

# A Type-Logical Approach to Japanese Potential Constructions

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## Abstract

Potential constructions have long attracted much attention in Japanese Linguistics, mainly focusing on the case alternation of object NPs. I will point out some important characteristics of the constructions they have missed and propose a completely new analysis from a view point of logical grammar. First, we show significant differences between potential and passive sentences which have been assumed to be projected from one and the same suffix *-rare* ‘can’. I suggest that these two uses must be distinguished at least in contemporary Japanese. Our type-logical approach to unbounded dependencies has an empirical coverage broader than traditional and generative grammatical approaches and can explain the fact that various arguments including adjuncts can be marked with nominative. We also examine interesting interactions of case alternation with scope alternation.

## 1 Introduction

Potential constructions have long attracted much attention in Japanese Linguistics, mainly focusing on their meanings and case-alternation phenomena. I argue in this paper that the past studies have failed to describe their important characteristics in significant ways and propose a completely new analysis from a formal grammar view point. To

show what is wrong with the past analyses, let us observe the points Japanese traditional linguistics have assumed, and show why the potential suffix *rare* must be distinguished from the passive *rare*, and then propose an analysis which can properly deal with a broad empirical coverage. Observe the standard active and passive pair in Japanese in (1).

- (1) a. Hitobito-wa sakuban takusan-no  
People-Top last-night a lot of  
banana-o tabeta.  
bananas-Acc ate.  
'People ate a lot of bananas last night.'  
b. Takusan-no banana-ga sakuban  
A lot of bananas last night  
hitobito-niyotte taber-are-ta.  
people by eat-Pass-Past  
'A lot of bananas were eaten by people last night.'

Sentences in (1) show a typical active-passive correspondence where the passive suffix *-rare* is used to form the passive complex verb *taber-are-ta* ‘were eaten,’ the theme argument *banana* is subjectivized and the agent argument is demoted to the adjunct marked with oblique case. In Japanese linguistics, it has been assumed that the same suffix *-rare* is also used to form the potential verbs and that the distinction in interpretation between passives and potentials is dependent on contexts. It is also suggested that complex potential verbs project active or passive potential sentences and the distinctions were made depending on surface case markings of arguments, as exemplified in (2) (see Teramura 1982 for discussion on this dichotomy):

- (2) a. Kodomo-ga kono banana-o taber-are-u.  
Children-Nom this banana-Acc eat-can-Pres

- 'The child can eat this banana.' (active)  
 b. Kono banana-ga mou taber-are-ru.  
 This banana-Nom already eat-Can-Pres  
 'This banana can be eaten now.' (passive)

Teramura (1982) and his followers call sentences like (2a) 'active potentials' and those like (2b) passive potentials. This dichotomy has led to the analyses dealing with the contrast in (2) in terms of active/passive voice alternation. It seems, however, that this kind of analysis is completely wrong. We will show several pieces of evidence which are clearly inconsistent with the voice-based account of potential constructions.

First, let us consider the difference in the subject status of the two constructions. In Japanese linguistics, it has been assumed that the discontinuous honorific form *o ... ni-nar* triggers agreement with the subjects. In the literature, the behaviors of prefix *o* and the suffix (light verb) (*-ni-nar-*) are sometimes accounted for independently and given separate positions and functions, but I simply take it as a kind of discontinuous morpheme which 'sandwiches' a verb stem and mark its external argument as a person to whom the speaker shows his or her deference.

Subject honorification has been assumed to target subjects, referring to people worthy of respect and generative grammarians have suggested the head of honorific form *o ... ni-nar* agree with the subjects which have moved to the spec, TP or Spec, vP position (see Kishimoto 2012, Hasegawa 2006, among others). We argue that the discontinuous morpheme *o .. ni-nar* does NOT, in fact, trigger honorific agreement with the sentential subjects. Consider (I attach the negative predicate just to make sentences sound natural):

- (3) a. Sensei-ga gakusei-o o-sikari-ni-nar-e-nai.  
 Prof-Nom student-Acc Hon-blame-Hon-Can-NOT-Pres  
 'The professor[+honorific] cannot scold students.'  
 b. Sensei-ni gakusei-ga o-sikari-ni-nar-e-nai.  
 Prof-Dat student-Nom Hon-blame-Hon-Can-NOT-Pres  
 c. Sensei-ga gakusei-ni o-sikar-are-ni-natta.  
 Prof-Nom student-BY Hon-blame-Pass-Hon-Past.  
 'The professor[+honorific] was blamed by students.'

It should be noticed here that the derived form *sikar-rare* comprising the base verb and the passive suffix in (3c) is wrapped by the honorific

form *O ... ni-nar*, whereas the discontinuous honorific form first combines with the base verb, and then is followed by the potential suffix in potential (3a) and (3b). In (3a), the nominative sensei 'teacher' is marked as the person worthy of respect, so the honorific *o ....ninar-* targets the subject which is the agent of the base verb *sikar-*, as predicted from the past work. In (3b), the target of honorification is not nominative object, but the dative subject, which should be taken to agree with the honorific form. In passive (3c), though the derived subject is the target of honorification, it is the theme argument of the base verb. We will show that the subject honorification can and must target the external argument (i.e., the agent of base verbs because the potential suffix combines only with action verbs), regardless of their case markings, in potential sentences, whereas only the derived subject (i.e., the theme argument) can be marked as a person to respect in passive sentences. We will also discuss phenomena regarding quantification and anaphora resolution to propose a new, proper analysis of the potential constructions.

## 2 Difference between Passive and Potential Uses of the Suffix *Rare*

Though it is widely assumed that one and the same suffix *rare* is used in both passive and potential constructions, we will argue that the two uses must be clearly distinguished at least in contemporary Japanese. Besides, though many researchers like Teramura (1982) have argued that potential constructions are divided into active and passive ones, we believe this dichotomy, as well as the notion of 'nominative object' in generative grammar (we will come back to this shortly) is simply wrong, and claim that there be only one analysis of potential sentences regardless of the surface case markings of their (non-)arguments. In addition to (apparent) active-passive pairs like (2a) and (2b), any argument or its possessor argument can actually become subjects in potential sentences, whereas only theme arguments can and must be subjects in passive constructions.

- (4) a. Kono naifu-ga/-de katai kami-o/kami-ga  
 this knife-Nom/-With hard paper-Acc/- Nom  
 yoku kir-(ar)e-ru. (potential)  
 well cut-Can-Pres  
 'They can cut papers well with this knife.'  
 b.\*Kono naifu-ga kami-o yoku kiru.  
 (active)

- c. \*Kono naifu-ga (kami-o) yoku kir(are)-ta.  
(passive)
- (5) a. Kono michi-ga/-kara tyozyo-made nobor-e-ru  
This path-Nom/-From top-up-to climb-Can-  
Pres  
'This path enables you to climb up to the top of  
the mountain.'
- b. Kono-michi-ga cyozyo-made nobor-u.  
(active)
- c. \*Kono-michi-ga cyo-zyo-made nobor-are-ta.  
(passive)

In potential (4a) and (5a), potential sentences with the instrument and locative arguments marked with nominative as well as their original oblique cases, whereas their active and passive counterparts are completely ungrammatical. Therefore, the notion of active/passive potentials is simply wrong. It should be noticed in passing that honorification can be applied even to (4a)(*kono naifu-ga kami-o joozuni o-kir-ini-nar-eru* 'Pro[+respect] can cut hard paper well with this knife' and (5a)(*Kono michi-ga tyozyo-made o-nobor-ininar-e-ru* 'This path enables you[+respect] to climb up to the top' to mark the pro subjects as persons to be worthy of respect'), while it cannot apply to the active and passive counterparts. We argue, therefore, that the characterization of subject honorification as a diagnosis of subjecthood seems also wrong at least in the examples we have seen so far. In potential constructions, the honorific form wrapping the base verbs indicates that the speakers show respect to the persons referred by the outermost arguments of the base verbs, not of the derived complex predicates.

Another fact showing the difference between the passive and potential verbs is observed in sentences with the subject-oriented anaphor *zibun* 'self'. While *zibun* can show up in all potential constructions and construed as picking out the same individuals with explicit or implicit agent arguments of base verbs, the coreferential readings are possible only with the derived subjects in passives.

- (6) a. Oisii karee-ga jibuni-no daidokoro-de  
delicious curry-Nom self-Pos kitchen-In  
tsukur-(rar)e-ru. (potential)  
make-can-Press
- b. \*Oisii karee-ga jibuni-no daidokoro-de  
tsukur-(rar)e-ru. (passive)

In (6b), *karee* 'curry' cannot be construed as an antecedent of the anaphora for pragmatic reasons (i.e., it is not [+Human]).

The properties of potential constructions that any argument of base verbs can be the subject of a matrix sentence and that subject oriented honorification and anaphora agree with the agent argument of a base verb regardless of its surface case marking shows a sharp contrast with the properties of passives though the two constructions have been assumed to be projected from the same suffix. From now on, let us focus on the derivation and interpretation of potential constructions in the next section.

### 3 Type-Logical Account of Potential Constructions

In this paper, I assume that the readers are familiar with some version of logical grammars (especially, type-logical and/or categorial grammars) and omit basic explanations except for a few basic rules. In addition to the normal elimination/introduction rules, we need to posit the infixation or extraction operators to insert a constituent into or extract it from a bigger constituent. Let us assume that a linguistic expression is a triple  $\langle \text{prosodic form, meaning, syntactic category} \rangle$ . Here,  $s_1, \dots, s_n$  stand for prosodic forms with + as concatenation operator,  $A/B$  or  $B \setminus A$  stands for a functional category looking for an expression of category B (on the right in the former and on the left in the latter) to form an expression of category A.

#### (7) Elimination and Introduction

Elimination

$$\begin{array}{ccc} \begin{array}{cc} : & : \\ s_1 & s_2 \\ \alpha:A/B & \beta:B \end{array} & & \begin{array}{cc} : & : \\ s_2 & s_1 \\ \beta:B & \alpha:B \setminus A \end{array} \\ \hline s_1+s_2:\alpha(\beta):A & & s_2+s_1:\alpha(\beta):A \end{array} \begin{array}{l} /E \\ \setminus E \end{array}$$

Introduction

$$\begin{array}{ccc} \begin{array}{cc} : & [x:B]^n \\ : & : \end{array} & & \begin{array}{cc} [x:B]^n & : \\ : & : \end{array} \\ \hline s_1:\alpha:A & & s_1:\alpha:A \\ \hline s_1:\lambda x.\alpha:A/B & & s_1:\lambda x.\alpha:A \setminus B \end{array} \begin{array}{l} /I^n \\ \setminus I^n \end{array}$$

The elimination rules  $/E$  and  $\setminus E$  are often called *modus ponens*. These rules derive an expression of

category A as a conclusion from expressions of categories B and A/B or B\A as premises. The introduction rules correspond to lambda-abstraction in semantics. Assuming some arbitrary  $x$  of category B, we suppose that an expression of category A can be derived. Then we discharge the assumption  $x:B$  (linguistically, phonologically null elements of category B) to abstract over  $x$  and create a function of category A\B or A/B as a conclusion, depending on where the discharged assumption is located. The assumption and the step at which it is discharged are coindexed with an integer  $n$ , and the discharged assumption is shown in square brackets.

In addition to the standard elimination and introduction rules, we need the special elimination (infixation/wrapping) and introduction (extraction) operators to deal with discontinuity (See Morrill 1994, 2011, Carpenter 1997 for discussion).

(8) Infixation and Extraction Constructor

- a. If  $a, b \in \text{Cat}$ , then  $B \downarrow A \in \text{Cat}$ .

$$\text{Type}(B \downarrow A) = \text{Typ}(B) \rightarrow \text{Type}(A)$$

- b. If  $a, b \in \text{Cat}$ , then  $A \uparrow B \in \text{Cat}$ .

$$\text{Type}(A \uparrow B) = \text{Typ}(B) \rightarrow \text{Type}(A)$$

The category  $A \downarrow B$  stands for a function that wraps an argument of category B with discontinuous expressions and form the expression of category A. The idea of (8b) is that an expression of category A has an expression of category B missing somewhere within it.

(9)  $\downarrow$  Elimination (Infixation)

$$\begin{array}{ccc} : & : \\ s_3 & s_1+s_2 \\ \beta:B & \alpha:A \downarrow B \\ \hline & \downarrow E \\ s_1+s_3+s_2:\alpha(\beta):A \end{array}$$

(10)  $\uparrow$  Introduction (Extraction)

$$\begin{array}{ccc} s_1 & [x:B]^n & s_3 \\ : & : & \\ \hline & & \uparrow I^n \\ s_1+s_3:\lambda x. \alpha:B \uparrow A \end{array}$$

First we assume an arbitrary expression of category B within the discontinuous expressions  $s^1$  and  $s^3$  which are taken to be a single constituent of category A. Where  $x:B$  is extracted, we discharge

this assumption, which is represented as in  $[x:B]^n$  (as in standard implication introduction rules, the assumption and the stage where the introduction rules applies must be co-indexed with integer  $n$ ), and get the discontinuous constituent with an expression of category B missing anywhere inside it, to which category  $A \uparrow B$  is assigned. As an example of infixation, we show the derivation of a potential predicate wrapped by the discontinuous honorific form.

$$\begin{array}{ccccccc} (11) & \text{tabe} & \text{o-ni-nar} & \text{-e} & \text{ru} & & \\ & \text{eat}(x,y):V & V \downarrow V & \diamond:V \setminus V & \text{PRES} & & \\ & & & & & & \downarrow E \\ & & & & & & \text{o-tabe-ni-nar:eat}(x_{[+\text{respect}]},y):V \\ & & & & & & \hline & & & & & & \text{o-tabe-ninar-e-}\diamond V:\text{eat}(x_{[+\text{respect}]},y) \end{array}$$

Note here that the  $\uparrow$  introduction rules must have been involved here implicitly to allow for delay of the concatenation of the base verb and its arguments until the derived complex predicate combines nominative NPs.

Given the standard and additional elimination and introduction rules above, we can show the derivation of potential constructions. In the same spirit as many current lexicalist approaches, we assume passive predicates in Japanese are lexically formed accompanied by changes in their argument structures, as we have seen from the passive examples, so let us focus on the derivations of potential sentences, where we will argue the potential predicates are NOT formed in the lexicon, but derived in syntax via the  $\uparrow$  introduction rule. Let us take (3a) and (3b) as examples, where the object NP is assigned nominative or accusative case. When it is marked with accusative case, we don't need any new device to explain the derivation. The verb stem *sikar* 'scold' combines with the object, then the derived passive form is wrapped by the honorific form. We use the introduction rule to postpone the concatenation of the base verb and direct object. Here let us assume that the potential verb takes an experiencer argument in its own argument structure, and looks for the base verb with a gap and a pro agent (this is the target of honorification), which is construed as an anaphora if the experiencer of the potential verb is phonologically realized (see Steedman 1996 for a lexicalist approach to control). The derivation of a part of (3b) can be shown in (12).

(12)	gakusei-ga	[x:n <sub>th</sub> ] <sup>2</sup>	o-sikar-i-nar	-e-ru
			scold':s\n <sub>pro</sub> \n	◇:((s\n) ↑ n)\(s\n)
-----				
			scold'(pro <sub>[+respect]</sub> ,x): s\n <sub>pro</sub>	
-----				
			◇scold(pro <sub>ana[+respect]</sub> ,x)(y <sub>Exp</sub> ):(s\n <sub>pro</sub> )\n <sub>Exp</sub>	
-----				
	(s\n)/(s↑(n...n) ↑ n)		◇(scold(pro <sub>ana[+respect]</sub> ,x):((s\n <sub>pro</sub> ))\n <sub>Exp</sub> )↑n	
-----				
			◇(scold(pro <sub>ana[+respect]</sub> ,student')(y):(s\n <sub>Exp</sub> ))	

(13) a.	Kono naifu-ga	katai kami-o/kami-ga	yoku	kir-(ar)e-ru.		
	This knife-Nom	hard paper-Acc/-Nom	well	cut -Can-Pres		
b.	this knife-ga	[y:n] <sub>inst</sub> <sup>2</sup>	katai kami-o	yoku	kir-	e-ru.
	knife':s\((s↑n)		hard-paper':n	well:V\V	cut':s\n <sub>pro</sub> \n <sub>inst</sub> \n <sub>Th</sub>	◇:(s\...n)↑n)\(s\n):
-----						
				◇well-cut'(pro, paper', with-y)(z):(s\n <sub>pro</sub> )		
-----						
				λy.◇well-cut'(pro, paper', with-y):(s\n <sub>Pto</sub> )↑n <sub>Inst</sub>		
-----						
				λy.◇well-cut'(pro, paper', with-knife):s		

In Japanese, it is well-known that nominative case is licensed by a tensed verb. We also assume that a nominative NP is able to combine an open proposition (and/or an open predicate) in a stative sentence, which means a nominative noun phrase can combine with a proposition (or predicate) with a missing argument somewhere inside it if the latter can be construed as a property of the former. This assumption can be proved by the derivation of (13) above, where the instrument argument of the base verb appears as the major subject.

In (13), we assume that optional arguments like the instrument argument here can be added (inserted) into argument structures of base verbs anytime. The base verb *kir-* 'cut' combines with the direct object first, and then consumes the optional instrument premise  $y:n_{inst}$  via the standard elimination rule. After the base verb combines with *rare*, this assumption is discharged to form an open proposition with an instrument gap missing (the discharged assumption is shown in brackets in (13b)). The nominative instrument must be raised

to be the special category which looks for an open proposition on its right. In (13b), the derived predicate correctly denotes a property of the subject (it has a property to make it possible for anyone to cut hard paper with it). Notice here that an arbitrary number of nominative noun phrases can occur in potential constructions because there is no limit on the number of application of the  $\uparrow$  introduction rule. Observe (14) as an example containing multiple nominative phrases.

(14) Kono naifu-ga	sentan-ga	katai kami-ga
this knife-Nom	edge-Nom	hard-paper-Nom
yoku	kir-(ar)e-ru.	
well	cut-Can-Pres	

where the subject corresponds to the possessor of the instrument NP *sentan-de*, so the remaining predicate means a set of sets of entities which enables anyone to cut hard paper with its edge.' Since the argument structure is not changed in a potential sentence, subject honorification can be applied to (14), marking the agent of the base verb as a person worthy of respect.

#### 4 Quantification in Potential Constructions

In Japanese generative linguistics, many authors tried to explain the case-alternation phenomena we have seen so far in terms of Case-checking, but they have made the same mistakes as traditional grammarians did. Object noun phrases marked with nominative in potential (and other stative) sentences are called ‘nominative object’, which is quite misleading and clearly excludes the possibilities that oblique and possessor arguments become subjects of potential predicates. They have tried to explain the case alternation in terms of A-movement, not A'-movement which might allow a wide variety of arguments to be the major subjects as in the tough constructions. In addition to the fact that our analysis of subjectivization in potential sentences covers a much wider variety of data, we will show that our approach can easily deal with the phenomenon of quantifier-scope alternation between noun phrases with different case markings and the modal verb *rare*. Tada (1992) pointed out a very interesting phenomenon concerning quantified objects, as in:

- (15) a. Taroo-ga migime-dake-o tsumu-re-ru.  
 Taroo-Nom right-eye-only-Acc close-CAN-Pres  
 ‘Taroo can close only his right eye.’  
 (only>can, can>only)  
 b. Taroo-ga migime-dake-ga tsumur-e-ru.  
 (only>can, \*can>only)

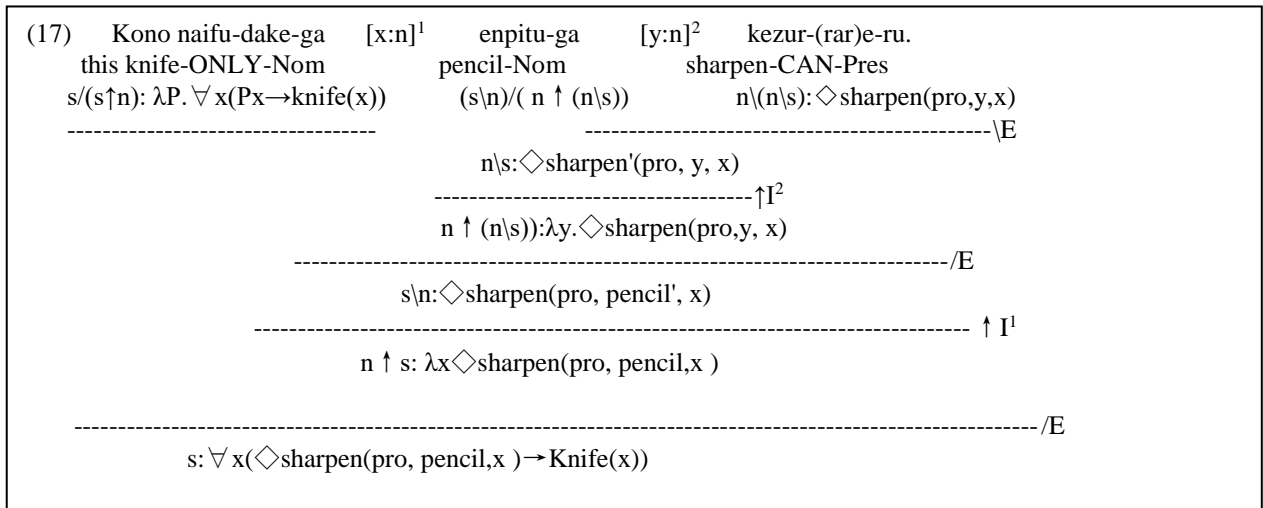
(15a) means that Taroo can wink (*rare* scopes over *migime-dake*) or Taroo cannot close his left eye (*migime-dake* scopes over *rare*). On the other hand, (15b) with its object marked with nominative case does not mean Taroo can wink. Tada explained

this scope difference in terms of NP-movement, which cannot apply to the wide range of subjectivization possibilities we have seen in potential constructions here. The oblique argument cannot be (at least directly) moved to the position where its nominative case is licensed. On the other hand, our explanation using the extraction constructor can easily account for all potential case alternations while giving appropriate meanings to the sentences. I just show the derivation of the potential sentence including the oblique argument modified by only subjectivized.

- (16) a. Kono naifu-dake-de enpitsu-ga kezur-e-ru.  
 this knife-Only-With pencil-Nom sharpen-Can-Pres  
 (CAN > ONLY, \*ONLY > CAN)  
 b. Kono naifu-dake-ga enpitsu-ga kezur-e-ru.  
 (ONLY > CAN, \*CAN>ONLY)

Regardless of word order, the oblique noun phrase (instrument argument, etc.) must take the narrow scope with respect to the suffix *rare* here, whereas the instrument argument marked with nominative case must outscope the suffix *rare*. The former interpretation can be easily derived only with the elimination rule, so let us see the derivation of the wide scope reading of the instrument subject.

We suppose the empty instrument argument [n:x] as an optional assumption, which is discharged after the formation of the complex verb phrase of category  $n \uparrow s$  (whose type is a function from individuals to sets, as with the standard slash categories), as shown by the square brackets. The instrument subject is a standard generalized quantifier which takes the whole predicate as an argument and return the truth value, and has a similar meaning with the universal quantifier,



though its necessary and sufficient conditions should be reversed. The derived predicate phrase denotes the set of entities which enables arbitrary persons to cut hard paper with them.

Our approach can easily deal with sentences with an arbitrary number of nominative NPs (and corresponding missing arguments of base verbs) because the multiple applications of the  $\uparrow$  introduction rule are allowed. We have argued that the subject in Japanese stative sentence is licensed when it can combine with an open proposition, so we can NOT predict the semantic role of the subject when we process it. We reconstruct the whole meaning of the potential sentence, using the logic we introduced above. To construct a predicate phrase with a missing argument (or adjunct) in it, a base verb combines with the assumption  $x:np$  first. Then we discharge it via the  $\uparrow$  introduction operation, which corresponds to lambda-abstraction to bind the variable. Note here that the category  $s \uparrow n$  is simply assigned to open propositions with a gap inside it. In (17), the subject (corresponding to the instrument argument of the base verb) takes the open proposition projected from the tensed potential predicate as an argument, and scope over the whole predicate including the suffix CAN. We assume here that the meaning of *dake* ‘only’ is a kind of universal quantifier with its antecedent and precedent of the standard universal quantifier reversed. So we can correctly derive the meaning of sentence (17) as shown below:

(18)  $\forall x[\diamond \text{cut}'(\text{pro}, \text{hard paper}, \text{with-}x) \rightarrow \text{knife}'(x)]$

(18) means that no knives other than this knife enable any person to cut hard paper with it.

### 3.1 Conclusion

We argue that the potential and passive constructions should be dealt with in a completely different way from the approaches Japanese traditional and generative grammar have pursued so far. Passive and potential uses of rare must be distinguished and treated separately even though they are projected from the (etymologically) same suffix. We also suggest that passives are derived in the lexicon accompanied by changes in their argument structures while potential predicates are constructed in syntax with proper semantic analysis in which any argument of base verbs can

become the subjects, which combine with open propositions of the discontinuous category derived by the  $\uparrow$  introduction and lambda abstraction. The derived complex potential predicates are built up in a compositional manner, and eventually denote the complex properties of the subjects. We also suggested subject honorification should be treated to target external arguments of verbs, instead of subjects. In potential constructions, the argument structures of base verbs are NOT changed, so, whether their external arguments are realized explicitly or implicitly, the agent NPs (assuming that the verb stems in potential predicates are action verbs) must be the targets of honorification. We explained the important phenomena concerning quantified arguments of base verbs with a wide variety of case alternations.

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