

# Type logic served by co-MERGE, MERGE and MOVE: an account for sluicing and questions of “common European” and Japanese types

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*Название:* Логика типов, которая обслуживается операциями co-MERGE, MERGE и MOVE: анализ шлюзинга и вопросов “общеευропейского” и японского типов.

We explore the power of type-logical grammar as a linguistic theory, specifically, of a new tentative development inside the framework—a “symmetricized” Lambek Calculus, due to [Moortgat2005]. The basis for our discussion is an account we give for constructions involving questions and—in particular—involving sluicing; it seeks to solve puzzles these constructions have been setting for linguistic theory.

The presented theory captures the behavior of the considered linguistic expressions and produces typological predictions.

Two things in the organization of grammar are of interest here:

- a uniform system joining structures from the surface side (syntactic) and structures from the “mind side” (discourse)—we call MERGE and co-MERGE the formal relations by which the former and the latter structures are arranged;
- a view on the circumstances of performing MOVE (by Syntax) from the type-logical perspective  
(+ connecting Minimalist kind of grammars and type-logical grammars: they will complement each other).

As it is usual for type-logical grammars, the theory is conscious of semantics (i.e., allows a compositional theory of meaning on top of the calculus of categories).

The calculus we use as the core of the grammar is “weak” (compared to various existing type-logical/categorial grammars). This is good—for making predictions.

We refer to examples from Japanese, on one side, and English and Russian, on the other. We see amazing generalizations across the two very distinct language types.

**Parts of the talk:** sections 1–3: “Background”; 4: “Main”; 5: “More! (less formal)”.

# Contents

<b>1</b>	<b>Questions, sluicing and “sluicing-based NPs”</b>	<b>2</b>
1.1	Puzzles . . . . .	3
1.1.1	The syntactic properties of WH-items . . . . .	3
1.1.2	The semantic non-compositionality/non-locality of WH-in-situ constructions . . . . .	4
1.1.3	The role of Syntax and Discourse in sluicing . . . . .	4
1.1.4	The syntactic abnormality of sl.-b.-NPs . . . . .	5
1.1.5	The semantics of WH-items and the connection to other kinds of pronouns . . . . .	5
1.1.6	Typology . . . . .	5
<b>2</b>	<b>Type-logical grammar</b>	<b>5</b>
2.1	Lambek calculus (NL) . . . . .	6
2.2	Symmetric NL (SNL) . . . . .	6
2.3	Expected merits . . . . .	6
<b>3</b>	<b>Demonstration: linguistic uses of SNL</b>	<b>7</b>
3.1	Simple case: . . . . .	7
3.2	The case of an indefinite: . . . . .	7
3.3	Sluicing . . . . .	7
3.4	The WH-1-----in-situ case: . . . . .	8
3.4.1	One new category for many old . . . . .	8
<b>4</b>	<b>Typological predictions</b>	<b>9</b>
4.1	Notes . . . . .	11
4.1.1	“Identity attitude” . . . . .	11
4.1.2	Syntax of Japanese sluicing . . . . .	11
4.1.3	Russian bare WH-words in irrealis contexts . . . . .	12
4.1.4	The value of Japanese KA . . . . .	12
4.1.5	Why is the WH-item always on the right in “common European” sl.-b.-NPs? . . . . .	12
4.2	Conclusion for the 1st part . . . . .	13
<b>5</b>	<b>Low-level syntax: Circumstances of MOVE</b>	<b>13</b>
5.1	Excursus: Pied-piping . . . . .	13
5.2	Circumstances of MOVE . . . . .	13
5.3	A balanced theory . . . . .	14
<b>6</b>	<b>Evaluation of Symmetric NL</b>	<b>14</b>

## 1 Questions, sluicing and “sluicing-based NPs”

We consider

- (embedded) special questions (1),(2),

- sluicing (3) (underlined; note: an indefinite (framed) is a prerequisite for the construction)—described in [Ross1969],
- “sluicing-based NPs”<sup>1</sup> (4)—discussed in [Bylinina&Testeleets2004].

- (1) *Taro-wa* [[dare-ga katta] mochi]-o *tabemasita ka?*<sub>(JAPANESE)</sub>  
 Taro-TOP [[who-NOM bought] rice.cake]-ACC ate Q [Shimoyama2006, (4a)]  
 ‘Who<sub>x</sub> did Taro eat rice cakes that *x* bought?’
- (2) *I don’t know* what John ate. (ENGLISH)
- (3) *Taro-ga* [nāni-kā-o] *tabeta rasii ga,...* (JAPANESE)  
 Taro-NOM what-KA-ACC ate seem but [Hiraiwa&Ishihara2002, (40)]  
 ‘It seems that Taro ate [something], but...’ (ENGLISH)
- boku-wa nani-o (da) ka wakara-nai*  
 I-TOP what-ACC (COPUL) Q know-not  
 ‘I don’t know what.’
- (4) Dare-kara-(da)-ka *henna tegami-ga todoita.* (JAPANESE)  
 who-from-(COPUL)-KA strange letter-NOM arrived [Shimoyama2006, p. 10, (iii)]  
 ‘A strange letter came from God knows who.’ (ENGLISH)

Note: The Japanese (4) is strange because of the absence of overt material representing the sentence “God knows ...” (which is implicitly meant?).<sup>2</sup>

## 1.1 Puzzles

Some theoretical puzzles they present:

### 1.1.1 The syntactic properties of WH-items

They move. What drives the movement?

- (5) We don’t know [what John ate *t*].

They (optionally) cause “pied-piping” (J.R. Ross).

<sup>1</sup>Our examples are almost all for NP-like phrases (some are for PPs), so we use this term.

<sup>2</sup>[Shimoyama2006]: Non-local association of indeterminate phrases and the existential particle *ka* seems to be difficult for some reason, <...>.

The following example from Nishigauchi (1990, pp. 121-122) [our (4)] may seem like a non-local case at a first glance.

The particle *ka* in this example could possibly be the question marker *ka*, as hinted at in Nishigauchi’s paraphrase “a letter came from someone, but I don’t know who it is from” and the discussion in the text surrounding (iii). *Dare-kara-ka* ‘who-from-KA’ in (iii) is interchangeable with *dare-kara-da-ka* ‘who-from-Cop-KA’, which suggests that it might very well be an elliptical form of embedded question.

- (6) Which car does he like *t*?  
\*Which does he like *t* car?
- (7) Whose car does he like *t*?  
\*Whose does he like *t* car?
- (8) To whom did she reveal her secret *t*?  
Who did she reveal her secret to *t*?

### 1.1.2 The semantic non-compositionality/non-locality of WH-in-situ constructions

And more generally: The association of indeterminate pronouns and operators in Japanese.  
Questions:

- (9) *Taro-wa nani-o tazunemasita ka?*  
Taro-Top what-Acc asked Q  
'What did Taro ask?'

Universal quantification:

- (10) *Dono gakusei-mo odotta.*  
which student-MO danced  
'Every student danced.'
- (11) *[[Dono gakusei-ga syootaisita] sensei]-mo odotta.*  
which student-Nom invited teacher-MO danced  
'For every student *x*, the teacher(s) that *x* had invited danced.'

Cf. existentials (local), (3).

### 1.1.3 The role of Syntax and Discourse in sluicing

Copy+delete (Syntax) or anaphoric link (Discourse)?

How it would be done by Syntax (example by Ross):

- (12) Somebody just left–guess who.  
Somebody just left–guess who just left.

Against Syntax: island violations in the “common European” examples (example by Merchant):

- (13) They want to hire someone who speaks a Balkan language, but...  
... I don't remember which.  
... \*I don't remember which (Balkan language) they want to hire someone who speaks.

For Japanese see 4.1.2.

#### 1.1.4 The syntactic abnormality of sl.-b.-NPs

- The apparent change of category in (4) (sentence  $\rightsquigarrow$  NP or PP),
- the “(quasi-)grammaticalization” of the sluicing-based NPs

#### 1.1.5 The semantics of WH-items and the connection to other kinds of pronouns

Cf. Russian series of pronouns:

**-Ø:** *что-Ø, кто-Ø, ...*

**-то:** *что-то, кто-то, ...*

**-нибудь:** *что-нибудь, кто-нибудь, ...*

**кое-:** *кое-что, кое-кто, ...*

**ни-:** *ничто, никто, ...*

...

The semantics of some of pronouns in the languages of the world has been “decomposed”: e.g., Hamblin alternatives semantics (starting with Japanese indeterminates, Kratzer&Shimoyama), choice-functions, ...

Any unified compositional system possible?

(We just keep this question in mind, no “solutions”.)

#### 1.1.6 Typology

Big differences between languages (Japanese vs. “common European”).

## 2 Type-logical grammar

Categorial grammars+Montague-style semantics; see [Moortgat1997] for a presentation.

Type-logical grammars are based on the primitive, allegedly indispensable formal laws (“*logic*”) of combination, which happen to act at the Syntax–Semantics–Discourse interface. These laws reflect inherent universal properties of computation (it’s semantic composition that is a computation: the computation of the semantic value).

The laws are formulated in terms of *types* (or *categories*)—abstractions of semantic values and syntactic properties of linguistic objects.

The language-specific part of the grammar in this approach are the assignments of categories (and underlying semantic values) to lexical items.

## 2.1 Lambek calculus (NL)

*Composition* laws on structures arranged by  $\otimes$  (MERGE) by Syntax:

$$\begin{aligned} A \rightarrow C/B &\iff A \otimes B \rightarrow C \iff B \rightarrow A \setminus C, \\ (A \rightarrow C \text{ and } B \rightarrow D) &\implies A \otimes B \rightarrow C \otimes D. \end{aligned}$$

Semantics (by Curry-Howard correspondence): lambda-terms, function application.

## 2.2 Symmetric NL (SNL)

In our considerations, we adopt a new tentative development inside the framework—“symmetricized” Non-associative Lambek Calculus, due to [Moortgat2005]. The aim is to gain descriptive power but preserve the predictive stringency as a linguistic theory.

<p><i>Direct composition</i> laws (structures arranged by <math>\otimes</math> (MERGE) are taken from Syntax):</p> $\begin{aligned} A \rightarrow C/B &\iff A \otimes B \rightarrow C \iff B \rightarrow A \setminus C, \\ (A \rightarrow C \text{ and } B \rightarrow D) &\implies A \otimes B \rightarrow C \otimes D, \end{aligned}$	<p><i>Dual composition</i> laws (structures arranged by <math>\oplus</math> (co-MERGE) are given to Discourse):</p> $\begin{aligned} C \otimes B \rightarrow A &\iff C \rightarrow A \oplus B \iff A \otimes C \rightarrow B, \\ (A \rightarrow C \text{ and } B \rightarrow D) &\implies A \oplus B \rightarrow C \oplus D, \end{aligned}$
<p><i>Interaction</i> laws: <math>(A \otimes B) \otimes C \rightarrow A \otimes (B \otimes C)</math> and <math>B \otimes (A \otimes C) \rightarrow A \otimes (B \otimes C)</math>, and similarly for <math>\otimes</math>.</p>	

This calculus of categories is in accordance with a suitable theory of semantics (in “continuation passing style” [Barker2002]; work in progress for linguistic applications of **SNL**: [Bernardi&Moortgat in progr.]).

Derivability between categories (“ $\rightarrow$ ”) is to be understood as the ability (for an item of a corresponding category) to expose a certain behavior.

## 2.3 Expected merits

The descriptive gain is the coverage of

- long-distance & discourse-linked phenomena (examples: analyses below),
- and possibly, a grip on (some of) the conditions of movement.

The explanatory strength is due to a “minimalism” in the architecture of the system:

1. just the few (motivated) primitives make up the system;
2. the single system spans several “levels” of Language;
3. lexical peculiarities must be semantically justified.
4. low computational complexity

(Cf. 1–3 and the methodological arguments of Chomsky’s Minimalist Program.)

No extra stipulations should be admitted.

### 3 Demonstration: linguistic uses of SNL

#### 3.1 Simple case:

Let's assign categories to lexical items:

$$\textit{John}, \textit{Mary} \vdash \text{np}, \quad \textit{saw} \vdash (\text{np} \setminus \text{s})/\text{np}.$$

Let's analyze an expression built from these items:

$$\textit{John saw Mary} \vdash \text{np} \otimes (((\text{np} \setminus \text{s})/\text{np}) \otimes \text{np}).$$

By laws of direct composition, this complex category derives the category of a complete sentence:

$$\text{np} \otimes ((\text{np} \setminus \text{s})/\text{np}) \otimes \text{np} \rightarrow \text{np} \otimes (\text{np} \setminus \text{s}) \rightarrow \text{s}.$$

(And by Curry-Howard correspondence, a formal semantic value corresponding to this deduction is constructed compositionally.)

#### 3.2 The case of an indefinite:

In the analysis of indefinites, we follow the ideas developed in [Heim1982; Kamp1981; Muskens1994; Dekker2000; Jäger2005].

Assign a category: *someone*  $\vdash \text{np} \odot \text{np}$ .

Let's analyze:

$$\textit{John saw someone} \vdash \text{np} \otimes (((\text{np} \setminus \text{s})/\text{np}) \otimes (\text{np} \odot \text{np})).$$

By the interaction and direct composition:

$$\text{np} \otimes (((\text{np} \setminus \text{s})/\text{np}) \otimes (\text{np} \odot \text{np})) \rightarrow \text{np} \odot (\text{np} \otimes ((\text{np} \setminus \text{s})/\text{np}) \otimes \text{np}) \rightarrow \text{np} \odot \text{s}.$$

And  $\text{np} \odot \text{s}$  is the category of a complete sentence with a link to an object of category  $\text{np}$  in the discourse (the indefinite).

(Note: different categories of *John saw Mary* and *John saw someone* are detected by, for example, their different behaviors in combination with a sluicing construction (3)—even if we don't look into the internal semantic differences.)

#### 3.3 Sluicing

Sluicing is analyzed similarly: the category

$$\text{Q} \odot (\text{np} \odot \text{s})$$

reflects a discourse anaphoric link leading to the antecedent sentence which has an indefinite inside.

This is similar to [Jäger2005]).

### 3.4 The WH-in-situ case:

Our analysis of WH-in-situ follows [Moortgat2005]; it involves also the dual composition laws in the derivation of a complete question phrase.<sup>3</sup>

$$nani \text{ ‘what’ } \vdash \text{np} \otimes (\text{Q} \otimes \text{s}), \quad katta \text{ ‘buy’ } \vdash \text{np} \setminus (\text{np} \setminus \text{s}),$$

we simplify things and take *ka* to be semantically empty. We analyze:

$$John\text{-}ga \text{ } nani\text{-}o \text{ } katta \text{ } ka \text{ ‘What did J. buy?’ } \vdash \text{np} \otimes ((\text{np} \otimes (\text{Q} \otimes \text{s})) \otimes (\text{np} \setminus (\text{np} \setminus \text{s}))).$$

By interaction, direct composition and dual composition it derives:

$$\dots \rightarrow \text{s} \otimes (\text{Q} \otimes \text{s}) \rightarrow \text{Q};$$

that is, we get a question phrase formed by long-distance relations inside it.<sup>4</sup> This possible behavior of *nani* ‘what’  $\vdash \text{np} \otimes (\text{Q} \otimes \text{s})$  is summarized by the derivability:

$$\text{np} \otimes (\text{Q} \otimes \text{s}) \rightarrow (\text{np} \setminus \text{Q}) / (\text{np} \setminus (\text{np} \setminus \text{s})),$$

i.e.,  $nani \vdash \text{np} \otimes (\text{Q} \otimes \text{s})$  can behave as if it has the category  $(\text{np} \setminus \text{Q}) / (\text{np} \setminus (\text{np} \setminus \text{s}))$ , which corresponds to the position of *nani* fixed inside the considered sentence:

$$John\text{-}ga \text{ } \underline{\quad} \text{ } katta \text{ } ka;$$

other derivable “weak” categories correspond to other positions.

Note: Several different positions can’t be served with a single category in the traditional (only direct) system;  $nani \vdash \text{np} \otimes (\text{Q} \otimes \text{s})$  serves them all and is insensitive to structural restrictions of Syntax.

#### 3.4.1 One new category for many old

Some from the infinitely many categories for questions (in Japanese):

- $\text{Q}/(\text{np} \setminus \text{s})$ : a simple predicate on the right: “WH–Obj–V”;  
example: ??.

For the sake of simple presentation, we also take it to be the category used in WH-extraction in “common European”: with a sentence with a gap on the right;

example: (2).

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<sup>3</sup>Simplification: we don’t write out cases in the categories. But this could be done.

<sup>4</sup>Note: the last step (deriving a question phrase category) is optional. A serious analysis should coerce this derivation by selectional requirements of the enclosing context. An analysis of *ka* must be important for this.



- $\text{np} \setminus \text{Q}/(\text{np} \setminus (\text{np} \setminus \text{s}))$ : in an “Subj–WH–V” sentence: a simple predicate (requiring 2 arguments) on the right, the WH-item is the 2nd argument  
example: (9)
- $((\text{Q}/(\text{np} \setminus \text{s}))/\text{CNP})/(\text{np} \setminus (\text{np} \setminus \text{s}))$  (Uhh!): a WH-item inside a relative clause (complex NP) in Japanese: “Subj–((WH–V)–Obj)–V”  
example: (1)
- ...

## 4 Typological predictions

We formally explore the derivability relations between the involved categories; the results are presented by the diagram. It explains the patterns of questions and sluicing (importantly: analyzes sl.-b.-NPs), hints at solutions to the mentioned puzzles and supplies predictions as to which language types are (im)possible w.r.t. such constructions.

We admit an extra stipulation (which is bad!): lexical items come in two “dual” variants.

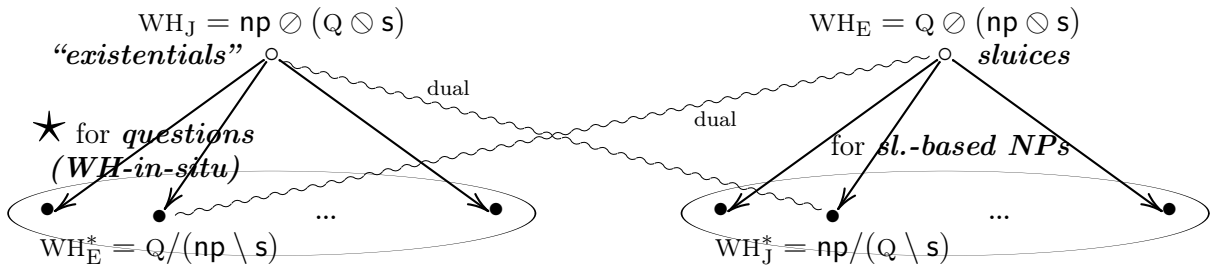


Figure 1: “Space” of categories: points are categories, arrows—the derivabilities between them.

The summary of our view is as follows:

Convenience notation:  $\Gamma[x]$  denotes some context  $\Gamma$  containing an  $x$  inside; an example of usage:  $\Gamma[\text{np}] \rightarrow \text{s}$  means that if the  $x$  is substituted by  $\text{np}$ , it would derive an  $\text{s}$ . (Not quite accurate! We ignore “scope interactions”.)

Japanese: WH-extraction is impossible in Syntax, but *questions* are a necessary language function ( $\star$ ). So, the WH-item must be assigned a category ( $\text{WH}_J$ ) suitable for *WH-in-situ question* formation. Consequences: *sluicing* is not available for  $\text{WH}_J$  (so, it’s done by Syntax and is subject to syntactic restrictions); there are *sluicing-based NPs* (realized by the dual WH-item  $\text{WH}_J^*$ ; subject to strong syntactic restrictions—that’s why (4) is so defective); other—discourse-linked—uses of *nani...-ka* are predicted by our scheme: these are the “*existentials*” (framed in (3))! (Previously, they have commonly been assumed to be unrelated to questions.)

Japanese	“common European” (Russian, English, ...)
Syntax: <u>WH-extraction</u> : impossible (4.1.2)   possible	
Lexicon: <u>WH-items</u> :	
Simplified view: <i>dare(?)... ka</i> (cf. ... <i>mo</i> —universal quantifier, etc.) <i>ka</i> —“zero semantics” (4.1.4)	English: bare <i>who</i> ; Russian bare <i>кто</i> (cf. <i>кто-то</i> , <i>кто-нибудь</i> etc.) - $\emptyset$ —no series marker
type assignment to the WH-items: $WH_J \stackrel{Lex}{=} np \circ (Q \circ s)$   $WH_E \stackrel{Lex}{=} Q \circ (np \circ s)$	
we admit dual variants of the lexical items: (extra assumption of our theory) $WH_J \stackrel{dual}{\rightsquigarrow} WH_J^*$ , $WH_J^* = np / (Q \setminus s)$   $WH_E \stackrel{dual}{\rightsquigarrow} WH_E^*$ , $WH_E^* = Q / (np \setminus s)$	
Consequences:	
By direct composition and <u>interaction</u> laws:	
Prediction: $\Gamma[np] \rightarrow s \implies \Gamma[WH_J] \rightarrow s \circ (Q \circ s)$ – the WH-item can substitute an <i>np</i> ; the enclosing <i>s</i> becomes an <i>s</i> which has a discourse link to a special id-attitude. <b>Phenomenon: (?) existentials</b> – YES.	Prediction: $\Gamma[Q] \rightarrow s \implies \Gamma[WH_E] \rightarrow s \circ (np \circ s)$ – the WH-item can substitute a <i>Q</i> ; the enclosing <i>s</i> becomes an <i>s</i> which has a discourse link to a special simple predicate. <b>Phenomenon: sluicing</b> – YES.
<div style="text-align: center;">id attitude</div> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: fit-content;"> <math display="block">\left( \left( \dots \left[ \begin{array}{c} \dots \\ \text{what was that} \\ \dots \end{array} \right] \dots \right) \right)</math> </div> <p><i>Taro-ga nani-ka-o tabeta [rasii].</i> Taro <u>what</u> ate [it seems]. like an <i>np</i></p>	<div style="text-align: center;">simple predicate</div> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: fit-content;"> <math display="block">\text{John gave the book to } \left[ \begin{array}{c} np \\ \text{someone} \end{array} \right] \dots</math> </div> <p>... <i>I don't know who(m).</i> like a <i>Q</i></p>
By direct composition, interaction and dual composition laws:	
Prediction: $\Gamma[np] \rightarrow s \implies \Gamma[WH_J] \rightarrow Q$ (3.4.1) – the WH-item can substitute an <i>np</i> ; the enclosing <i>s</i> turns into a <i>Q</i> <b>Phenomenon: ★questions</b> (WH-in-situ)—YES. <i>John-ga nani-o katta ka (...).</i> John <u>what</u> bought I won't tell like an <i>np</i>	Prediction: $\Gamma[Q] \rightarrow s \implies \Gamma[WH_E] \rightarrow np$ – the WH-item can substitute a <i>Q</i> ; the enclosing <i>s</i> turns into an <i>np</i> <b>Phenomenon: sluicing-based NPs</b> —YES. (4.1.5) <i>Mary came with God knows who.</i> like a <i>Q</i>
Prediction: $np \circ (Q \circ s) \not\rightarrow Q \circ (np \circ s)$ ; $np / (Q \setminus s) \not\rightarrow Q \circ (np \circ s)$ (provable). neither $WH_J$ nor $WH_J^*$ derives the type of a sluice-item <b>Phenomenon: sluicing</b> —NO (other means: Syntax)	Prediction: not derivable (provable). <b>Phenomenon: (?) existentials</b> —(?)NO (other means) (4.1.3)
Using <u>dual lexical items</u> (BAD):	
<b>Phenomenon: sluicing-based NPs</b> —MOVE.	<b>Phenomenon: ★questions</b> —MOVE.
<div style="text-align: center;">id attitude</div> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: fit-content;"> <math display="block">\left[ \begin{array}{c} Q \\ t \\ t \end{array} \right] \text{no-} (da) \text{-} ka \text{ henna}</math> </div> <p><i>Dare-kara who from God knows NO (COP) strange</i> <math>np / (Q \setminus s)</math>   <math>np / PP</math></p> <p><i>tegami-ga todoita.</i> letter arrived.</p>	<div style="text-align: center;">action predicate</div> <div style="border: 1px solid black; padding: 5px; margin: 5px auto; width: fit-content;"> <math display="block">\text{I won't tell whom } \left[ \begin{array}{c} np \\ t \end{array} \right] \text{John gave the book } \left[ \begin{array}{c} np \\ t \end{array} \right]</math> </div> <p><math>Q / (np \setminus s)</math>   <math>Q</math></p>

★ marks an absolutely necessary function of a language, so the grammar must implement it.)  
Note the *Q*–*np* symmetry which helps relate the Japanese and “common European” formulae. (We can’t yet suggest an interpretation for the symmetry. Is it relevant for understanding relative clauses?)

Figure 2: Phenomena

The “common European” type (English, Russian, ...) is symmetric: WH-extraction is possible, *questions* are formed using a “weak” category ( $WH_E^*$ , able only to directly combine with sentences with gaps), which is related by duality to the category for anaphoric *sluicing* ( $WH_E$ ; not sensitive to syntactic restrictions); *sluicing-based NPs* are easily formed; the WH-item can’t realize *existentials* (they are realized by other indefinite pronouns; note: Russian bare WH-items present a problem for this prediction).

## 4.1 Notes

### 4.1.1 “Identity attitude”

- entity—simple predicate
- proposition—propositional attitude
- question—identity attitude
- a special simple predicate = an s (proposition) which bears an indefinite np (entity)
- a special id-attitude = an s (proposition) which bears an undefined Q (question)

### 4.1.2 Syntax of Japanese sluicing

[Hiraiwa&Ishihara2002]: A possible movement: focus-movement accompanied by either topicalization or deletion of the remnant. DA is the lexical head of FocusP; it is optionally deleted with the remnant subtree.

**Sluicing** (3) [Hiraiwa&Ishihara2002]: the WH-item is moved into the Focus-position, followed by remnant deletion.

The theory matches the data: Japanese sluicing is sensitive to syntactic restrictions (e.g., islands).

**Sl.-b.-NP** (me): Analogous to “common European” question formation by WH-extraction, but—additionally—the id-attitude with the question gap is to be deleted after the WH-(focus)-movement. So, on the surface, we see only the moved WH-item and optionally DA, the Focus lexical head. Pied-piping gets the postposition along with the WH-item, as in (4).

**Japanese pseudo-sluicing.** A similar construction; overt difference: no case-marker.

No island-sensitivity! But we believe it’s not a counterargument for our prediction scheme, because its syntactic peculiarities are shared with other constructions which do not involve WH-items: pseudo-cleft etc. [Hiraiwa&Ishihara2002].

### 4.1.3 Russian bare WH-words in irrealis contexts

Cf. some bare WH-root uses in Russian: “*Спой что!*” (Belorussian?), “*Если кто придёт, расскажи ему.*”

These enclosing sentences could match the presumable category of an existential rather well: the id-attitude (an accessibility relation) would be supplied by the modal/irreal contexts in these cases.

Should we admit both category assignments to Russian *кто* (of the “common European” and “Japanese” language types)? That of course would spoil the strength of the overall scheme presented here.

**Paradox:** [Yanovich2005] likes that they exist; in this work, I dislike it.

### 4.1.4 The value of Japanese KA

Difficult to understand and analyze.

Description: KA is as close to the WH-item as possible, but it can't intervene into the syntactic subtree where dual composition happens. (Existentials: no dual composition in the syntactic tree, so KA is closest to the WH-item; questions: dual composition happens at a subtree, so KA is just outside of it.)

Two different KAs?

### 4.1.5 Why is the WH-item always on the right in “common European” sl.-b.-NPs?

First: hard to think of an id-attitude verb, where the question wouldn't occupy the object position. (“*известно X*”?)

Second: the  $s$  in  $Q \otimes (np \otimes s)$  ( $WH_E$ ) might not be the high complete sentence; it might be a deeper intermediate level of a sentence tree: the subtree where the objects are at their initial positions, and there are no invisible “functional” heads, which supply the positions for scrambled constituents. And the conversion by dual composition happens at that level, so afterwards there is no possibility for re-ordering the constituents. (A sl.-b.-NP “freezes”?)

Tentatively, a consequence: a higher syntactic strictness of “amalgams” (sl.-b.-NPs), say, in word order.

Idea: discover the base word order and base positions for objects by observing “amalgams” like sl.-b.-NPs.

## 4.2 Conclusion for the 1st part

So, our analysis shows how a single category assignment can explain the connection between several language phenomena where a lexical item participates in either discourse relations, or long-distance relations within a sentence, or just in direct combination (this kind of ambiguity of certain lexical items has been noticed to be systematic); and how the alternation in category explains the typology. This is a success of the Symmetric Lambek Calculus.

Further work is required: a more thorough study of the data (and extension to related constructions, such as relative clauses, indefinite pronouns), understanding the formalisms (and working out the formal semantic values, cf. [Bernardi&Moortgat in progr.]), and coping with the extra stipulation we made.

How to do the last: section 5.

## 5 Low-level syntax: Circumstances of MOVE

### 5.1 Excursus: Pied-piping

In the presented framework, *pied-piping* (in sluicing-based NPs and by WH-extraction) is to be treated by assigning “stronger” categories to WH-items, e.g. for WH inside NP in “common European”:  $\text{np} \otimes (\text{WH}_E \otimes \text{np})$ ,  $\text{np} \otimes (\text{WH}_E^* \otimes \text{np})$ . Note: they can also behave as the normal  $\text{WH}_E$ ,  $\text{WH}_E^*$ , respectively.

The 2nd case would have been a problem for our original theory (a further complication of the “duality stipulation”) unless we reduced the treatment of WH-extraction to sluicing-based NPs in 5.2.

### 5.2 Circumstances of MOVE

**Syntax–Semantics division** We shall maintain a view where the grammar is organized in a complementary way: the “high-level” type-logical module is served by a “lower-level” Syntax module, which performs MERGE and MOVE under its own restrictions. We shall discuss the reasons the type logic gives for movement.

**The suggestion.** The cases where our theoretically unwanted “duality assumption” is used (“common European” WH-question formation, Japanese sluicing-based NPs) are also the cases involving movement: the “weak”  $\text{WH}_E^*$  and  $\text{WH}_J^*$  combine with sentences with gaps. We suggest to substitute the “duality stipulation” by a theory of MOVE.

Informally, the idea is as follows. Consider (2). At the place of the gap, a syntactic object is merged which has a hypothesis of category  $\text{s/Q}$  inside and as a whole is of category  $\text{np}$  (a

sluicing-based NP): *John ate* [ $\emptyset_{s/Q}$  *what*]<sub>NP</sub>; MOVE is performed to cancel the hypothesis: the object must be re-merged into a position where it “directly” takes the value for the hypothesis from the enclosing sentence (“*I don’t know*” for  $\emptyset_{s/Q}$ ).

(A more radical, but cleaner approach: the initial position of “*I don’t know*” is that denoted by  $\emptyset_{s/Q}$  here.)

### 5.3 A balanced theory

Comparison to other approaches:

- The generativist (and, ultimately, the Minimalist) syntax: their Semantics component isn’t full-fledged, and thus the strictness of categories is inadequate. Cf. the problem of “sluicing-based NPs’ category change”.
- Type-logical grammars: their Syntax component is not full-fledged, and thus the attachment to the surface word order is inadequate. Cf. the problem of compositionality of expressions with gaps/moved objects.
- ACG: there is freedom in the mapping between the abstract language (“tecto-”) and the syntactic and semantic object languages (“pheno-”). Hence, linguistic explanations–predictions do not emerge immediately from the framework.

The grammar, of course, can be restricted, but that is done by *additional* restrictions, not *primitive* ones.

## 6 Evaluation of Symmetric NL

**Direct composition laws:** The plain traditional part.

**Interaction laws (Grishin):** Good. Like in other systems. By G. Jäger, P. Jacobson.

**Dual composition laws:** Works well for us: single category assignment, whole bunch of correct behaviors derived: (1) infinitely many long-distance configurations, (2) discourse-linked usages.

What about things not captured yet? (Relative clauses, existential bare WH--words usage in Russian, what else?)

⊗ vs. ⊙: **left–right distinction significance on the Discourse side:** Could try to link to definiteness–indefiniteness distinction (new–old)... But we don’t see a neat picture yet.

Perhaps, the left–right is inadequate on the Discourse side. We could take a calculus with Commutativity law on the Discourse side.

**Non-associativity:** Philosophically good: matches the division between low-level Syntax and “Semantics”/Discourse; implements the minimalistic connection.

**Non-commutativity:** OK, we use MOVE in Syntax. (We need a theory of it, too, but at a different place of the grammar.)

**Linearity (resource-consciousness):** Probably, philosophically good. Difficult to maintain in semantics. (GQs)

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