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The *Evaluation-of-Predicted-Schematic-Asymmetry* (*EPSA*) Method: Toward a scientific study of the language faculty

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1. Introduction: some questions

I would like to start by mentioning several questions that one might have wondered about at one point or another.

(1) On linguistics being a science
 a. I have been told, or I have read, that linguistics is a scientific study of language. But what makes a particular intellectual activity *scientific*? Is it possible to draw a clear distinction between a science and a non-science?
 b. Is linguistics a *science* in the sense of the answer(s) to the above question?
 c. Is this a meaningful question, to begin with?

(2) On the goal of linguistics
 a. What is it that we are trying to discover in linguistics, assuming that we *are* trying to discover something?
 b. Linguistics covers a number of subareas; what is the goal of so-called generative grammar? (One may want to relativize the questions in (1), just focusing on generative grammar.)

(3) On predictions and their testing
 a. Do we make predictions? If yes, what are our predictions about? (Cf. (2).)
 b. How are our predictions to be tested?
 c. How are we to evaluate, i.e., what criteria do we use to evaluate, the result of the test?

(4) On the use of informant judgments
 a. A theoretical proposal in syntax is often based on the judgments by the researchers and perhaps their friends and acquaintances. But it seems that acceptability judgments can be greatly affected by pragmatic (i.e., non-grammatical) factors. In light of that, how can we justify the crucial use of informants' acceptability judgments in our research? And how can we justify the use of the researcher's own judgments in testing their own hypotheses?
 b. Is it not necessary for us to collect judgments from as many informants as possible?
 c. Is it not necessary for us to collect judgments from non-linguist informants because linguists may know what the predicted judgments are?

(5) On judgmental disagreement (This is for linguistics students.)
 a. When I read published work in syntax, I often find myself *disagreeing with the reported judgments*. Does that mean I do not understand the theory well enough and cannot judge the sentences correctly? If I study further, will I come to agree with the *reported judgments*?
 b. I also see in published works *judgments* that clearly conflict with each other on the same type of sentences under the same kind of interpretation. I wonder if researchers' and their informants' judgments on the *crucial examples* ever converge. Do we expect *judgmental disagreement* no matter how much efforts we make to obtain convergence?
 c. I sometimes find *my own judgments* on certain sentences not very stable. What does that

mean?

2. The goal of the talk

In this talk I will try to do the following:

- To answer some of the questions noted above, by making reference to the EPSA method.
  EPSA: *Evaluation of Predicted Schematic Asymmetry*.
- To introduce the EPSA method.
- To illustrate the EPSA method by making reference to actual experiments.

Key notions:

✧ Predicted
✧ Schematic
✧ Asymmetry

3. Methodological preliminaries

3.1. The goal of generative grammar

- The main goal of our research in generative grammar is to discover the properties of the Computational System, hypothesized to be at the center of the language faculty.

- A major source of evidence for or against our hypotheses concerning the Computational System is informant judgments, as explicitly stated by N. Chomsky in *Third Texas Conference on Problems of Linguistic Analysis in English* May 9-12, 1958, published in 1962 by the University of Texas.[1]

3.2. The computational system

- Minimally, the language faculty must relate 'sounds' (and signs in a sign language) and 'meanings'.

- A fundamental hypothesis in *generative grammar* is the existence of the Computational System at the center of the language faculty.

(6) The Model of the Computational System:

$$\begin{tikzcd} \text{Numeration } \mu \arrow[r, Rightarrow] & \boxed{CS} \arrow[r, Rightarrow] \arrow[d, Rightarrow] & LF(\mu) \\ & PF(\mu) & \end{tikzcd}$$

Numeration μ: a set of items taken from the mental Lexicon
LF(μ): an LF representation based on μ
PF(μ): a PF representation based on μ

[1] Chomsky's remarks in *Third Texas Conference on Problems of Linguistic Analysis in English* seem to point directly to what he had in mind at least around 1958, in my view more directly than what we find in his writings in the 1950s and 1960s and the subsequent years. (The emphases in (i) and (ii) are by HH.)

(i) (p. 167)
Hill: If I took some of your statements literally, I would say that you are not studying language at all, but some form of psychology, the intuitions of native speakers.
Chomsky: That is studying language.
Long: I agree with Chomsky and Harris here. Language goes on in the brain, not merely in the throat.
Chomsky: How language fits into the throat is a matter which is quite interesting. *I claim, however, that study of the native speaker's reactions is what all linguists are studying.*[1]

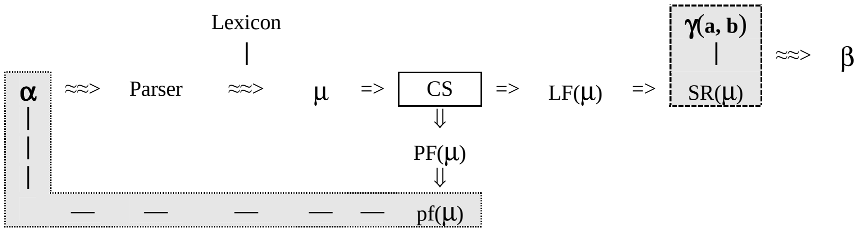
(ii) (p. 168)
Chomsky: I don't think such a test eliminates intuition; I think we want our tests to converge on intuition. If you want to eliminate intuition, then I think my absurd procedure is perfectly satisfactory.
Hill: Linguistic intuition is itself a system, almost a complete grammar. If it is good enough, why bother with any other grammar?
Chomsky: Because I am interested in explaining intuition. If you cannot accept this as the purpose of linguistic study, I am lost. I would like to get a theory which will predict intuitions.

- The main goal of *generative grammar* can therefore be understood as demonstrating the existence of such an algorithm by discovering its properties.

4. Proposal

4.1. The model of judgment making

(7) The Model of Judgment Making by the Informant on **the acceptability of sentence α with interpretation γ(a, b)** (due to A. Ueyama):



a. α: presented sentence
b. μ: numeration
c. γ(a, b): the interpretation intended to be *included* in the 'meaning' of α involving expressions *a* and *b*
d. LF(μ): the LF representation that obtains on the basis of μ
e. SR(μ): the information that obtains on the basis of LF(μ)
f. PF(μ): the PF representation that obtains on the basis of μ
g. pf(μ): the surface phonetic string that obtains on the basis of PF(μ)
h. β: the informant judgment on the acceptability of α under γ(a, b)

(8) a. Presented Sentence α ≈≈> Parser: ... is part of the input to ...
b. Parser ≈≈> numeration μ: ... contributes to the formation of ...
c. SR(μ) ≈≈> Judgment β: ... serves as a basis for ...

- As discussed in some depth in Hoji 2009, the model of judgment making in (7) is a consequence of adopting the theses, shared by most practitioners of generative grammar, that the Computational System in (7) is at the center of the language faculty and that informant judgments are a primary source of evidence for or against our hypotheses pertaining to properties of the Computational System.

4.2. Informant judgments and the fundamental asymmetry between a **Schema*-based prediction and an ^{ok}*Schema*-based prediction

- It seems reasonable to assume that the informant judgment β can be affected by the difficulty in parsing and the unnaturalness of the interpretation of the entire sentence in question.
- Even if the informant has (eventually) found a numeration μ corresponding to the presented sentence α such that the numeration μ results in pf(μ) non-distinct from α and SR(μ) compatible with the interpretation γ(a, b), that may not necessarily result in the informant reporting that α is (fully) acceptable under γ(a, b).
- On the other hand, if the informant fails to find such a numeration μ, the informant's judgment should necessarily be "total unacceptability" on α under γ(a, b).
- This is the source of the fundamental asymmetry between a **Schema*-based prediction and an ^{ok}*Schema*-based prediction in terms of the significance of their failure (to be borne out); the asymmetry will play the most crucial conceptual basis of what will be presented in this paper; see below.

THE FUNDAMENTAL ASYMMETRY (simplified)

- Grammaticality may or may not result in (full) acceptability.
- Ungrammaticality necessarily should result in total unacceptability.

4.3. Empirical rigor, "facts," and *confirmed schematic asymmetries*

> The history of the thing, briefly, is this. The ancients first observed the way the planets seemed to move in the sky and concluded that they all, along with the earth, went around the sun. This discovery was later made independently by Copernicus, after people had forgotten that it had already been made. Now the next question that came up for study was: exactly how do they go around the sun, that is, with exactly what kind of motion? Do they go with the sun as the centre of a circle, or do they go in some other kind of curve? How fast do they move? And so on. This discovery took longer to make. The times after Copernicus were times in which there were great debates about whether the planets in fact went around the sun along with the earth, or whether the earth was at the centre of the universe and so on. Then a man named Tycho Brahe evolved a way of answering the question. He thought that it might perhaps be a good idea to look very very carefully and to record exactly where the planets appear in the sky, and then the alternative theories might be distinguished from one another. This is the key of modern science and it was the beginning of the true understanding of Nature—this idea to look at the thing, to record the details, and to hope that in the information thus obtained might lie a clue to one or another theoretical interpretation. So Tycho, a rich man who owned an island near Copenhagen, outfitted his island with great brass circles and special observing positions, and recorded night after night the position of the planets. It is only through such hard work that we can find out anything.
>
> When all these data were collected they came into the hands of Kepler, who then tried to analyse what kind motion the planets made around the sun. And he did this by a method of trial and error. At one stage he thought he had it; he figured out that they went around the sun in circles with the sun off centre. Then Kepler noticed that one planet, I think it was Mars, was eight minutes of arc off, and he decided this was too big for Tycho Brahe to have made an error, and that this was not the right answer. So because of the precision of the experiments he was able to proceed to another trial and ultimately found out three things [i.e., Kepler's three laws of planetary motion, HH]." Feynman (1965/94: pp. 5-6))

- Given that "[i]t is only through such hard work that we can find out anything," it is clear that we should bring the utmost rigor to our attempt to identify what the "facts" are, i.e., what is a likely reflection of properties of the Computational System.

- Without being able to identify what is a likely reflection of properties of the Computational System, neither could we specify the consequences of "our guess" nor could we compare them with the results of a "very carefully checked experiment." See the Feynman remarks quoted at the outset of this document.

- It is proposed in Hoji 2009 that what we can regard as a likely reflection of properties of the Computational System is a *confirmed schematic asymmetry* such that sentences conforming to one type of Schema are always judged to be totally unacceptable under a specified interpretation while those conforming to the other type of Schema are not necessarily judged to be totally unacceptable.

- In Hoji 2009, the former type of Schema is called a **Schema* and sentences conforming to it are called **Examples* and the latter type of Schema is called an *^{ok}Schema* and sentences conforming to it are called *^{ok}Example*s.

(9) A **Schema*-based prediction:

The informant judgment on the presented sentence α under interpretation γ(*a*, *b*) is *always* "totally unacceptable" for *any *Example* conforming to a **Schema*.

(10) An *^{ok}Schema*-based prediction:

The informant judgment on the presented sentence α under interpretation γ(*a*, *b*) is not necessarily "totally unacceptable" for *^{ok}Examples* conforming to an *^{ok}Schema*.

- The two crucial points about a *schematic asymmetry*:
  - The contrast of significance is not between examples but it is between *Schemas*.
  - The contrast must be such that a **Schema*-based prediction has survived a rigorous test of disconfirmation and is accompanied by the confirmation of the corresponding ^{ok}*Schema*-based predictions.
    - The significance of these two points seems to be very poorly understood by the field at large.
    - That in turn seems to be related to the lack of serious attempt to identify what should count as relevant data for research concerned with a discovery of the properties of the Computational System of the language faculty.

(11) An ^{ok}*Schema*-based prediction—an extreme version 1:

The informant judgment on the presented sentence α under interpretation $\gamma(a, b)$ is not "totally unacceptable" for some ^{ok}*Example* conforming to an ^{ok}*Schema*.

(12) An ^{ok}*Schema*-based prediction—an extreme version 2:

The informant judgment on the presented sentence α under interpretation $\gamma(a, b)$ is "fully acceptable" for any ^{ok}*Example* conforming to an ^{ok}*Schema*.

The *marginal acceptability* of α under γ(a, b):
- It would disconfirm a **Schema*-based prediction.
- It would be compatible with, and hence would confirm, an ^{ok}*Schema*-based prediction as formulated in (10) or (11).

  - If the ultimate testability of our hypotheses lies in their being subject to disconfirmation, it follows that what makes our hypotheses testable is the **Schema*-based predictions they make.
  - To put it differently, it is by making **Schema*-based predictions that we can seek to establish a "fact" that needs to be explained in research that is concerned with the properties of the Computational System.

A *confirmed schematic asymmetry*:
- A *confirmed schematic asymmetry* obtains iff the informants' judgments on **Examples* are consistently "totally unacceptable" and their judgments on the corresponding ^{ok}*Examples* are not "totally unacceptable."

- The **Schema*-based prediction in question must survive a rigorous test of disconfirmation while at the same time the corresponding ^{ok}*Schema*-based predictions must be confirmed. Otherwise the *schematic asymmetry* does not get confirmed.

- If a testable hypothesis is not backed up by a *confirmed schematic asymmetry*, it should not be used in deriving further empirical consequences or in making further theoretical deduction.

A high standard for researchers:
- While it is bound to be a subjective matter to determine what the "representative value" of the ^{ok}*Schemas* should be in order for a *confirmed schematic asymmetry* to obtain, the researchers themselves perhaps should aspire to the "standard" suggested in the formulation of an ^{ok}*Schema*-based prediction in (12), leaving aside its actual feasibility in every experiment.

I maintain that identifying *confirmed schematic asymmetries* is analogous to the rigorous observation and recording of the positions of planets done by Tycho Brahe.

4.4. The significance of experiment results

Suppose:
- We have designed and conducted an experiment to see if a given *schematic asymmetry* gets confirmed.

- The **Schema*-based prediction does not get disconfirmed.
- The corresponding ^{ok}*Schema*-based predictions get confirmed.

  - Question: Does that mean that we are justified to conclude that we now have a *confirmed schematic asymmetry*?
  - Answer: Not really.

5. Hypotheses and their empirical consequences: an initial illustration

(13) a. *John* recommended *himself*.
b. **John* thought that Mary had recommended *himself*.

(14) A [+A] category must have an antecedent in its local domain.

(15) *Himself* is marked [+A] in the mental lexicon of the speakers of English.

(16) In: NP1 Verb [that NP2 Verb NP3]
NP2 is, but NP1 is not, in the local domain of NP3.

(17) a. ^{ok}*Schema*
NP V himself
NP=himself

b. **Schema*
NP1 V that NP2 V himself
NP1=himself

c. ^{ok}*Schema*
NP1 V that NP2 V him
NP1=him

6. "Local anaphors" in Japanese

6.1. Hypotheses

(18) a. *Otagai* is marked [+A] in the mental lexicon of the speakers of Japanese.
b. *Zibun-zisin* is marked [+A] in the mental lexicon of the speakers of Japanese.
c. *Kare-zisin* is marked [+A] in the mental lexicon of the speakers of Japanese.

(19) A [+A] category must have an antecedent in its local domain.

(20) NP1-ga [NP2-ga NP3-{o/ni} to] Verb
'NP1 Verb that NP2 Verb NP3'
NP2 is, but NP1 is not, in the local domain of NP3

- With the language-specific lexical hypotheses in (18), the universal hypothesis in (19), along with the articulation of "local domains" in Japanese just given, we make testable predictions, which we will discuss in the following subsection.

6.2. Predictions

6.2.1. *Otagai*

(21) a. ^{ok}*Schema*
NP-ga/wa [NP1-ga otagai-o/ni V-ru/ta {to/no ka}] V-ru/ta
under the reciprocal reading of *otagai* with NP1 as its "antecedent"

b. **Schema*
NP1-ga/wa [NP-ga otagai-o/ni V-ru/ta {to/no ka}] V-ru/ta
under the reciprocal reading of *otagai* with NP1 as its "antecedent"

c. ^{ok}*Schema*
NP1-ga/wa [NP-ga karera-o/ni V-ru/ta {to/no ka}] V-ru/ta

under the coreference between *karera* and NP1

(22) a. *okSchema*
[[otagai-o/ni V-ru/ta] NP1]
under the reciprocal reading of *otagai* with NP1 as its "antecedent"

b. **Schema*
[[[NP-ga otagai-o/ni V-ru/ta {to/no ka}] V-ru/ta] NP1]
under the reciprocal reading of *otagai* with NP1 as its "antecedent"

c. *okSchema*
[[[NP-ga karera-o/ni V-ru/ta {to/no ka}] V-ru/ta] NP1]
under the coreference between *karera* and NP1

- In what follows, I provide some concrete examples to satisfy the curiosity of the audience. In the interest of time, we may, however, focus on the *Schemata* instead.

(23) a. *okExample*
Mary-wa [*John to Bill*-ga *otagai*-ni toohyoosi-ta to] omoikonde-i-ta
'Mary thought that *John and Bill* had voted for *each other*.'

b. **Example*
John to Bill-wa [Mary-ga *otagai*-ni toohyoosi-ta to] omoikonde-i-ta
'*John and Bill* thought that Mary had voted for *each other*.'

c. *okExample*
John to Bill-wa [Mary-ga *karera*-ni toohyoosi-ta to] omoikonde-i-ta
'*John and Bill* thought that Mary had voted for *them*.'

(24) a. *okExample*
Sensei-wa [*John to Bill*-ga naze *otagai*-o suisensi-ta no ka] mattaku wakara-nakat-ta
'The teacher had no idea why *John and Bill* had recommended *each other*."

b. **Example*
John to Bill-wa [sensei-ga naze *otagai*-o suisensi-ta no ka] mattaku wakara-nakat-ta
'*John and Bill* had no idea why the teacher had recommended *each other*."

c. *okExample*
John to Bill-wa [sensei-ga naze *karera*-o suisensi-ta no ka] mattaku wakara-nakat-ta
'*John and Bill* had no idea why the teacher had recommended *them*."

On the basis of the Schemata in (22), we can construct the Examples in (25) and (26).

(25) a. *okExample*
[[*ec* sensyuu-no senkyo-de *otagai*-ni toohyoosi-ta] *John to Bill*]-wa Susan-ga dare-ni toohyoosi-ta ka sit-te odoroi-ta.
'*John and Bill*, who had voted for *each other* at the election last week, were surprised to learn who Susan had voted for.'

b. **Example*
[[*ec* [[Susan-ga sensyuu-no senkyo-de *otagai*-ni toohyoosi-ta] to] omoikonde-i-ta] *John to Bill*]-wa Susan-ga dare-ni toohyoosi-ta ka sit-te odoroi-ta.
'*John and Bill*, who thought that Susan had voted for *each other* at the election last week, were surprised to learn who Susan had voted for.'

c. *okExample*
[[*ec* [[Susan-ga sensyuu-no senkyo-de *karera*-ni toohyoosi-ta] to] omoikonde-i-ta] *John to Bill*]-wa Susan-ga dare-ni toohyoosi-ta ka sit-te odoroi-ta.
'*John and Bill*, who thought that Susan had voted for *them* for the election last week, were surprised to learn who Susan had voted for.'

(26) a. *okExample*
[[*ec* kondo-no yakusyoku-ni *otagai*-o suisensi-ta] *John to Bill*]-wa iroirona hito-ni meeru-o okut-te riyuu-o setumeisi-te-i-ru rasii.

'I hear that *John and Bill*, who had recommended *each other* for the new post, are emailing various people to explain why.'

b. **Example*
[[*ec* [Mike-ga kondo-no yakusyoku-ni naze *otagai*-o suisensi-ka] siritagat-te-i-ta] *John to Bill*]-wa iroirona hito-ni meeru-o okut-te riyuu-o sirabe-te-i-ru rasii.
'I hear that *John and Bill*, who wanted to know why Mike had recommended *each other* for the new post, are emailing various people to find out why.'

c. *okExample*
[[*ec* [Mike-ga kondo-no yakusyoku-ni naze *karera*-o suisensi-ka] siritagat-te-i-ta] *John to Bill*]-wa iroirona hito-ni meeru-o okut-te riyuu-o sirabe-te-i-ru rasii.
'I hear that *John and Bill*, who wanted to know why Mike had recommended *them* for the new post, are emailing various people to find out why.'

6.2.2. *Zibun-zisin*

(27) a. *okSchema*
NP-ga/wa [NP1-ga zibun-zizin-o/ni V-ru/ta {to/no ka}] V-ru/ta
NP1 = zibun-zisin

b. **Schema*
NP1-ga/wa [NP-ga zibun-zizin-o/ni V-ru/ta {to/no ka}] V-ru/ta
NP1 = zibun-zisin

c. *okSchema*
NP1-ga/wa [NP-ga {kare/kanozyo}-o/ni V-ru/ta {to/no ka}] V-ru/ta
NP1 = kare/kanozyo

(28) a. *okSchema*
[[[α-ga zibun-zisin-o/ni V-T to] V-T] NP]-wa ...
α = zibun-zisin

b. **Schema*
[[[NP-ga zibunzisin-o/ni V-T to] V-T] α]-wa ...
α = zibun-zisin

c. *okSchema*
[[[NP-ga {kare/kanozyo}-o/ni V-T to] V-T] α]-wa ...
α = kare/kanozyo

(29) a. *okExample*
John-wa [*Mary*-ga *zibun-zisin*-ni toohyoosi-ta to] omoikonde-i-ta
'John thought that Mary had voted for *herself*.'

b. **Example*
John-wa [Mary-ga *zibun-zisin*-ni toohyoosi-ta to] omoikonde-i-ta
'*John* thought that Mary had voted for *himself*.'

c. *okExample*
John-wa [Mary-ga *kare*-ni toohyoosi-ta to] omoikonde-i-ta
'*John* thought that Mary had voted for *him*.'

(30) a. *okExample*
John-wa [*Mary*-ga *zibun-zisin*-o suisensi-ta to] bakari omotte-i-ta
'John firmly believed that *Mary* had recommended *herself*.'

b. **Example*
John-wa [Mary-ga *zibun-zisin*-o suisensi-ta to] bakari omotte-i-ta
'*John* firmly believed that Mary had recommended *himself*.'

c. *okExample*
John-wa [Mary-ga *kare*-o suisensi-ta to] bakari omotte-i-ta

'*John* firmly believed that Mary had recommended *him*.'

(31) a. *^{ok}Example*
Ziro-wa [*Hanako*-ga *zibun-zisin*-o hihansi-ta to] it-ta
'Ziro said that *Hanako* had criticized *herself*.'

b. **Example*
Ziro-wa [Hanako-ga *zibun-zisin*-o hihansi-ta to] it-ta
'*Ziro* said that Hanako had criticized *himself*.'

c. *^{ok}Example*
Ziro-wa [Hanako-ga *kare*-o hihansi-ta to] it-ta
'*John* said that Hanako had criticized *him*.'

(32) a. *^{ok}Example*
[[*John*-ga *zibun-zisin*-ni toohyoosu-ru to]-wa omotte-mo-mi-nakat-ta] Yoko]-wa John-ga dare-ni toohyoosi-ta ka sit-ta toki totemo odoroi-ta.
'Yoko, who did not even think that *John* might vote for *himself*, was very surprised when she learned who John had voted for.'

b. **Example*
[[John-ga *zibun-zisin*-ni toohyoosu-ru to]-wa omotte-mo-mi-nakat-ta] *Yoko*]-wa John-ga dare-ni toohyoosi-ta ka sit-ta toki totemo odoroi-ta.
'*Yoko*, who did not even think that John might vote for *herself*, was very surprised when she learned who John had voted for.'

c. *^{ok}Example*
[[John-ga *kanozyo*-ni toohyoosu-ru to]-wa omotte-mo-mi-nakat-ta] *Yoko*]-wa John-ga dare-ni toohyoosi-ta ka sit-ta toki totemo odoroi-ta.
'*Yoko*, who did not even think that John might vote for *her*, was very surprised when she learned who John had voted for.'

(33) a. *^{ok}Example*
[[*Bill*-ga *zibun-zisin*-o suisensu-ru to] omikondei-ta] John]-wa Bill-ga dare-o suisensi-ta ka sit-ta toki totemo odoroi-ta.
'John, who firmly believed that *Bill* would recommend *himself*, was very surprised when he learned who Bill had recommended.'

b. **Example*
[*ec* [Bill-ga *zibun-zisin*-o suisensu-ru to] omikondei-ta] *John*]-wa Bill-ga dare-o suisensi-ta ka sit-ta toki totemo odoroi-ta.
'*John*, who firmly believed that Bill would recommend *himself*, was very surprised when he learned who Bill had recommended.'

c. *^{ok}Example*
[*ec* [Bill-ga *kare*-o suisensu-ru to] omikondei-ta] *John*]-wa Bill-ga dare-o suisensi-ta ka sit-ta toki totemo odoroi-ta.
'*John*, who firmly believed that Bill would recommend *him*, was very surprised when he learned who Bill had recommended.'

(34) a. *^{ok}Example*
[[*Ziro*-ga *zibun-zisin*-o hihansi-te-i-ru to] sit-ta] Hanako]-wa tyotto odoroi-ta.
'Hanako, who learned that *Ziro* was criticizing *himself*, was a little surprised.'

b. **Example*
[*ec* [Ziro-ga *zibun-zisin*-o hihansi-te-i-ru to] sit-ta] *Hanako*]-wa tyotto odoroi-ta.
'*Hanako*, who learned that Ziro was criticizing *herself*, was a little surprised.'

c. *^{ok}Example*
[*ec* [Ziro-ga *kanozyo*-o hihansi-te-i-ru to] sit-ta] *Hanako*]-wa tyotto odoroi-ta.
'*Hanako*, who learned that Ziro was criticizing *her*, was a little surprised.'

6.2.3. *Kare-zisin*

(35) a. ^{ok}*Schema*
NP-ga/wa [NP1-ga kare-zizin-o/ni V-ru/ta {to/no ka}] V-ru/ta
NP1 = kare-zisin

b. **Schema*
NP1-ga/wa [NP-ga kare-zizin-o/ni V-ru/ta {to/no ka}] V-ru/ta
NP1 = kare-zisin

c. ^{ok}*Schema*
NP1-ga/wa [NP-ga {kare/kanozyo}-o/ni V-ru/ta {to/no ka}] V-ru/ta
NP1 = kare/kanozyo

(36) a. ^{ok}*Schema*
[[[α-ga kare-zizin-o/ni V-T to] V-T] NP]-wa ...
α = kare-zisin

b. **Schema*
[[[NP-ga kare-zizin-o/ni V-T to] V-T] α]-wa ...
α = kare-zisin

c. ^{ok}*Schema*
[[[NP-ga {kare/kanozyo}-o/ni V-T to] V-T] α]-wa ...
α = kare/kanozyo

(37) a. ^{ok}*Example*
Mary-wa [*John*-ga *kare-zisin*-ni toohyoosi-ta to] omoikonde-i-ta
'Mary thought that *John* had voted for *himself*.'

b. **Example*
John-wa [Mary-ga *kare-zisin*-ni toohyoosi-ta to] omoikonde-i-ta
'*John* thought that Mary had voted for *himself*.'

c. ^{ok}*Example*
John-wa [Mary-ga *kare*-ni toohyoosi-ta to] omoikonde-i-ta
'*John* thought that Mary had voted for *him*.'

(38) a. ^{ok}*Example*
Mary-wa [*John*-ga *kare-zisin*-o suisensi-ta to] bakari omotte-i-ta
'Mary firmly believed that *John* had recommended *himself*.'

b. **Example*
John-wa [Mary-ga *kare-zisin*-o suisensi-ta to] bakari omotte-i-ta
'*John* firmly believed that Mary had recommended *himself*.'

c. ^{ok}*Example*
John-wa [Mary-ga *kare*-o suisensi-ta to] bakari omotte-i-ta
'*John* firmly believed that Mary had recommended *him*.'

(39) a. ^{ok}*Example*
Hanako-wa [*Ziro*-ga *kare-zisin*-o hihansii-ta to] it-ta
'Hanako said that *Ziro* had criticized *himself*.'

b. **Example*
Ziro-wa [Hanako-ga *kare-zisin*-o hihansii-ta to] it-ta
'*Ziro* said that Hanako had criticized *himself*.'

c. ^{ok}*Example*
Ziro-wa [Hanako-ga *kare*-o hihansii-ta to] it-ta
'*Ziro* said that Hanako had criticized *him*.'

(40) a. ^{ok}*Example*
[[*John*-ga *kare-zisin*-ni toohyoosu-ru to]-wa omotte-mo-mi-nakat-ta] Yoko]-wa John-ga dare-ni

toohyoosi-ta ka sit-ta toki totemo odoroi-ta.
'Yoko, who did not even think that *John* might vote for *himself*, was very surprised when she learned who John had voted for.'

b. **Example*
[[Yoko-ga *kare-zisin*-ni toohyoosu-ru to]-wa omotte-mo-mi-nakat-ta] *John*]-wa Yoko-ga dare-ni toohyoosi-ta ka sit-ta toki totemo odoroi-ta.
'*John*, who did not even think that Yoko might vote for *himself*, was very surprised when he learned who Yoko had voted for.'

c. *okExample*
[[Yoko-ga *kare*-ni toohyoosu-ru to]-wa omotte-mo-mi-nakat-ta] *John*]-wa Yoko-ga dare-ni toohyoosi-ta ka sit-ta toki totemo odoroi-ta.
'*John*, who did not even think that Yoko might vote for *him*, was very surprised when he learned who Yoko had voted for.'

(41) a. *okExample*
[[*John*-ga *kare-zisin*-o suisensu-ru to]-wa omotte-mo minakat-ta] Yoko]-wa John-ga dare-o suisensi-ta ka sit-ta toki totemo odoroi-ta.
'John, who firmly believed that *Bill* would recommend *himself*, was very surprised when he learned who Bill had recommended.'

b. **Example*
[*ec* [Yoko-ga *kare-zisin*-o suisensu-ru to] omikondei-ta] *John*]-wa Bill-ga dare-o suisensi-ta ka sit-ta toki totemo odoroi-ta.
'*John*, who firmly believed that Bill would recommend *himself*, was very surprised when he learned who Bill had recommended.'

c. *okExample*
[*ec* [Yoko-ga *kare*-o suisensu-ru to] omikondei-ta] *John*]-wa Yoko-ga dare-o suisensi-ta ka sit-ta toki totemo odoroi-ta.
'*John*, who firmly believed that Yoko would recommend *him*, was very surprised when he learned who Yoko had recommended.'

(42) a. *okExample*
[[*Ziro*-ga *kare-zisin*-o hihansi-te-i-ru to] sit-ta] Hanako]-wa tyotto odoroi-ta.
'Hanako, who learned that *Ziro* was criticizing *himself*, was a little surprised.'

b. **Example*
[*ec* [Hanako-ga *kare-zisin*-o hihansi-te-i-ru to] sit-ta] *Ziro*]-wa tyotto odoroi-ta.
'*Ziro*, who learned that Hanako was criticizing *himself*, was a little surprised.'

c. *okExample*
[*ec* [Hanako-ga *kare*-o hihansi-te-i-ru to] sit-ta] *Ziro*]-wa tyotto odoroi-ta.
'*Ziro*, who learned that Hanako was criticizing *him*, was a little surprised.'

7. Experiments[2]

7.1. The general design of experiments

- In our on-line experiments, the Examples are presented to the informants, including the specification of their intended interpretation.
- The Examples, the instructions, and the specification of the intended interpretations are all in Japanese, and the Examples presented to the informants do not contain *ec*, unlike some of the examples given in section 5.2.
- Bracketing is supplied when we thought that it would help the informants parse the sentence easily (typically indicating the sentence boundaries).

[2] I should like to acknowledge that the program for the basic design of our on-line experiments has been created by Ayumi Ueyama.

- The specifications of the intended interpretations are like those in (43), for example, when translated into English.

(43) a. under the interpretation that "John voted for Bill and Bill voted for John"
b. under the interpretation that *karera* 'them' and *John to Bill* 'John and Bill' refer to the same individuals
c. under the interpretation that *kare-zisin* and *Ziro* refer to the same person

- In the experiment on the *predicted asymmetries* in (21) and (22), for example, the 12 Examples in (23)-(26) are presented to informants in a random fashion, (i) one at a time or (ii) three at a time (three Examples as a set of an ^{ok}*Example*, a **Example*, and another ^{ok}*Example*, e.g., those in (23)), depending upon the test type chosen by each informant.
- Depending upon the test type of their choice, they either (i) choose "No" (for "not acceptable no matter what") or "Yes" (for "(more or less) acceptable") or (ii) indicate how acceptable they find each example by clicking one of the five radio buttons as in (44).

(44) Bad < ===== > Good
o o o o o

(45) 0, 25, 50, 75, 100

- What the informant has indicated gets converted to numerical values as indicated in (45), i.e., the worst score is "0" and the best score is "100."
- Likewise, the "Yes" or the "No" answer in the "Yes-or-No" test gets converted to "0" or "100," respectively although the informants are not informed how their judgments get converted to numerical values.

- The informants are allowed to return to the experiment website and report their judgments in the same experiment again and in fact as many times as they wish.
- They may repeat the same "test type" as before or different "test types" (as to "Yes-or-No" or "Five-ranking" and also as to "one at a time," "three at a time" (or "all in one sheet" in some cases)).
- In the event that one informant has reported his/her judgment on the same experiment more than once, regardless of the "test type," the average score on a given example by that informant is used when calculating the average score on that example by the entire informants for the experiment.
- The results we have obtained so far indicate that the choice of the "test type" does not make a significant difference. See, for example, the chart in (46), which shows the results, as of 11/10/2009, of "different test types" of the experiment on the 12 Examples given in (23)-(26). 26 informants have responded and some have reported their judgment more than once.[3]

(46)

EPSA [5]-#1	Schema A		Schema B		Schema C	
Five-ranking (in pairs)	79 values	97	80 values	58	79 values	80
Yes-or-No (one each)	52 values	96	52 values	51	51 values	82
Yes-or-No (in pairs)	48 values	97	46 values	58	48 values	81
Five-ranking (one each)	28 values	93	28 values	46	28 values	79

- "Schema A" covers the ^{ok}*Schemata* in (21a) and (22a), "Schema B" the **Schemata* in (21b) and (22b), and "Schema C" the ^{ok}*Schemata* in (21c) and (22c).
- As can be seen from (46), there really is not much difference at all among the different "test types."

- The result of an experiment can be viewed in a variety of ways including those indicated in (47).

(47) The information that we can extract out of the result of an experiment:
a. the number of the informants who have participated in it
b. the total number of times that informant judgment has been provided on an example

[3] 6 of the 26 informants have provided their judgments as many as four times.

c. the mean 'score' on an given example for an informant or for the entire informants
d. the mean 'score/value' of a given Schema for an informant or for the entire informants
e. the effects of specific lexical choices
f. the judgments by an individual informant, represented by her/his code number, with respect to various dimensions including those mentioned above (We can also compare an informant's judgments in one experiment with those in another.)
g. the results, depending upon the "test type"
h. the mean 'score/value' of a given example or a Schema, depending upon different informant groups, categorized by means of whether they are familiar with certain notions such as "bound variable anaphora" and/or "wide scope reading or by means of their dialects, etc.

- We can thus observe whether there is consistency (i.e., *informant-internal repeatability*) on a certain Schema within an experiment and also across various experiments.

7.2. The results of the experiments

7.2.1. *Otagai*

(48) A summary of the results of an experiment on the predicted *Schematic Asymmetry* in (21) and (22):

Hypothesis: *Otagai* is a local anaphor.				
Schema group 1	*Otagai* is in the embedded object position.			
	Schema 1 A	52 values	98	ok NP-ga/wa [NP1-ga otagai-o/ni V-ru/ta {to/no ka}] V-ru/ta (under the reciprocal reading of *otagai* with NP1 as its "antecedent")
	Schema 1 B	52 values	63	* NP1-ga/wa [NP-ga otagai-o/ni V-ru/ta {to/no ka}] V-ru/ta (under the reciprocal reading of *otagai* with NP1 as its "antecedent")
	Schema 1 C	52 values	86	ok NP1-ga/wa [NP-ga karera-o/ni V-ru/ta {to/no ka}] V-ru/ta (with the coreference between *karera* and NP1)
Schema group 2	*Otagai* is in the embedded object position. The intended antecedent is the relative head.			
	Schema 2 A	52 values	96	ok [[otagai-o/ni V-ru/ta] NP1] (under the reciprocal reading of *otagai* with NP1 as its "antecedent")
	Schema 2 B	52 values	60	* [[[NP-ga otagai-o/ni V-ru/ta {to/no ka}] V-ru/ta] NP1] (under the reciprocal reading of *otagai* with NP1 as its "antecedent.")
	Schema 2 C	52 values	76	ok [[[NP-ga karera-o/ni V-ru/ta {to/no ka}] V-ru/ta] NP1] (with the coreference between *karera* and NP1)
26 participants, 619 answers				

✓ "Schema group 1" is for (21).
✓ "Schema group 2" is for (22).
✓ "Schema 1 A" covers the ^{ok}*Examples* in (23a) and (24a).
✓ "Schema 1 B" covers the **Examples* in (23b) and (24c).
✓ "Schema 1 C" covers the ^{ok}*Examples* in (23c) and (24c).
✓ "Schema 2 A" covers the ^{ok}*Examples* in (25a) and (26a).
✓ "Schema 1 B" covers the **Examples* in (25b) and (26b).
✓ "Schema 1 C" covers the ^{ok}*Examples* in (25c) and (26c).
✓ "619 answers" means that there have been 619 occurrences of a judgment reported on an example. As noted, some informants have judged the same example more than once; but in such cases the values in (48) are based on the average score on a given example by the same informant.

- The values of "Schema 1 B" and "Schema 2 B" should be close to "0" according to the *predicted schematic asymmetry* in (21) and (22).

- The informant judgments as indicated in (48) thus clearly disconfirm the **Schema*-based predictions based on the lexical hypothesis in (18a).

7.2.2. *Zibun-zisin*

(49) A summary of the results of the experiment on the predicted *Schematic Asymmetry* in (27) and (28):

Hypothesis: *Zibun-zisin* is a local anaphor.				
Schema group 1	the topic construction			
	Schema 1 A	33 values	100	ok NP-ga/wa [α-ga zibun-zisin-o/ni V-T to] V-T (under the interpretation that *zibun-zisin* and α are understood to refer to the same individual)
	Schema 1 B	33 values	68	* α-ga/wa [NP-ga zibun-zisin-o/ni V-T to] V-T (under the interpretation that *zibun-zisin* and α are understood to refer to the same individual)
	Schema 1 C	33 values	82	ok α-ga/wa [NP-ga kare/kanozyo-o/ni V-T to] V-T (under the interpretation that *kare/kanozyo* and α are understood to refer to the same individual)
Schema group 2	the relative clause construction			
	Schema 2 A	33 values	99	ok [[[α-ga zibun-zisin-o/ni V-T to] V-T] NP]-wa ... (under the interpretation that *zibun-zisin* and α are understood to refer to the same individual)
	Schema 2 B	33 values	58	* [[[NP-ga zibun-zisin-o/ni V-T to] V-T] α]-wa ... (under the interpretation that *zibun-zisin* and α are understood to refer to the same individual)
	Schema 2 C	33 values	70	ok [[[NP-ga kare/kanozyo-o/ni V-T to] V-T] α]-wa ... (under the interpretation that *kare/kanozyo* and α are understood to refer to the same individual)
12 participants 340 answers				

- As in the case of the **Schema*-based prediction in (18a) about *otagai*, the **Schema*-based prediction in (18b) about *zibun-zisin* is also clearly disconfirmed.

7.2.3. *Kare-zisin*

We have not obtained enough informant judgments on the examples in (37)-(42).
We have however obtained informant judgments on examples that conform to (35b), for example, in experiments where those examples are given as "control." In one of those experiments, only a few informants out of over 60 informants judged examples conforming to (35b) to be unacceptable consistently. In another such experiment, all of the 11 informants accepted examples conforming to (35b). I would therefore be quite surprised if the result of the experiments on the examples in (37)-(42) would not disconfirm the **Schema*-based prediction about *kare-zisin*.

7.3. Other experiments

(50) A summary of the results of a different experiment in which the **Schema* is where *otagai* fails to be c-commanded by "its antecedent."

Hypothesis: *Otagai* is a local anaphor.				
Schema group 1	In Schema B, *otagai* is not c-commanded by its "antecedent."			
	Schema 1 A	39 values	94	ok NP1-ga [ogatai-no M]-ni/o V (under the reciprocal reading of *otagai* with NP1 as its "antecedent")
	Schema 1 B	39 values	82	* [otagai-no N]-ga NP1-ni/o V (under the reciprocal reading of *otagai* with NP1 as its "antecedent")
	Schema 1 C	39 values	74	ok [karera-no N]-ga NP1-ni/o V (with the coreference between *karera* and NP1)
13 participants 242 answers				

- The **Schema*-based prediction is also clearly disconfirmed.

Hoji 2006b contains examples conforming to such a **Schema* and other **Schemas* in relation to *otagai* and reports that those **Schema*-based predictions are also clearly disconfirmed.

8. Fukui's (1986) thesis and the absence of local anaphors in Japanese

- It is not possible to *empirically* demonstrate the *non-existence* of elements in Japanese that are marked [+A]—for it is not possible to *empirically* demonstrate the non-existence of anything.
- But their *non-existence* in Japanese is an immediate consequence if we adopt the thesis put forth in Fukui 1986.

- Fukui (1986) proposes that the mental Lexicon of the speakers of Japanese does not contain what is responsible for making functional categories "active."

- Given the assumption that what most crucially underlies a local anaphor is an "active functional category," it follows that Japanese does not have local anaphors. Given this, the results of the experiments reported above is just as expected.

- That is to say, the fact that the researchers have so far failed to identify what qualifies as a local anaphor in Japanese—once we apply a *minimally rigorous* empirical test—*despite* the concerted efforts by a substantial number of researchers for over 3 decades, is not puzzling, after all. It is just as expected.

9. BVA (bound variable anaphora)

9.1. The main hypotheses

(51) Hypotheses

a. H_{CS}
FD(a, b) only if
(i) a c-commands b, and
(ii) a and b are *not* co-arguments.

b. *Bridging Statement*
BVA(A, B) only if there is FD(α, β) where α and β are LF objects corresponding to A and B, respectively.

c. *pf-LF correspondences*
SOV in Japanese corresponds to an LF representation in which S asymmetrically c-commands

O.

(52) BVA(A, B):

We intend the *linguistic intuition BVA(A, B)* to have the following properties:

a. A is not singular-denoting; i.e., either there are two or more individuals or entities that are 'expressed' by A or there is no individual or entity expressed by A.
b. B does not refer to a particular individual or entity.
c. B is singular-denoting.
d. B is understood to 'express the same thing' as A is understood to express; i.e., the value of B co-varies with that of A.

9.2. Predicted schematic asymmetries

(53) (Where the V is not an "ergative verb.")

a. *okSchema*
NP[4]-ga [... so-NP ...]-ni/o V
BVA(NP, so-NP)

b. **Schema*
[... so-NP ...]-ga NP-ni/o V
BVA(NP, so-NP)

c. *okSchema*
[... so-NP ...]-ga NP-ni/o V
(With so-NP "referring to" an individual/object that has been mentioned in the preceding discourse)

- Before we proceed with further experiments on various hypotheses and predictions involving the availability of BVA, it is necessary that we first obtain a *confirmed schematic asymmetry* in accordance with (53).
- If we fail to obtain a *confirmed schematic asymmetry* in accordance with (53), there is not much point of considering the (un)availability of BVA in further experiments that go beyond the simple SOV pattern.

9.3. On the restriction on A of BVA(A, B)

- Not every choice of A of BVA(A, B) yields a *confirmed schematic asymmetry*.

(54) a. With "#-cl-no N" (e.g., *san-nin-no gakusei* 'three students') and "subete-no N" (e.g., *subete-no gakusei* 'every student') as A of BVA(A, B), the **Schema*-based prediction as indicated in (53b) gets disconfirmed.

b. With "kanari-no kazu-no N" (e.g., *kanari-no kazu-no gakusei* 'a good number of students') "55% izyoo-no N" (e.g., *55% izyoo-no gakusei* '55% or more students') and "NP-sae" (e.g., *ano gakusei sae* 'even that student') as A of BVA(A, B), the **Schema*–based prediction indicated in (53b) survives a test of disconfirmation to a much greater extent.

➢ The choice of A in relation of wide scope distributive reading DR(A, B) also affects whether we obtain a *confirmed schematic asymmetry* in essentially the same was as indicated in (54), as extensively discussed in works by Hayashishita.

➢ (54) is based on the informant intuitions that we have obtained over the years, informally semi-systematically and more systematically in the recent months.
➢ The results of the recent on-line experiments are introduced below.
➢ The number of the informants who have judged the relevant examples is still relatively small in the recent version of our experiments, as compared to the earlier version of our experiments—for which the number of our informants was well over 70 in some experiments. The results of the new version of the experiments and those of the older version of the experiments do not seem to differ significantly.

[4] The choice of *NP* over *DP* is inconsequential in this presentation.

(55) a. BVA(kanari-no kazu-no N, so-ko) 'BVA(a good number of Ns, so-ko)'
b. BVA(55% izyoo-no N, so-ko) 'BVA(55% or more Ns, so-ko)'
c. BVA(NP-sae, so-ko) 'BVA(even NP, so-ko)'
d. BVA(subete-no N, so-ko) 'BVA(every N, so-ko)'
e. BVA(mi-ttu-no N, so-ko) 'BVA(three Ns, so-ko)'

(56) Results of experiment (the judgments are on the scale of 0 (totally unacceptable) to 100 (fully acceptable)):[5]

	(53a)	(53b)	(53c)	# of informants	the total # of reported judgments
(55a)	98	15	96	15	658
(55b)	98	2	91	11	433
(55c)	98	2	95	10	414
(55d)	92	54	98	7	402
(55e)	90	52	97		

(57) One of the 10 result charts of an experiment on (53) with (55a), with some parts translated into English.

Hypothesis: FD(a,b) is established only if a c-commands b at LF.

Schema group 1	'so-ko-no N-o/-ni' is a matrix argument.			
	Schema 1 A	29 values	98	ok kanari-no kazu-no NP-ga so-ko-no N-o/-ni V (under BVA(kanari-no kazu-no N, so-ko))
	Schema 1 B	29 values	15	* so-ko-no N-ga kanari-no kazu-no NP-o/-ni V (under BVA(kanari-no kazu-no N, so-ko))
	Schema 1 C	30 values	96	ok so-ko-no N-ga kanari-no kazu-no NP-o/-ni V (with 'so-ko' referring to a specific individual/object)
Schema group 2	'so-ko' is an argument in a relative clause.			
	Schema 2 A	30 values	94	ok kanari-no kazu-no NP-ga [... so-ko ...]-o/-ni V (under BVA(kanari-no kazu-no N, so-ko))
	Schema 2 B	29 values	26	* [... so-ko ...]-ga kanari-no kazu-no NP-o/-ni V (under BVA(kanari-no kazu-no N, so-ko))
	Schema 2 C	30 values	96	ok [... so-ko ...]-ga kanari-no kazu-no NP-o/-ni V (with 'so-ko' referring to a specific individual/object)
Schema group 3	The binder and the bindee are separated by a clause boundary.			
	Schema 3 A	30 values	96	ok kanari-no kazu-no NP-ga [N-ga so-ko-no N-ni V sita to] V (under BVA(kanari-no kazu-no N, so-ko))
	Schema 3 B	30 values	8	* so-ko-no N-ga [N-ga kanari-no kazu-no NP-ni V sita to] V (under BVA(kanari-no kazu-no N, so-ko))
	Schema 3 C	30 values	96	ok so-ko–no N-ga [N-ga kanari-no kazu-no NP-ni V sita to] V (with 'so-ko' referring to a specific individual/object)

15 participants
658 answers

[5] (The information in this and some other footnotes below are only for myself; it is intended to help me recall what actual experiments and examples are being talked about.) EPSA[1] #1, #2, #3, and #18.

(58) Results of an earlier (less systematic) experiment (the judgments are on the scale of −2 (totally unacceptable) to +2 (fully acceptable))[6]

	(53a)	(53b)	# of informants
an example conforming to a version of (55b), with 10-izyoo-no N 'more than 10 Ns' as A of BVA(A, B)	+1.91	−1.59	32-33
an example conforming to (55a)	+1.90	−1.53	30
an example conforming to (55d)	+1.97	−0.86	29-30

(59) Results of yet another earlier experiment (the judgments are on the scale of −2 (totally unacceptable) to +2 (fully acceptable))[7]

	(53a)	(53b)	# of informants
an example confirming to (55b)	+1.65	−1.30	54
another example confirming to (55b)	+1.70	−1.37	54
an example conforming to a version of (55b), with 10-izyoo-no N 'more than 10 Ns' as A of BVA(A, B	+1.88	−1.72	32

- The hypotheses in (51a) and (51b), which is shared by most practitioners in one form or another, also give rise to the *predicted schematic asymmetry* in (60).

(60) (Where the V is not an "ergative verb.")
a. ^{ok}*Schema*
NP-ga [... so-NP ...]-ni/o V
BVA(NP, so-NP)
b. **Schema*
[... NP ...]-ga [... so-NP ...]-ni/o V
BVA(NP, so-NP)
c. ^{ok}*Schema*
[... NP ...]-ga [... so-NP ...]-ni/o V
(With so-NP "referring to" an individual/object that has been mentioned in the preceding discourse)

- The use of *dono-N* (such as those given in (61)) as A of BVA(A, B), however, results in a clear disconfirmation of the **Schema*-based prediction indicated in (60b) (even in examples where *dono-N* can be safely regarded as not singular-denoting) although we seem to obtain a *confirmed schematic asymmetry* in (53) with *dono-N* as A of BVA(A, B).

(61) a. *do-ko* ('which place')
b. *do-no N* ('which NP')
c. *do-no N-mo* 'which N also' ('any N', whichever N')

(62) a. (Cf. (53b).)
**Schema*$_1$
[… so-ko …]-ga NP-o V
BVA(NP, so-ko)

b. (Cf. (60b).)
**Schema*$_2$
[… NP-o … V-ta N]-ga [… so-ko …]-o V
BVA(NP, so-ko)

(63) a. ^{ok}*Schema*$_{1\text{-}1}$ / ^{ok}*Schema*$_{2\text{-}1}$
NP-ga [… so-ko …]-o V
BVA(NP, so-ko)

b. ^{ok}*Schema*$_{1\text{-}2}$
NP-o [… so-ko …]-ga V
BVA(NP, so-ko)

[6] CFJ-55.
[7] CFJ-6.

c. *ok**Schema*$_{1-3}$
[… so-ko …]-o NP-ga V
BVA(NP, so-ko)

(64) a. *ok**Example* of *ok**Schema* (63a):
Do-no *zidoosyagaisya*-ga *so-ko*-no kogaisya-o uttaeta no?
which-GEN auto:company-NOM that-place-GEN subsidiary-ACC sued
'*Which automobile company* sued *its* subsidiaries?'

b. **Example* of **Schema* (62a):
So-ko-no kogaisya-ga *do-no* *zidoosyagaisya-o* uttaeta no?
that-place-GEN subsidiary-NOM which-GEN auto:company-ACC sued
'*Its* subsidiaries sued *which automobile company*?'

c. *ok**Example* of *ok**Schema* (63c):
So-ko-no kogaisya-o *do-no* *zidoosyagaisya*-ga uttaeta no?
that-place-GEN subsidiary-ACC which-GEN auto:company -NOM sued
'*Its* subsidiaries, *which automobile company* sued?'

d. *ok**Example* of *ok**Schema* (63b):
Do-no *zidoosyagaisya-o* *so-ko*-no kogaisya-ga uttaeta no?
which-GEN auto:company -ACC that-place-GEN subsidiary-NOM sued
'*Which automobile company*, *its* subsidiaries sued?'

e. **Example* of **Schema* (62b):
[Kyonen Nissan-ga *do-no* *zidoosyagaisya-o* uttaeta saiban]-ga
last:year Nissan-NOM which-GEN auto:company ACC sued law-suit-NOM
so-ko-o toosan-ni oiyatta no?
that-place-ACC bankruptcy-to forced
'The lawsuit(s) in which Nissan sued *which automobile company* last year forced *it* to bankruptcy?'

(65) Results of an earlier (less systematic) experiment (the judgments are on the scale of −2 (totally unacceptable) to +2 (fully acceptable))[8]

	Number of informants who accepted it	Mean Score	Standard Deviation	Corresponds to:
(64a)	25 out of 25	+2.00	0.00	*ok**Schema* in (63a)
(64b)	3 out of 25	−1.24	1.07	**Schema* in (62a)
(64c)	22 out of 25	+1.48	1.20	*ok**Schema* in (63c)
(64d)	23 out of 25	+1.60	1.10	*ok**Schema* in (63b)
=>(64e)	20 out of 25	+1.04	1.56	**Schema* in (62b)

(66) Results of an earlier (less systematic) experiment, including the informant judgments obtained subsequent to (65) (the judgments are on the scale of −2 (totally unacceptable) to +2 (fully acceptable))[9]

	Mean Score	# of informants	Standard Deviation	Corresponds to:
(64a)	+1.41	71	1.24	*ok**Schema* in (63a)
(64b)	−1.07	71	1.19	**Schema* in (62a)
(64c)	+0.37	71	1.61	*ok**Schema* in (63c)
(64d)	+0.73	71	1.44	*ok**Schema* in (63b)
=>(64e)	+0.51	71	1.66	**Schema* in (62b)

- Similar results have obtained on the examples in (67), as summarized in (68).

[8] CFJ-55: as reported in Hoji 2006a.
[9] CFJ-55: based on the results as of 12/5/2009.

(67) a. *Do-no zidoosyagaisya-mo so-ko*-no kogaisya-o uttaeta
which-GEN auto:company-also that-place-GEN subsidiary-ACC sued
'*Every automobile company* sued *its* subsidiaries.'

b. *So-ko*-no kogaisya-ga *do-no zidoosyagaisya-mo* uttaeta.
that-place-GEN subsidiary-NOM which-GEN auto:company-also sued
'*Its* subsidiaries sued *every automobile company*."

c. *So-ko*-no kogaisya-o *do-no zidoosyagaisya-mo* uttaeta.
that-place-GEN subsidiary-ACC which-GEN auto:company -also sued
'*Its* subsidiaries, *every automobile company* sued.'

d. *Do-no zidoosyagaisya-mo so-ko*-no kogaisya-ga uttaeta.
which-GEN auto:company -also that-place-GEN subsidiary-NOM sued
'*Every automobile company*, *its* subsidiaries sued.'

e. [Kyonen Nissan-ga *do-no zidoosyagaisya-o* uttaeta saiban]-mo
last:year Nissan-NOM which-GEN auto:company ACC sued law-suit-also
so-ko-o toosan-ni oiyatta.
that-place-ACC bankruptcy-to forced
'*E*very lawsuit in which Nissan sued *an automobile company* last year forced *it* to bankruptcy.'

(68) Results of an earlier (less systematic) experiment (the judgments are on the scale of −2 (totally unacceptable) to +2 (fully acceptable))[10]

	Number of informants who accepted it	Mean Score	Standard Deviation	Corresponds to:
(67a)	25 out of 25	+2.00	0.00	^{ok}*Schema* in (63a)
(67b)	6 out of 25	−0.76	1.42	**Schema* in (62a)
(67c)	23 out of 25	+1.52	1.10	^{ok}*Schema* in (63c)
(67d)	21 out of 24	+1.58	0.91	^{ok}*Schema* in (63b)
=>(67e)	20 out of 25	+1.16	1.38	**Schema* in (62b)

(69) Results of an earlier (less systematic) experiment, including the informant judgments obtained subsequent to (68) (the judgments are on the scale of −2 (totally unacceptable) to +2 (fully acceptable))[11]

	Mean Score	# of informants	Standard Deviation	Corresponds to:
(67a)	+1.61	72	0.96	^{ok}*Schema* in (63a)
(67b)	−0.81	72	1.31	**Schema* in (62a)
(67c)	+0.75	71	1.43	^{ok}*Schema* in (63c)
(67d)	+0.93	69	1.27	^{ok}*Schema* in (63b)
(67e)	+0.79	72	1.47	**Schema* in (62b)

9.4. Implications

- Having obtained a *confirmed schematic asymmetry* for (53), we have reason to believe that (51a) and (51c) may be valid and that (51b) may also be valid as long as we choose to use a 'right item' (such as those mentioned in (54b)) as A of BVA(A, B), indicating that the informant intuitions on our Examples under such BVA(A, B) are likely a reflection of the properties of the Computational System under discussion.

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[10] CFJ-55: as reported in Hoji 2006a.

[11] CFJ-55: based on the results as of 12/5/2009.

- With the use of NPs such as those mentioned in (54a) or "wh-NP" as A of BVA(A, B), the **Schema*-based prediction indicated in (53) and (62b) has been disconfirmed.

- That means that we should not use such NPs as A of BVA(A, B) in our further experiments, for example, on the validity of some hypotheses about OSV, including 'long-distance OSV" (i.e., so-called long-distance scrambling), the multiple OS construction (so-called multiple scrambling), 'resumption' in the OS construction, etc.; see below.

  - If **Schema*-based predictions in such further experiments get disconfirmed, we could not attribute it to the new hypothesis about *pf-LF correspondences* being invalid because the use of such an NP as A of BVA(A, B) results in the failure to obtain a *confirmed schematic asymmetry* in simpler experiments.

  - To the extent that our further experiments make crucial reference to BVA(A, B) as a reflection of a property of the Computational System, we must use NPs for A for BVA(A, B) that *have resulted* in a *confirmed schematic asymmetry* in our simpler/earlier experiments.

  - It goes without saying that we should use the most reliable experimental design. The use of NPs such as those mentioned in (54a) would only make our experimental design clearly less reliable.

10. Merits of working with *schematic asymmetries*

- It helps us see actual empirical consequences of various proposals, beyond technical details, which tend to make things opaque unless conscious efforts are made to articulate how the proposal under discussion *can be put to empirical test*.
- Hence, it helps us determine which of the alternative proposals are to be preferred over the others, without relying on rhetorical (and advertisement) skills.
- It also helps up understand how we can deal with, and/or proceed in, cross-linguistic research in a meaningful and effective way.

- Most importantly, it makes us hopeful that we might be able to make generative grammar an empirical science.

11. References

[If there is something missing below that is mentioned in the above, please let me know.]

Boeckx, Cedric. 2006. *Linguistic Minimalism: Origins, Concepts, Methods, and Aims*. Oxford University Press, New York.

Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*. Mass.: MIT Press.

Chomsky, Noam. 1981. *Lectures on Government and Binding*. Dordrecht: Foris.

Chomsky, Noam. 1993. "A Minimalist Program for Linguistic Theory," in K. Hale & S. J. Keyser (eds.), *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*. Cambridge, MA: MIT Press.

Chomsky, Noam. 1995. *The Minimalist Program*. MA: The MIT Press.

Feynman, Richard. 1965/1994. *The Character of Physical Law*. New York: The Modern Library. (This is a reproduction of his 1964 Messenger Lectures at Cornell University. The book was originally published in hardcover by BBC in 1965 and in paperback in 1967 by MIT Press. The page references are to the 1994 edition. The Feynman lectures can be viewed at http://research.microsoft.com/apps/tools/tuva/#.)

Feynman, Richard. 1974. "Cargo Cult Science," 1974 Caltech commencement address, reproduced in Feynman 1997, pp. 338-346. (Available at: http://www.physics.brocku.ca/etc/cargo_cult_science.php; reproduced in Feynman 1997.)

Feynman, Richard. 1997. *Surely You're Joking, Mr. Feynman!*. New York: Norton & Company. (The hardcover was originally published in 1985.)

Fukui, Naoki. 1986. *A Theory of Categories Projection and Its Applications*, Doctoral dissertation, MIT.

Hoji, Hajime. 1995. "Demonstrative Binding and Principle B," *NELS* 25: 255-271.

Hoji, Hajime. 2003. "Falsifiability and Repeatability in Generative Grammar: A Case Study of Anaphora and Scope Dependency in Japanese," *Lingua* 113: 377-446.

Hoji, Hajime. 2006a. "Assessing Competing Analyses: Two Hypotheses about 'Scrambling' in Japanese," in Ayumi Ueyama, ed., *Theoretical and Empirical Studies of Reference and Anaphora—Toward the establishment of generative grammar as an empirical science*, a report of the Grant-in-Aid for Scientific Research (B), Project No. 15320052, Supported by Japan Society for the Promotion of Science, Kyushu University, pp. 139-185. (Available at: http://www.gges.org/hoji/research/hp-papers.cgi.)

Hoji, Hajime. 2006b. "Otagai," in Ayumi Ueyama, ed., *Theoretical and Empirical Studies of Reference and Anaphora—Toward the establishment of generative grammar as an empirical science*, a report of the Grant-in-Aid for Scientific Research (B), Project No. 15320052, Supported by Japan Society for the Promotion of Science, Kyushu University, pp. 126-138. (Available at: http://www.gges.org/hoji/research/hp-papers.cgi. The paper was circulated originally in 1997.)

Hoji, Hajime. 2009. under review. *A Foundation of Generative Grammar as an Empirical Science*.

Katada, Fusa. 1991. "The LF Representation of Anaphors," *Linguistic Inquiry* 22: 287-313.

Kuroda, S.-Y. 2008. "Mathematics and Generative Grammar—"Beyond Explanatory Adequacy" and Mathematical Realism of Language: A Fable for Naoki Fukui," *Sophia Linguistica* 56: 1-36.

Lakatos, Imre. 1970. "Falsification and Methodology of Scientific Research Programmes," in I. Lakatos and A. Musgrave (eds.), *Criticism and the Growth of Knowledge*, Cambridge University Press. pp. 91-195. (Reprinted as Lakatos 1978: chapter 1; the page references are to Lakatos 1978.)

Lakatos, Imre. 1973. "Science and Pseudoscience," included in Lakatos 1978 as "Introduction: Science and Pseudoscience." (pp. 1-7) (The page references are to Lakatos 1978; the transcript can be obtained at http://www.lse.ac.uk/collections/lakatos//Default.htm.)

Lakatos, Imre. 1978. *The Methodology of Scientific Research Programmes: Philosophical Papers Volume 1*, edited by John Worrall and Gregory Currie, Cambridge University Press.

Narita, Hiorki. to appear. "The Tension between Explanatory and Biological Adequacy. A Review of Naoki Fukui's (2006) Theoretical Comparative Syntax: Studies in Macroparameters," *Lingua*.

Newmeyer, J. Fredrick. 2008. "A Review of *Linguistic Minimalism: Origins, Concepts, Methods, and Aims. by Cedric Boeckx*," *Language* 84: 387-395.

Nishigauchi, Taisuke. 1992. "Syntax of Reciprocals in Japanese," *Journal of East Asian Linguistics* 1: 157-96.

Popper, K. 1959. *The Logic of Scientific Discovery*. London and New York: Routledge. (The English translation of *Logic der Forschung* 1934.)

Popper, Karl. 1963. "Science: Problems, Aims, Responsibilities," *Federation Proceedings (Baltimore), Federations of American Societies of Experimental Biology* Vol. 22, Issue 4: 961-972.

Saito, Mamoru. 1992. "Long Distance Scrambling in Japanese," *Journal of East Asian Linguistics* 1: 69-118.

Saito, Mamoru. 2003. "A Derivational Approach to the Interpretation of Scrambling Chains," *Lingua* 113: 481-518.

Schütze, Carson. 1996. *The Empirical Base of Linguistics: Grammaticality Judgments and Linguistic Methodology*, University of Chicago Press.

Takita, Kensuke. 2009. "VP-scrambling, Linearization Preservation, and the Theories of Control," NELS 40 abstract. (http://web.mit.edu/nels40/program/abstracts/NELS40Takita.pdf)

Townsend, D. J. & T. G. Bever. 2001. *Sentence Comprehension: The Integration of Habits and Rules*, MIT Press.

Ueyama, Ayumi. 2009. "Model of Judgment Making and Hypotheses in Generative Grammar," in S. Iwasaki, H. Hoji, P. Clancy, and S.-O. Sohn, eds., *Japanese/Korean Linguistics 17*, CSLI. (Available at: http://www.gges.org/hoji/research/hp-Ayumi.cgi.)