (25b). Observe the following negative sentences.

- (26)a. I don't regret that it is raining.
 b. I don't think that it is raining.

After examining the syntactic and semantic characteristics of factive sentences, the Kiparskys introduced the hypothesis that factive presuppositions are reflected in their syntactic deep structure. Hence theoretically they suggested the interrelationships of syntax and semantics. I do not agree with their hypothesis, since I do not believe in syntactic deep structure, nor do I agree with Wilson's (1975) claim that factive presupposition should be accounted for by pragmatic principles.

I would like to point out that the Japanese mark factivity morphologically to a certain extent. Observe the following examples.

- (27) Taroo wa Hanako ga rusu dearu $\left\{ \begin{array}{c} \text{koto} \\ \text{no} \\ \text{*to} \end{array} \right\}$ o wasureteita.
 absent is forgotten
 "Taro has forgotten that Hanako was absent."

- (28) Taroo wa Hanako ga rusu dearu { to } omotteiru
 *koto
 *no

"Taro thinks that Hanako is absent."

The koto and no clauses express factivity and to clause represents non-factivity.²

According to the Kiparskys (1971:360), some English verbs "occur indifferently with factive and non-factive complements." Examples are anticipate, acknowledge, suspect, report, remember, emphasize, announce, admit, deduce, etc. In Japanese, some verbs can take not only koto and no but also to. Observe the following examples of Kuno (1973:220).

- (29)a. Mary wa John ga kuru koto o kitaisiteita
come was-expecting

"Mary was expecting that John would come."

- b. Mary wa John ga kuru no o kitaisiteita
c. Mary wa John ga kuru to kitaisiteita.

There are some subtle differences in meaning among these three sentences with verbs of expecting. In (29a) and (29b) the subject is certain that John would come, while in (29c) the expectation did not come true. This seems to be related to the non-presuppositional nature of to.

Next let us consider the factive verb know. In the following example, the truth of the complement is not always presupposed.

- (30) John does not know that he passed the exam.

Japanese distinguishes between the factive and non-factive uses siru "know" morphologically, namely kadooka "whether or not" is used instead of koto/no in case of non-factive examples. The corresponding Japanese examples are as follows:

(31)a. John wa siken ni tootta kadooka siranai (non-factive)
 exam passed whether know-not

b. John wa siken ni tootta { koto } o siranai (factive)
 { no }

Moreover, even in the longer sequences, if koto/no is used in the embedded sentence, factivity is maintained. Observe the following example.

(32) Taroo wa tikyuu ga marui koto o sitteiru kadooka siranai
 earth round know whether know-not

"Taro does not know whether he knows that the earth is round."

In the infinite sequence, factivity is not clearly maintained, since the intuition is blurred. However, it cannot be denied that factivity is morphologically distinguished in Japanese. Hence factive presupposition must be semantic in Japanese, although the complementizer choice between no and koto is pragmatic. Therefore, factive presupposition must be part of grammar at least in Japanese.

5.5. Arguments against a Gricean account of factive presupposition

I will demonstrate that Wilson's Gricean account of factive presupposition is untenable in Japanese examples of predicate negation. According to Wilson (1975:99), the following sentence (33) has the possible interpretations (a)——(e).

(33) John doesn't regret that Bill is ill.

(a) John does not exist.

(b) Bill does not exist.

(c) Bill exists but is not ill.

(d) John exists and Bill is ill but John does not know that Bill is ill.

(e) John knows that Bill is ill but he is not sorry about it.

She claims that (a)——(c) are eliminated by appeal to Gricean goals of conversation which is the avoidance of obscurity and ambiguity. Then (d) and (e) are the most likely interpretations of (33). Since the most efficient way of conveying (d) would be

(34) John does not know that Bill is ill

(d) will be eliminated by the theory of conversation and (e) only will remain as a possible interpretation.

However, in Japanese, which distinguishes predicate negation from sentence negation syntactically, her Gricean account does not work. The English sentence (33) can be translated into Japanese in four ways.

(35) John doesn't regret that Bill is ill.

(i) John wa Bill ga byooki dearu koto o zannen ni omowanai.
ill regret not

(predicate negation)

"John knows that Bill is ill but is not sorry about it." (e)

(ii) John ga Bill ga byookidearu koto o zannen ni omou.

wake ganai
not the case

(sentence negation)

"It is not the case that John regrets that Bill is ill."

(a) (b) (c) (d) (e)

(iii) John ga Bill ga byooki dearu koto o zannen ni omowanai.

(exhaustive-listing ga)

"It is John who does not regret that Bill is ill."

(iv) John wa Bill ga byooki dearu koto o zannen ni wa omowanai.

(contrastive wa)

"John regrets something, but not that Bill is ill."

Since the predicate negation (i) can only have Wilson's preferred interpretation (e), there is no need to appeal to Gricean maxims.

Recently Sperber and Wilson (1980) have advanced a Neo-Gricean theory of pragmatics which completely rejects mutual knowledge as a successful condition of communication and maintains that the single principle of relevance is sufficient for comprehending discourse. The principle of relevance is:

"The speaker tries to express the proposition which is the most relevant one possible to the hearer."

Even if this principle can select the preferred interpretation (e) for the English sentence (33), it is obvious that it does not work for the Japanese example (35i).

Moreover, I am convinced that mutual knowledge is an optional condition for comprehension. This is shown most clearly in Japanese. One piece of convincing evidence is the anaphoric use of the demonstratives in the a-series. There are three kinds of demonstratives in Japanese, that is, ko-series, so-series, and a-series. As Kuno (1973:283) points out, the a-series is anaphorically used when the speaker knows that the speaker and the hearer mutually know the referent, while the so-series is used when the speaker does not assume that mutual knowledge of the referent. Note in English "that" or "the" is used in either case. Observe the following example of Kuno:

- (36) A. Kinnoo Yamada-san ni aimasita. Ano (*sono) hito itumo
 yesterday Mr. Yamada met that man always
 genki desune.
 high spirits

"Yesterday, I met Mr. Yamada. That man is always in high spirits."

- B. Hontoo ni soo desu ne.
 true is "Indeed so."

Since the speaker knows that the hearer knows Mr. Yamada, ano is used and sono is ungrammatical. This suggests that mutual knowledge could be semantic in Japanese and optionally necessary in comprehension of discourse. I am convinced that mutual knowledge is part of discourse grammar and hence I will depart from the Neo-Gricean theory of pragmatics.

5.6. Psycholinguistic studies of factive presupposition

The first psycholinguistic study of factive presupposition in child language was made by Macnamara (1977) and his aim was to explore children's ability to generate presupposition and to infer indirect implication from them. He believes that such operations constitute part of linguistic competence although they are closely connected with the more general cognition. He also believes that children learn language by assigning meaning to sentences and hence that presuppositions must play a crucial part in the learning of language.

He selected expressions that generate presuppositions and indirect implications, and told these stories to 20 4-year-olds and questioned them about the relevant propositions. Stories and questions are as follows.

"Forget"

The following is the positive version:

"There once were two friends called Mary-Jane and Dick, They used to play together in Dick's backyard. Sometimes Mary-Jane would bring a big coloured ball that she had, and sometimes she would bring a truck, and she and Dick would

play with her ball or her truck. One day, Mary-Jane and Dick were playing together and they decided that they would play after dinner that night. They decided that Mary-Jane would bring one of her toys. They chose which toy she would bring and they were looking forward to playing with it. After dinner Dick came outside to wait for Mary-Jane. When Mary-Jane came outside, she forgot to bring the ball." The negative version was similar, but ended "she didn't forget to bring the ball."

Questions (the same for both versions):

1. Was Dick disappointed? (Indirect implication)
2. Did Mary-Jane have the ball with her? (Implicative)
3. Was Mary-Jane supposed to bring the ball? (Presupposition)
4. Was Mary-Jane supposed to bring the truck? (Control question)

Results.

Numbers of Correct Responses for Forget

Type of question	Story version		
	Positive	Negative	Both
1. indirect implication	17(Y)	19(N)	16
2. Implicative	20(N)	18(Y)	18
3. Presupposition	19(Y)	18(Y)	17
4. Control	13(N)	12(N)	10
All of the above	12	12	10

Note: The questions were posed to 20 children. The parenthetical letters indicate whether the correct response was yes or no.

Then he concludes that many children aged 4 can grasp presuppositions and assign them truth values correctly. "In other words, these children showed in certain cases understanding of the semantic system which generates presuppositions and assign truth values to sentential complements" (cf. J. Macnamara:1977:281).

I carried out a similar experiment with my six-year-old daughter who has mastered an English grammar which is almost indistinguishable from an adults. She can correct the grammatical mistakes as follows:

- (37)a. *John have a dog.
b. John has a dog.
- (38)a. *John has beat a dog.
b. John has beaten a dog.
- (39)a. *Mary is beat by my mother.
b. Mary is beaten by my mother.
- (40)a. *Mary did not saw the moon.
b. Mary did not see the moon.
- (41)a. *You can television watch.
b. You can watch television.
- (42)a. *John loves herself.
b. John loves himself.
- (43)a. *Mary is a girl pretty.
b. Mary is a pretty girl.
- (44)a. *John is tall than Mary.
b. John is taller than Mary.
- (45)a. *I saw her clever.
b. I think she is clever.
- (46)a. *I stop read a book.
b. I stop reading a book.
- (47)a. *I heard Mary sang.
b. I heard Mary sing.
- (48)a. *I should can read a book.
b. I should be able to read a book.

- (49)a. *I wish I am a mother.
 b. I wish I was a mother.
- (50)a. *I wish I can go there.
 b. I wish I could go there.

Next I asked the following sentences (51) (52) (53) to my daughter.

- (51) Mary doesn't regret having married,
 because she is unmarried.
- (52) Mary doesn't stop beating her baby,
 because she has no baby.
- (53) It isn't John who is married to Mary,
 because Mary is unmarried.

She failed to understand the above sentences which are counter-examples to the presuppositional approach. Since a five to six years-old child is considered to have mastered a grammar which is indistinguishable from an adult grammar, I think (51) (52) and (53) do not exist in her grammar. The entailment approach seems to develop much later in English.

5.7. A model-theoretic approach

If we take the Davidsonian truth definitions, factive presupposition should be handled at the level of pragmatics. This is because Davidson defines truth by pairing two true sentences. Hence truth-values have nothing to do with the context of use. If the determination of truth-values depends on a common background set of assumptions between speakers and hearers, then Davidsonians would have to regard this phenomenon as pragmatic.

However, if we take the model-theoretic approach, which determines truth-values contextually, factive presupposition can be accounted for truth-conditionally. This approach was first taken by Peters (1979) for factive presupposition. He attempted to formulate factive presupposition using the direct interpretation into model theory rather than adding a special component to intensional logic. He said,

"In conversation, what counts is not truth of a sentence's presupposition in the actual world, i.e., relative to the reference point which indexes the actually existing state of affairs. The important thing is rather truth relative to the shared background assumptions of the conversationalists." Imagine we lived before Galileo was born. If I said, "I know the earth is flat," it was a true sentence at that time. Thus the truth-value depends on the discourse. This approach seems to be sufficient for Japanese factive presupposition.

This idea was further developed into a discourse model by Kamp (MS). He argues that "the truth of a bit of

discourse D in a model M must be defined as the existence of a proper embedding into M of the representation of D."

If we take the discourse model theoretic approach, we can account for factive presupposition without assuming the existence of the common ground but use the existence of embedding of a discourse D into a model M. Moreover, solutions can be found for other controversial problems such as quantifiers, pronouns, negation, etc. by a discourse model.

In this chapter, I have argued against some recent research which claims that all the presuppositional phenomena should be accounted for at the level of pragmatics. I have suggested that if we change the theory from truth theory into model theory and further into a discourse model, factive presupposition turns out to be truth conditional. Therefore, before we argue what is semantic or pragmatic, we must examine which type of theory of truth is used. I conclude that Davidsonian truth conditional semantics is inadequate as a semantic theory of natural languages and if it is applied to natural languages it treats some parts of semantics as pragmatic.

Footnotes

1. The context set is "the set of possible worlds recognized by the speaker to be the "live options" relevant to conversation. (Cf. R. Stalnaker;1978:321).
2. This was observed by S. Kuno (1973:213).

Chapter 6: A fragment of JFL

6.1. The syntax of a fragment of Japanese

(i) Syntactic categories

t, or the category of declarative sentences, is the basic category t.

CN, or the category of common noun phrases, is the basic category CN.

IV, or the category of intransitive verb phrases, is the basic category IV.

T, or the category of terms, is to be t/IV.

TV, or the category of transitive verb phrases, is to be IV/T.

IV/IV, or the category of IV-modifying adverbs.

t/t, is the category of sentence-modifying adverbs.

IV/t, is the category of sentence-taking verb phrases.

TV/IV, is the category of IV-taking transitive verb phrases.

IV//IV, is the category of IV-taking verb phrases.

TV/t, is the category of sentence-taking transitive verb phrases.

(ii) Basic expressions

$$B_{CN} = \left\{ \begin{array}{lll} \text{inu,} & \text{otoko,} & \text{onna,} \\ \text{dog} & \text{man} & \text{woman} \end{array} \right\}$$

$$B_{IV} = \left\{ \begin{array}{lll} \text{hoeru,} & \text{hasiru,} & \text{aruku,} \\ \text{bark} & \text{run} & \text{walk} \end{array} \right\}$$

$$B_T = \left\{ \begin{array}{lllll} \text{Taroo,} & \text{Ziroo,} & \text{Hanako,} & \text{kare}_n, & \text{zibun}_n \\ \text{Taro} & \text{Jiro} & \text{Hanako} & \text{he} & \text{self} \end{array} \right\}$$

$$B_{TV} = \left\{ \begin{array}{lll} \text{o-miru,} & \text{o-matu,} & \text{o-yameru,} \\ \text{see} & \text{wait} & \text{stop} \end{array} \right\}$$

$$B_{IV/IV} = \left\{ \begin{array}{lll} \text{sibasiba,} & \text{kasikokumo,} & \text{yukkurito,} \\ \text{often} & \text{wisely} & \text{slowly} \end{array} \right\}$$

$$B_{t/t} = \left\{ \begin{array}{lll} \text{kanarazusimo,} & \text{ainiku,} & \text{-rasii,} \\ \text{necessarily} & \text{unfortunately} & \text{likely} \\ \\ \text{-nitigainai,} & \text{-kamosirenai} & \\ \text{must} & \text{might} & \end{array} \right\}$$

$$B_{IV/t} = \left\{ \begin{array}{ll} \text{to-omou,} & \text{to-sinjiru,} \\ \text{think} & \text{believe} \end{array} \right\}$$

$$B_{TV/IV} = \left\{ \begin{array}{lll} \text{to-omou,} & \text{to-sinjiru,} & \text{no-o-miru,} \\ \text{think} & \text{believe} & \text{see} \\ \\ \text{no-o-matu,} & & \\ \text{wait} & & \end{array} \right\}$$

$$B_{IV//IV} = \left\{ \begin{array}{llll} \text{-tai,} & \text{-tagaru,} & \text{-dasu,} & \text{-hajimeru} \\ \text{want} & \text{show a sign} & \text{start} & \text{begin} \\ & \text{of} & & \end{array} \right\}$$

$$B_{TV/t} = \left\{ \begin{array}{l} \text{-sase,} \\ \text{cause} \end{array} \right\}$$

(iii) Syntactic rules, lexical rules and morphological rules

S.1. $B_A \subseteq P_A$ for every category A.

L.2. If $\alpha \in P_{CN}$, then $F_1(\alpha) \in P_T$, where $F_1(\alpha) = [\alpha]_T$

S.3. If $\alpha \in P_T$, and $\beta \in P_{IV}$, $F_2(\alpha, \beta) \in P_T$.

M.1. (+S.3) If $\alpha \in P_T$, $\beta \in P_{IV}$ and β has a Generic IV-operator,

$$F_{Gn}(\alpha, \beta) = \alpha - \underline{wa} \beta$$

where the particle wa is attached to .

M.2. (+S.3) If $\alpha \in P_T$, $\beta \in P_{IV}$ and β has an Event IV-operator,

$$F_{EV}(\alpha, \beta) = \alpha - \underline{ga} \beta ,$$

where the particle ga is attached to α .

S.4. If $\alpha \in P_{IV}$, $F_3(\alpha) \in P_{IV}$, , where $F_3(\alpha) = \underline{wa} - [\alpha]_{IV}$,

S.5. If $\alpha \in P_{IV}$, $F_4(\alpha) \in P_{IV}$, , where $F_4(\alpha) = \underline{ga} - [\alpha]_{IV}$,

S.6. If $\alpha \in P_{IV/IV}$ and $\beta \in P_{IV}$, $F_5(\alpha, \beta) \in P_{IV}$,

$$\text{where } F_5(\alpha, \beta) = \alpha \beta$$

S.7. If $\alpha \in P_{t/t}$ and $\beta \in P_t$, $F_6(\alpha, \beta) \in P_t$,

$$\text{where } F_6(\alpha, \beta) = \alpha \beta$$

S.8. If $\alpha \in P_T$ and $\beta \in P_t$, $F_7(\alpha, \beta) \in P_t$,

where $F_7(\alpha, \beta)$ comes from β by replacing the first occurrence of a variable X_n by α .

- S.9. If $\alpha \in P_T$, and $\beta \in P_t$, $F_{sae}(\alpha, \beta) \in P_t$,
 where $F_{sae}(\alpha, \beta)$ comes from β by replacing the
 first occurrence of a variable X_n by α sae.
- S.10. If $\alpha \in P_T$, and $\beta \in P_t$, $F_{wa}(\alpha, \beta) \in P_t$,
 where $F_{wa}(\alpha, \beta)$ comes from β by replacing the
 first occurrence of a variable X_n by α wa.
- L.11. If $\alpha \in P_{TV}$, $F_8(\alpha) \in P_{TV/IV}$, where $F_8(\alpha) = \underline{\text{no-}}\alpha$
- S.12. If $\alpha \in P_{TV/IV}$ and $\beta \in P_{IV}$, $F_9(\alpha, \beta) \in P_{TV}$,
 where $F_9(\alpha, \beta) = \{\beta\alpha\}_{TV}$.
- S.13. If $\alpha \in P_{TV}$ and $\beta \in P_T$, $F_{10}(\alpha, \beta) \in P_{IV}$,
 where $F_{10}(\alpha, \beta) = \{\beta\alpha\}_{IV}$.
- L.14. If $\alpha \in P_{IV/t}$, then $F_{11}(\alpha) \in P_{TV/IV}$.
- S.15. If $\alpha \in P_{IV//IV}$ and $\beta \in P_{IV}$, $F_{12}(\alpha, \beta) \in P_{IV}$
 where $F_{12}(\alpha, \beta) = \{\beta\alpha\}_{IV}$.
- S.16. If $\alpha \in P_{CN}$, and $\beta \in P_t$ and β includes a
 free variable,

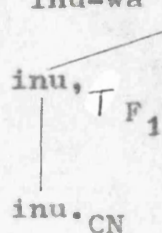
$$F_{13}(\alpha, \beta) \in P_t,$$
 where $F_{13}(\alpha, \beta) = \{\beta\alpha\}_t$.
- L.17. If $\alpha \in P_{TVP}$, $F_{14}(\alpha) \in P_{IV}$,
 where $F_{14}(\alpha) = \alpha$ -rare

S.18. If $\alpha \in P_{TV/t}$ and $\beta \in P_T$ and β has the form $\chi n \delta$,
 then $F_{15}(\alpha, \beta) \in P_{TV}$, where $F_{15}(\alpha, \beta) = \delta \alpha$.

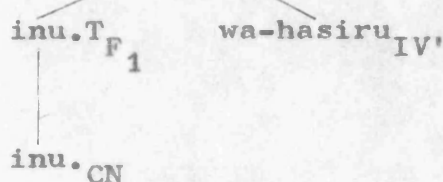
S.19. If $\alpha \in P_{IV}$, then $F_{16}(\alpha) \in P_{IV'}$, where $F_{16}(\alpha) = \alpha' \text{-nai}$,
 where α' is a stem-form of α .

(iv) Examples.

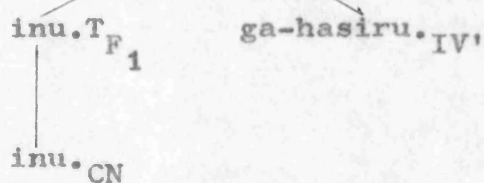
L.2. Inu-wa hasiru, t "Dogs run."



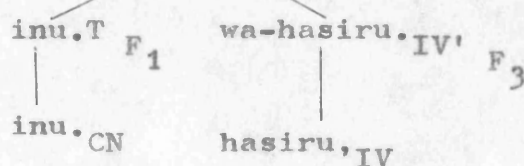
S.3. M.1. Inu-wa hasiru, t_{F2, FGn} "Dogs run."



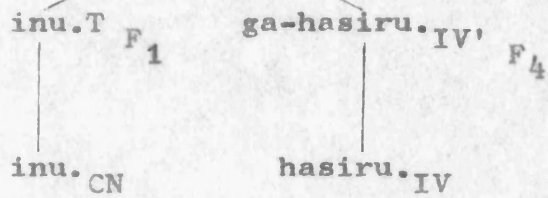
S.3. M.2. Inu-ga hasitteiru, t "Some dogs are running."



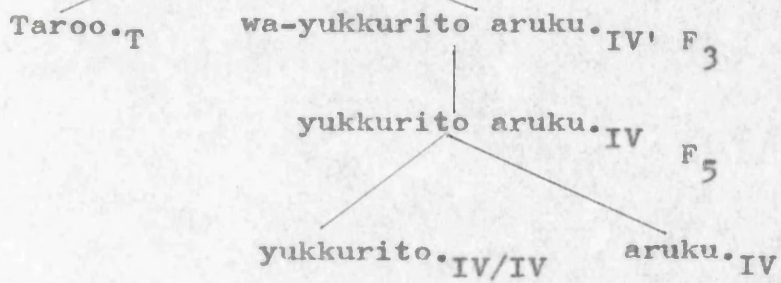
S.4. Inu-wa hasiru, t_{F2, FGn} "Dogs run."



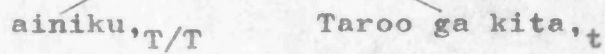
S.5. Inu-ga hasitteiru. t "Some dogs are running."
F₂, FE_v



S.6. Taroo wa yukkurito aruku. t "Taro walks slowly."
F₂, FG_n



S.7. Ainiku Taroo ga kita. t "Unfortunately Taro came."
F₆

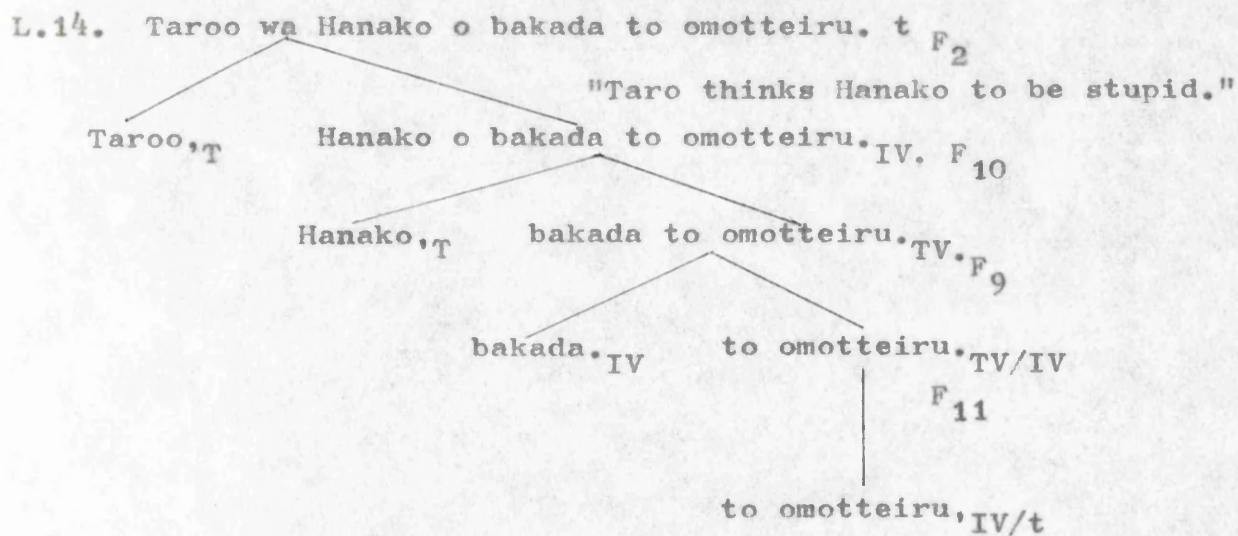
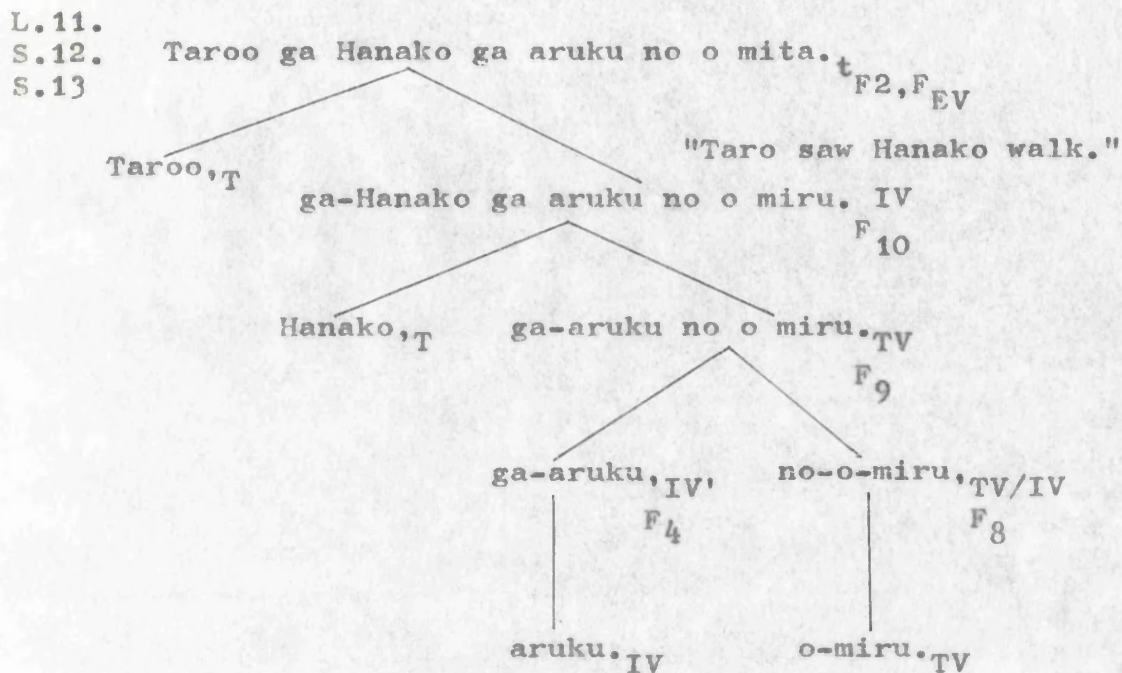
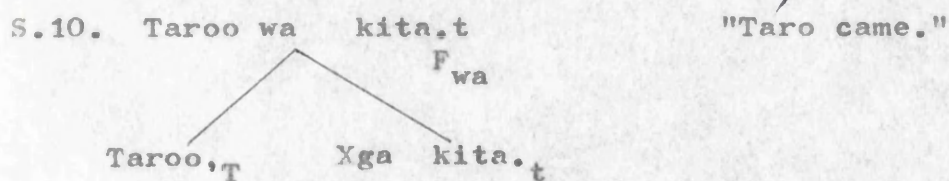


S.8. Taroo ga kita, t "Taro came."
F₇

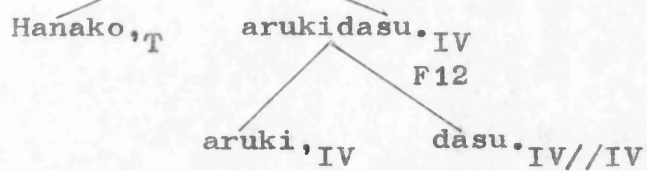


S.9. Taroo sae kita. t "Even Taro came."
F_{sae}

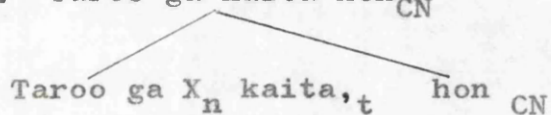




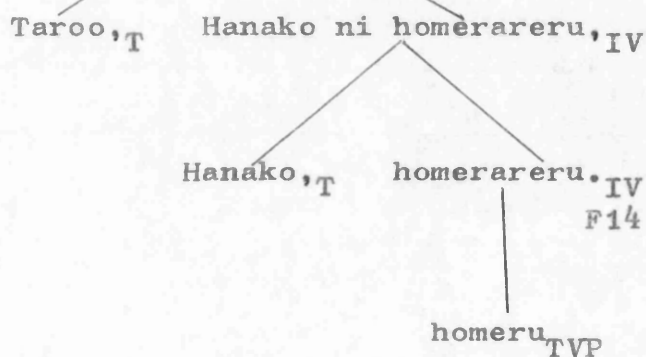
S.15. Hanako wa arukidasita._t "Hanako started walking."
F2



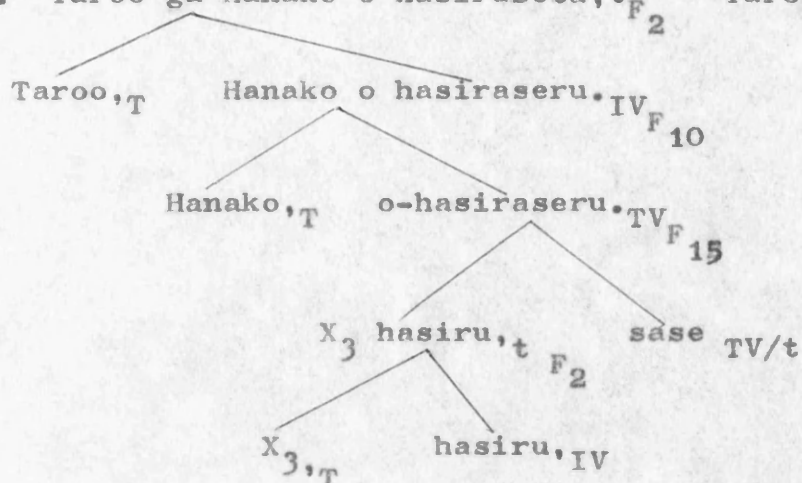
S.16. Taroo ga kaita hon_{CN} "A book Taro wrote."



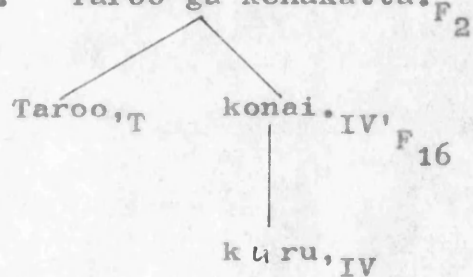
L.17. Taroo wa Hanako ni homerareta._t "Taro was praised
F2 by Hanako."



S.18. Taroo ga Hanako o hasirasete, t_{F_2} "Taro made Hanako run."



S.19. Taroo ga konakatta. F_2 "Taro did not come."



Chapter 7: Conclusion

In this thesis a logical syntax has been constructed for a fragment of ordinary Japanese by using Montague's theory of grammar. To do this it was first necessary to develop some points of Montague's theory in relation to its application to Japanese examples and to indicate why this theory is preferable by comparing it with other currently held theories.

One such set of comparisons was with Davidsonian truth theoretic semantics where it was found that truth theory cannot exactly handle modal notions such

(1) It is necessary that water is H_2O .

Model theory can be developed to handle this type of sentence and the consequent modal notions by incorporating into it the concept of possible worlds. When this is done it is possible to capture the semantics of ordinary language which deals in such ideas rather more easily than through truth conditional semantics.

It was also pointed out that truth theory cannot account for some important examples of structurally valid inference although model theory can.

The semantic form of adverbs in Japanese, as in English, offers difficulties to linguistic theories. In particular the Davidsonian logic has problems when it is used to tackle intensional adverbs and again it was shown that Montague's grammar is more efficient in analysing these.

In matters relating to tense, it was noted that truth theory cannot readily capture the context sensitivity of tense. Montague attempted to do this by introducing

indices which specify features relevant to the discourse at a chosen moment of time. Kamp on the other hand developed model theory into a discourse model and in this proposed to treat tense as discourse referents. Model theory is one that allows a more simple and direct application of the theory to natural languages.

Also of interest in this analysis is possible world semantics. Although this has a wide acceptance among both philosophers and linguists the basic philosophical concept of 'possible worlds' causes much trouble to both groups. It was pointed out that this need not be so despite the fact that Lewis' literal view of possible worlds is one of the most famous. The equally well known inadequacy of this theory where it deals with counterparts can be bypassed if Kripke's views are accepted. Here it was shown that counterfactual situations should not be identified with possible worlds and that a possible world is defined by the descriptive conditions that we associate with it. It is also interesting that Kripke should maintain that possible worlds should be scientifically discoverable.

Montague grammar was also compared with transformational grammar. This is an intriguing comparison as in both there is an assumption of linguistic universals although this is not clearly stated in Montague grammar. However, the methodologies for dealing with language analysis are vastly different with transformational grammar assuming that natural language is an elaboration by the human mind of some simpler linguistic universal. This analysis relies heavily on the

native speaker's intuition as to the meaning and forms of the sentences. On the other hand Montague grammar accepts natural language as formal languages and seeks to analyse it through a set of precise of mathematical rules and thereby arrive at what, at its minimum level, is set of universal categories.

It is also of interest to compare Montague's methodology with that adopted by many philosophers where often it is the subtleties of language that are discussed. What Montague has attempted is to retain the precision of their arguments but also develop a formalism capable of dealing with both syntax and semantics. In as far as Montague's grammar attempts to deal with this duality it is a radical departure from the current philosophies of language.

If a comparison is made between model-theoretic semantics and the linguistic semantic theories then Katzian translational semantics is the closest to model-theoretic semantics. However, while both of them are compositional, Katzian semantics is not explicitly truth conditional.

Katzian semantics deals with the relation between natural language and its literal meaning so that it effectively translates the natural language into its semantic representation. On the other hand model theoretic semantics concerns the relation between language and the world it represents and in this case the role of semantics is to assign denotations to each linguistic expression so that for Katzian semantics translation represents the final stage of the analysis whereas for Montague Grammar translation is used only as an intermediary step in between assigning

natural language to its model-theoretic interpretation. We note that a central feature of Katzian semantics is word meaning but at this time there is argument over whether word meaning should be a part of formal semantics.

Another approach to formal semantics would be to base it on syntactic categories. To do this using transformational grammar could be difficult as the syntactic categories are determined through the application of transformations to sentences. However, it would seem that in some applications transformational operations depend on a knowledge of meaning and hence to use a transformational theory of syntactic categories to produce a formal semantics would introduce a degree of unreliability. In comparison Montague grammar is based on a categorial grammar which automatically provides a logical syntax. This also confers the further advantage that it can be systematically translated into a corresponding semantic type unlike Chomsky's phrase structure grammar which is based on the autonomy of syntax and relies on unanalysable symbols such as NP and VP that have no semantic relevance.

These results were combined in chapter two to construct the first fragment of a Japanese Formal Language. The starting point was to note that in Japanese the generic reading is translated into sentences using the particle wa whereas the event reading into a sentence using ga. In general this view would be acceptable to most Japanese although there are differences in terminology. However Sakai, who was broadly using Montague Grammar methodology, proposed

translating thematic wa sentences into necessary truth. This view was not accepted in this thesis and an analysis based on an analogy with Carlson's unified analysis of the bare plural was developed. As a result of this the generic use of wa was found to be a generic predicate operator and in the same way the descriptive use of ga as an event predicate operator. Through this analysis a discrepancy is revealed between linguistic syntax, which is based on morphology, and logical syntax which is based on truth conditions. There is nevertheless a link between linguistic syntax and logical syntax through morphological rules.

In fact, if these morphological rules are understood in a wider sense to deal with any linguistic regularity relating to phonological phrases or words, then they are capable of further development. In the present example the generic wa and descriptive ga (subject marker) are predicate operators in the underlying semantic structure, are also attached to the subject phrase by morphological rules and are phonologically considered to be enclitics. This area of linguistics while being of great interest is also extremely complex involving as it does the interactions between phonology, morphology, syntax, semantics and pragmatics.

In Sakai's treatment of adjectives and verbs they are both considered to function as declarative sentences. However this is to ignore morphological, syntactic and semantic distinctions and the forcing together of the adjectives and verbs results in great strains to his theory. If, as shown here, the two distinct categories are maintained

then Japanese adjectives can be fairly naturally handled by the predicate theory of adjectives.

Further to translate manner adverbs into the type $((S,t)t)$, as Sakai does, gives rise to problems. For example sentence adverbs cannot be handled by this system. The method used here is to treat manner adverbs as predicate operators and a sentence adverb as a sentence operator.

Chapter three took as its task a comparison of Montague grammar and Transformational grammar when used to analyse various Japanese linguistic constructions. As examples verbs of perception taking the sentential nominizer no were considered. Here the method was found to be that of Carlson's event level predicate. Subject raising was also considered and examples such as

(2) Taroo ga kita rasii "It is likely Taroo came"

were most simply analysed as a combination of a sentence and a sentence operator rasii. Subject to object raising was examined and sentence forms like -

(3) Taroo wa Hanako o bakada to omotteiru

Taro thinks Hanako to be stupid

were analysed by a lexical rule based on Montague Grammar.

Verb raising was next looked at and a typical example such as

(4) Hanako wa arukidasita "Hanako started walking"

was seen to be a concatenation of the IV phrase with the IV//IV phrase.

Lastly desiderative sentences were considered and examples where the verb takes the morpheme /tai/ examined as in the example:

(5) Hanako wa mizu ga nomitai "Hanako wants to drink water."
Here the analysis suggested that a morphological rule exists that replaces o with ga.

In the case of every example the Montague Grammar based analysis was considered to have advantages over the Transformational Grammar analysis.

In chapter four the comparison between Transformational and Montague Grammars was continued and neither theory was able to fully deal with the formations considered. First to be examined was Japanese reflexivization a subject which had been largely ignored by traditional grammarians. The first major studies were by transformational grammarians who made a number of interesting observations. These were discussed and it was concluded that a reflexive coreference condition which contains the notion of an experiencer was necessary. This raises a problem because as formulated Montague grammar cannot handle the notion of an experiencer.

The study of passives presents the problem that there is no agreement at present between Montague grammarians as to whether they are syntactic or lexical in English. For Japanese an attempt was made to analyse the direct passive by a lexical rule. However this approach was unable to handle the scope ambiguity of attitudinal adverbs.

Japanese o-causatives were also examined using an analysis based on a lexical syntactic operation. The difference between o-causatives and ni-causatives lies not in logical semantics but in lexical semantics. Moreover, it was proposed to incorporate

phrase structure grammar into the theory at the level of linguistic syntax. This new linguistic framework seems to coincide with some recent psychological research which suggests that there are two main stages in comprehension. The first stage concerns phonetics, word recognition and surface syntax while the second stage provides a mental model derived from the first. The discourse model which includes mental representation belongs to the second stage.

At the beginning of chapter five the question was posed as to whether there was a relationship between semantics and pragmatics and whether there was a clear demarcation between semantics and pragmatics.

Having considered this an attempt was made to analyse Japanese predicate negation using Montague's theory of grammar. It was then suggested that Japanese sentence negation should be handled by a discourse model. It was further argued that not all of the Japanese presuppositional phenomena could be handled at the level of pragmatics. It was especially noted that in Japanese factivity is marked morphologically. If we take a model-theoretic approach here noting that it determines truth values contextually then it is able to account for Japanese factive presupposition truth-conditionally. A discourse model can also handle this problem semantically.

Another theoretical concern at this point was to determine how far it is possible to translate natural languages into intensional logic. Although it was found to be possible to handle adjectives and factive presupposition

by this means it was seen that direct interpretation by model theory was a better method. Montague's PTQ framework which translates material into intensional logic can therefore be used as a tool for semantic analysis since it will provide an explicit semantics but it must be noted that it is not all powerful and does have limitations.

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Abbreviations:

AB	<u>Annual Bulletin, Research Institute of Logopedics and Phoniatics, University of Tokyo.</u>
CLS <u>n</u>	<u>Papers from the nth Regional Meeting of the Chicago Linguistic Society.</u>
FL	<u>Foundations of Language.</u>
IULC	Reproduced by the <u>Indiana University Linguistics Club.</u>
Lg	<u>Language</u>
LI	<u>Linguistic Inquiry</u>
L & P	<u>Linguistics and Philosophy</u>
PIJL	<u>Papers in Japanese Linguistics</u>

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