



RESEARCH ARTICLE

Intransparent-Gap Relatives in Japanese

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Abstract

In the present article, we describe what we call *Intransparent-Gap Relatives* (IGRs) in Japanese. In IGRs, a gap is located within the relative clause, and the head noun appears outside the relative clause. Unlike the standard head-external relatives, the gap in IGRs is not transparently associated with the head noun, but they are mediated through a metonymic relation. We propose a formal account of IGRs in terms of incremental parsing in Dynamic Syntax: an IGR string is processed in a left-to-right manner, and a semantic structure is progressively built up. This account unifies the standard head-external relatives and IGRs, relegating their differences to the ways in which the head noun is parsed and construed against the relative clause structure. Confirmation of this analysis comes from cross-constructional and cross-linguistic considerations. First, the analysis predicts that a metonymic reading is available in relatives but not in other rightward-displacement constructions, such as clefts and postposing. Second, the analysis suggests that IGRs are possible in languages such as Japanese and Korean, where the relative clause is processed before the head noun, but not in languages such as English and French, where the head noun is processed before the relative clause.

1. Introduction

Relative clauses are arguably one of the most extensively studied topics in syntactic research. In this regard, Japanese is noteworthy in that it exhibits a wide range of relative constructions. The most standard type is head-external relatives, as illustrated in (1).

- (1) [[*Sono sakka-ga jikaisaku-toshite* \emptyset_i *kaita*]
[[that writer-NOM next.work-as wrote]
shōsetsu]-*ga* *shuppansareta*.
novel]-NOM was.published
'The novel which the writer wrote as his next work was published.'¹

¹ Japanese examples are notated according to the Hepburn system, except that long vowels are transcribed as \bar{a} for /a:/, \bar{e} for /e:/, \bar{i} for /i:/, \bar{o} for /o:/, and \bar{u} for /u:/. Korean examples are notated according to the Yale system. Glossing is based on *The Leipzig Glossing Rules*, except for ATT 'attributive', FP 'final particle', and HON 'honorific'.

This construction is called *head-external relatives* because the head noun *shōsetsu* ‘novel’ is located outside the relative clause. The head noun is associated with the gap (notated as \emptyset in a theory-neutral fashion) within the relative clause.

In this paper, we contend that Japanese has a unique type of relative ((2)), which is similar to, but qualitatively distinct from, head-external relatives.

- (2) [[*Sono sakka-ga jikaisaku-toshite \emptyset kaita*]
 [[that writer-NOM next.work-as wrote]
shōsetsu-mē]-ga happyōsareta.
 novel-title]-NOM was.announced
 ‘The title of the novel which the writer wrote as his next work was announced.’

In (2), as in the case of (1), the gap is inside the relative clause, and the head noun is outside the relative clause. Unlike (1), however, the gap is not transparently associated with the head noun; what was written is a novel, whereas what was announced is its title. We call this type of relative *Intransparent-Gap Relatives* (IGRs).² As can be seen in (3), the non-relative analogue of (2) is not ungrammatical but semantically anomalous.

- (3) †*Sono sakka-ga jikaisaku-toshite shōsetsu-mē-o kaita.*
 that writer-NOM next.work-as novel-title-ACC wrote
 ‘The writer wrote the title of a novel as his next work.’

In the subsequent sections, we will describe the syntactic and semantic properties of IGRs (Section 2) and show that these properties (and further related data to be provided) are captured straightforwardly in Dynamic Syntax (Kempson et al. 2001, Cann et al. 2005) (Sections 3–6). As will be detailed in Section 3, its core architectural features are spelt out as follows:

- A structure is progressively updated based on incremental parsing.
- The structure is semantic, and no independent level of syntactic structure is posited.

As will be proposed in Section 4, these architectural designs are suitable for modelling IGRs. To give an example, the difference between restrictive and non-restrictive IGRs with respect to negation boils down to the timing at which a certain structure-building operation is applied. The proposed account has several consequences beyond IGRs in Japanese. Cross-constructionally, it predicts that a metonymic interpretation is available in relatives but not in other rightward-displacement constructions: clefts and postposing (Section 5). Cross-linguistically, it suggests that IGRs are possible in languages like Japanese and Korean, where a relative clause precedes the head noun, but not in languages like English and French, where the order of a relative clause and the head noun is reversed (Section 6). By way of conclusion, Section 7 sums up the benefits of the Dynamic Syntax approach and mentions further issues in IGRs as future prospects.

² (2) (and other IGR examples in this paper) are acceptable to the present author as well as two consulted speakers. As pointed out by Reviewer #1, some speakers seem to accept IGRs with the kind of marginality that they feel with respect to internally headed and doubly headed relatives (see, e.g., Erlewine & Gould 2016). The present paper models the grammar of those who accept IGRs, setting aside the issues of cross-speaker variations.

2. Description

2.1. IGRs in Japanese

The IGR example in (2) is repeated here as (4).

- (4) [[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]
 [[that writer-NOM next.work-as wrote]
shōsetsu-mē]-ga *happyōsareta*.
 novel-title]-NOM was.announced
 ‘The title of the novel which the writer wrote as his next work was announced.’

As stated above, the head noun *shōsetsu-mē* ‘novel title’ is not directly associated with the gap Ø in that it does not function as the object of the embedded verb *kaita* ‘wrote’. Some objections, however, may be raised to this structural construal.

First, one may presume that the relative clause in (4) modifies *shōsetsu* ‘novel’ alone. If this were the case, (4) would be no more than a case of head-external relatives. Such a partial modification, however, is not possible, as can be seen in (5).

- (5) *nagai shōsetsu-mē*
 long novel-title
 (a) ‘the long title of a novel’
 (b) *‘the title of a long novel’

If *nagai* could modify *shōsetsu* alone, the reading in (5b) would be obtainable, contrary to fact. It is thus reasonable to hold that the relative clause modifies the whole head noun in (4).³

Second, Japanese is a pro-drop language, and one may wonder whether Ø in (4) is a *pro*. If this were the case, Ø could be overtly expressed, but as shown in (6), it cannot.

- (6) *[[*Sono sakka-ga jikaisaku-toshite shōsetsu-o kaita*]
 [[that writer-NOM next.work-as novel-ACC wrote]
shōsetsu-mē]-ga *happyōsareta*.
 novel-title]-NOM was.announced
 Intended ‘The title of the novel which the writer wrote as his next work was announced.’

In frameworks allowing covert elements, one could posit a complex structure where a *pro* (or other types of null items) cannot be overtly expressed. In Dynamic Syntax, such null items are disallowed, and (6) shows that Ø in IGRs cannot be seen as a *pro* as long as the data are analysed in this framework (see Section 3.1 for the treatment of *pro* in Dynamic Syntax).

Third, one may wonder whether the gap in (4) is located somewhere other than the object position of *kaita* ‘wrote’. One could suppose that the IGR in (4) is based on

³ Reviewer #3 wondered whether one could posit the genitive *-no* between *shōsetsu* and *-mē*, but the resulting sequence is unacceptable to me and my informants. Also, if the covert *-no* were present, *nagai* ‘long’ should be able to modify *shōsetsu* alone in (5), but this is not the case. Further, *-mē* is a bound morpheme, but in general, the genitive *-no* is not followed by a bound morpheme; I wish to thank Anthony Backhouse for related discussion. *-Mē* is written as ‘名’ in kanji. This kanji is also read as *na*. Note that *na* is a free morpheme; thus, *shōsetsu-no na* ‘the title of a novel’ is licit. As expected, if *nagai* ‘long’ is placed before *shōsetsu-no na*, both readings in (5) are possible.

(7), where *shōsetsu-mē* (together with the instrumental marker *-de*) functions as an adjunct.

- (7) (??) *Sono sakka-ga jikaisaku-toshite sono shōsetsu-mē-de kaita.*
 that writer-NOM next.work-as that novel-title-INS wrote
 ‘That writer wrote (a novel) with that title as his next work.’

(7), however, is not quite acceptable out of context, and it is not clear whether it could be a basis for the IGR in (4), which is fully acceptable out of context. The acceptability of (7) improves if the object of *kaita* ‘wrote’ is explicitly expressed, as in (8).

- (8) *Sono sakka-ga jikaisaku-toshite sono shōsetsu-mē-de*
 that writer-NOM next.work-as that novel-title-INS
shōsetsu-o kaita.
 novel-ACC wrote
 ‘That writer wrote a novel with that title as his next work.’

Still, the IGR version of (8), where *shōsetsu-o* remains overt as in (9), is not acceptable.⁴

- (9) *[[*Sono sakka-ga jikaisaku-toshite* Ø_i *shōsetsu-o kaita*]
 [[that writer-NOM next.work-as novel-ACC wrote]
shōsetsu-mē]-ga *happyōsareta.*
 novel-title]-NOM was.announced
 Intended ‘The title of the novel which the writer wrote as his next work was announced.’

We have examined (4) as a case of IGRs. Further examples are presented below:

- (10) [[*Kinō Ken-ga biyōin-de* Ø *kit-temorat-ta*]
 [[yesterday Ken-NOM beauty.salon-at cut-BEN-PST]
kamigata]-wa *kakkoyokatta.*
 hairstyle]-TOP was.cool
 ‘Ken had his hair cut at a beauty salon yesterday, and the hairstyle was cool.’
- (11) [[Ø *ibento-unē-o tantōshiteiru*]
 [[event-running-ACC take.care.of.IPFV]

⁴ Reviewer #1, based on the judgments of their consulted speaker, reported that (9) is acceptable with lexical modifications, as in (i) below (the free translation in (i) is provided by the present author).

(i) [[*Sono sakka-ga nisakume-toshite* Ø_i *aratana shōsetsu-o*
 [[that writer-NOM second.work.as new novel-ACC
kaita] (*kono*) *shōsetsu-mē*]-ga *happyōsareta.*
 wrote] (this) novel-title]-NOM was.announced

‘The title of the novel which the writer newly wrote as his second work was announced.’

(i) is still unacceptable to me, but it becomes acceptable with *sono* ‘that’ in place of *kono*. (I consulted with two informants about the present point. The judgments of one informant were the same as mine; the other said that though the sentences were all degraded, the sentence with *sono* was relatively better.) At present, I cannot offer any explanation for the judgments reported by Reviewer #1 and a detailed survey of examples like (i) and the idiolectal variations are left for future work (see also footnote 2).

rōdō-jinin]-o *huyasu-bekida*.
 work-human.number]-ACC increase-should
 ‘The number of workers in charge of the event running should be increased.’

As expected, the non-IGR analogues of (10)–(11) are semantically inappropriate.

(12) #*Kinō Ken-ga biyōin-de kamigata-o kit-temorat-ta*.
 yesterday Ken-NOM beauty.salon-at hairstyle-ACC cut-BEN-PST
 ‘Ken had his hairstyle cut at a beauty salon yesterday.’

(13) #*Rōdō-jinin-ga ibento-unē-o tantōshiteiru*.
 work-human.number-NOM event-running-ACC take.care.of.IPFV
 ‘The number of workers is in charge of the event running.’

In the IGRs in (4), (10), and (11), there are surface similarities between the head noun and the item that is expected to fill the gap. In (10), the gap corresponds to *kami* ‘hair,’ and this is part of the head noun *kamigata* ‘hairstyle’. But such similarities are not prerequisites for the formation of IGRs. Compare the IGRs in (14)–(15) with their non-IGR versions in (16)–(17).

(14) [[Ø *tabe-owatta*] *osara*]-wa *kochirani oi-tekudasai*.
 [[eat-finished] plate.HON]-TOP here.HON place-IMP.HON
 ‘Please put the plate here after you finish eating (a meal on the plate).’

(15) [[*Boku-ga* Ø *tabeta*] *menyū*]-wa *kore-desu*.
 [[1SG-NOM ate] menu]-TOP this-COP
 ‘This is the menu of the meal I ate.’

(16) #*Boku-wa osara-o tabe-owatta*.
 1SG-TOP plate.HON-ACC eat-finished
 ‘I finished eating a plate.’

(17) #*Boku-wa menyū-o tabeta*.
 1SG-TOP menu-ACC ate
 ‘I ate a menu.’

Further, *shōsetsu-mē* ‘novel title’ in (4) could be replaced with *taitoru* ‘title’.

(18) (?) [[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]
 [[that writer-NOM next.work-as wrote]
taitoru]-ga *happyōsareta*.
 title]-NOM was.announced
 ‘The title (of the novel) which the writer wrote as his next work was announced.’

(18) may sound less acceptable than (4), but it becomes fully acceptable when it is preceded by a sentence containing *shōsetsu* ‘novel’ and *taitoru* ‘title’, as shown in (19).

- (19) [[*Kazukazuno bungakushō-o totta*] *sono sakka*]-*wa*
 [[many literary.award-ACC received] that writer]-TOP
koseitekina taitoru-no shōsetsu-o kaku-koto-de shirareteiru.
 unique title-GEN novel-ACC write-NMLZ-as is.known
Senjitsu [[*sono sakka-ga jikaisaku-toshite* Ø *kaita*]
 the.other.day [[that writer-NOM next.work-as wrote]
taitoru]-*ga happyōsare masukomi-ga sore-o hōjita.*
 title]-NOM was.announced mass.media-NOM that-ACC reported
 ‘That writer, who has received many literary awards, is known to write novels with a
 unique title. The other day, the title (of the novel) which the writer wrote as his next
 work was announced, and the mass media reported it.’

These data are indicative that the relation between the head noun and the gap is not purely syntactic. We claim that the relation is semantic, more specifically, metonymic. Metonymy is a cognitive function of using one entity to refer to another, based on various types of contiguity relations (Lakoff & Johnson 2003: 36). A classic example is *The kettle is boiling*, where *kettle* refers to the water inside the kettle, based on the relation THE CONTAINER FOR THE CONTENT. Another case is *Our restaurant doesn't hire longhairs*, where *longhairs* refers to persons with long hair, based on the relation THE PART FOR THE WHOLE.⁵

Our contention is that IGRs involve a metonymic relation. In (4), the head noun *shōsetsu-mē* ‘novel title’ is related to *shōsetsu* ‘novel’ based on the relation THE PART FOR THE WHOLE, provided that the title of a novel is a (conceptual) part of the novel. Another type of metonymic relation is pertinent to (14), where *osara* ‘plate’ is related to *ryōri* ‘meal’ based on the relation THE CONTAINER FOR THE CONTENT. In other examples, too, a metonymic relation may be posited between ‘hairstyle’ and ‘hair,’ between ‘menu’ and ‘meal,’ and so forth.⁶

The metonymy relation discussed here is not reducible to the ‘aboutness’ relation (Kuno 1973: Chapter 21). This point is worth considering since some scholars (e.g. Saito 1985: 291) hold that in Japanese head-external relatives, the head noun is tied to the relative clause through an aboutness relation (i.e. the head noun sets a theme about which the relative clause is construed). Given that a primary case of aboutness relations is topicalisation, if a metonymy relation were subsumed under aboutness relations, the topicalised version of an IGR should also be possible. Now, compare the IGR in (11) with its topicalised counterpart in (20).

- (20) **Sono rōdō-jinin-wa ibento-unē-o tantōshiteiru.*
 that work-human.number-TOP event-running-ACC take.care.of.IPFV
 Intended ‘As for the number of workers_i, they_i are in charge of the event running.’

⁵ The relation based on THE PART FOR THE WHOLE is sometimes considered synecdochical, but it is treated as metonymic in Lakoff & Johnson (2003: 36).

⁶ The establishment of a metonymic relation depends on various factors. For instance, the relation between ‘plate’ and ‘meal’ in (14) is based on the world knowledge that a customer of a restaurant may be expected to return a plate after eating the food on the plate. The present paper does not attempt to comprehensively enumerate such factors. I presume this requires substantive further work, as in the cases of head-internal relatives, for which a number of scholars have presented a formal analysis without delving into the Relevancy Condition (Kuroda 1992: 147), a semantic–pragmatic condition on the construction.

The topicalised item *sono rōdō-jinin* cannot be understood as the theme about which the rest of the sentence is interpreted. This suggests that the metonymy relation in IGRs cannot be equated with an aboutness relation.

We assume that the metonymic interpretation is a constructional property of IGRs. This is because if it were freely available, (21), for instance, would be interpretable as ‘The novel is interesting,’ contrary to fact.

- (21) *Sono shōsetsu-mē-ga omoshiroi.*
 that novel-title-NOM interesting
 ‘The title of the novel is interesting.’ (* with the reading ‘The novel is interesting.’)

The metonymic reading is also unavailable for other rightward-displacement constructions, such as clefts ((22)) and postposing ((23)); each example only allows the literal, absurd reading.

- (22) #*[Sono sakka-ga jikaisaku-toshite Ø kaita-no]-wa*
 [that writer-NOM next.work-as wrote-NMLZ]-TOP
kono shōsetsu-mē(-o)-da.
 this novel-title(-ACC)-COP
 ‘It is this novel’s title; that the writer wrote x_i as his next work.’⁷

- (23) #*Sono sakka-ga jikaisaku-toshite Ø kaita-yo,*
 that writer-NOM next.work-as wrote-FP
kono shōsetsu-mē(-o).
 this novel-title(-ACC)
 ‘The writer wrote x_i as his next work, this novel’s title.’⁸

One may suspect that (22)–(23) disallow a metonymic reading because the right-displaced item *shōsetsu-mē* itself is not predicated. Note, however, that an IGR is wholly acceptable even if the head noun itself is not predicated, as can be seen in (24).

- (24) *[Sono sakka-ga jikaisaku-toshite Ø kaita] kono shōsetsu-mē*
 [that writer-NOM next.work-as wrote] this novel-title
 ‘this novel;_i’s title, which the writer wrote x_i as his next work’

⁷ In Japanese clefts, a focus is optionally case-marked, and this brings syntactic consequences (Hoji 1990, Hiraiwa & Ishihara 2012). What is important here is that (22) is semantically anomalous whether the focus is case-marked or not. The presupposition clause is followed by *-no*; this item has been treated differently (possibly in connection with case-marking of a focus), such as a pronominal (Hoji 1990) and a complementiser/nominaliser (Kizu 2005). In Dynamic Syntax, *-no* in clefts is regarded as a nominaliser, regardless of whether a focus is case-marked (Seraku 2013: 130).

⁸ Japanese is verb-final, but a non-verbal item may appear to the right of the verb in colloquial register. In (23), the final particle *-yo* ensures that the sentence is uttered in casual speech. A postposed element is optionally case-marked, with corresponding syntactic differences (Takita 2014). As shown in (23), the sentence is semantically anomalous irrespective of the case-marking of the postposed element.

Except for (24), the examples of IGRs discussed thus far concern restrictive modification. Compared with head-external relatives, the interpretation of restrictive modification in IGRs is complex.⁹ Consider the head-external relative in (25) and the IGR in (26).

- (25) [[*Sono sakka-ga jikaisaku-toshite* Ø_i *kaita*]
[[that writer-NOM next.work-as wrote]
shōsetsu]-*ga shuppansareta*.
novel]-NOM was.published
'The novel which the writer wrote as his next work was published.'

- (26) [[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]
[[that writer-NOM next.work-as wrote]
shōsetsu-mē]-*ga happyōsareta*.
novel-title]-NOM was.announced
'The title of the novel which the writer wrote as his next work was announced.'

In (25), the relative clause restricts the set of novels to the set of novels which the writer wrote as his next work. In (26), the relative clause restricts the set of novels to the set of novels which the writer wrote as his next work, and the novels in the restricted set are metonymically mapped to their titles. An example of non-restrictive IGRs is presented in (27).

- (27) [[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]
[[that writer-NOM next.work-as wrote]
ano shōsetsu-mē]-*ga happyōsareta*.
that novel-title]-NOM was.announced
'The title of the novel, which the writer wrote as his next work, was announced.'

In (27), the relative clause provides supplementary information about the novel in question, and this novel is metonymically mapped to its title.

Restrictive and non-restrictive IGRs act differently with respect to the negator *no-de-wa-nai* 'It is not that ...'. In restrictive IGRs, the relative clause falls in the negation scope. In (28), the sole difference (except for the negator) between the two sentences concerns the subject of each relative clause. The initial sentence negates that the author is Ryū, an individual referred to by the subject NP of the relative clause. Thus, in restrictive IGRs, an element inside a relative clause may be the focus of the negator *no-de-wa-nai*.

- (28) [[*Ryū-ga* Ø *kaita*] *shōsetsu-mē*]-*ga zanshinna-no-de-wa-nai*.
[[*Ryū*-NOM wrote] novel-title]-NOM unique-NMLZ-COP-TOP-NEG
[[*Haruki-ga* Ø *kaita*] *shōsetsu-mē*]-*ga zanshinna-no-da*.
[[*Haruki*-NOM wrote] novel-title]-NOM unique-NMLZ-COP
'It is not that the title of the novel which Ryū wrote is unique. It is that the title of the novel which Haruki wrote is unique.' [restrictive]

In non-restrictive IGRs, the negator only targets the matrix clause.

⁹ Reviewer #3 suggested that it is up for debate whether the restrictive/non-restrictive distinction holds in Japanese relatives (see also Kempson & Kurosawa 2009: 67). In (28)–(29), we will observe that so-called restrictive and non-restrictive IGRs behave differently with respect to negation. The present paper concentrates on such syntactic/semantic differences, setting aside the issues of whether the so-called restrictive/non-restrictive distinction in Japanese relatives can be equated with the corresponding distinction in English and other languages.

- (29) #[[Ryū-ga Ø *kaita*] *ano shōsetsu-mē*]-ga
 [[Ryū-NOM wrote] that novel-title]-NOM
zanshinna-no-de-wa-nai.
 unique-NMLZ-COP-TOP-NEG
 [[Haruki-ga Ø *kaita*] *ano shōsetsu-mē*]-ga
 [[Haruki-NOM wrote] that novel-title]-NOM
zanshinna-no-da.
 unique-NMLZ-COP
 ‘It is not that the title of the novel_i, which Ryū wrote, is unique. It is that the title of the novel_i, which Haruki wrote, is unique.’ [non-restrictive]

If the negation scope contained a relative clause, the sequence in (29) would be felicitous. The fact that (29) is infelicitous suggests that the negator cannot take scope over a relative clause in non-restrictive IGRs.

Since Kuno (1973: 237–241), it has been widely assumed that head-external relatives in Japanese are island-insensitive; see Grosu & Hoshi (2018: Section 3.1) for a recent defence of this view. We observe that IGRs are also island-insensitive. Before considering relevant data, let us first note that IGRs allow a long-distance dependency, as can be seen in (30).

- (30) [[[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]-to
 [[that writer-NOM next.work-as wrote]-COMP
henshūsha-ga itteita] *shōsetsu-mē*]-ga *happyōsareta*.
 editor-NOM was.saying] novel-title]-NOM was.announced
 ‘The title of the novel which the editor was saying that the writer wrote as his next work was announced.’

Now, (31) shows that IGRs are not sensitive to the Complex NP. Constraint. In (31), the part in grey forms a complex NP. (I owe this example to an anonymous reviewer of *Natural Language & Linguistic Theory*.)

- (31) [[[[Ø; *jikaisaku-toshite* Ø *kaita*] *sakka*]_i]-ga *sono shō-no*
 [[[[next.work-as wrote] writer]_i]-NOM that award-GEN
kōho-dearu] *shōsetsu-mē*]-ga *happyōsareta*.
 candidate-COP] novel-title]-NOM was.announced
 ‘The title of the novel the writer of which is a candidate for that award was announced.’

Next, (32) indicates that IGRs are not sensitive to the Adverbial Island Constraint. In (32), the part in grey forms an adverbial clause.

- (32) [[*Sono sakka-ga* [*jikaisaku-toshite* Ø *kaite*]-kara]
 [[that writer-NOM [next.work-as write]-after
kyūshita] *shōsetsu-mē*]-ga *happyōsareta*.
 died.suddenly] novel-title]-NOM was.announced
 ‘After writing a novel as his next work, the writer died suddenly, and the title of this novel was announced.’

We have described IGRs in Japanese, revealing their metonymic nature as well as other syntactic and semantic properties. Their empirical and theoretical implications will be discussed in the next subsection.

2.2. Implications

To the best of the author's knowledge, IGRs have not been documented in the literature. In Japanese syntax and semantics, various types of relatives have been identified, including pseudo relatives (Inoue 1976), head-internal relatives (Kuroda 1992), change relatives (Tonosaki 1998), *no/de*-introduced relatives (Hiraiwa 2012), doubly headed relatives (Erlewine & Gould 2016), and so forth. These types of relatives syntactically differ from IGRs in terms of the presence of a gap and/or the position of a head noun. Also, IGRs are unique in always evoking a metonymy-based interpretation. For instance, IGRs are distinguished from pseudo relatives, such as (33) in several respects.¹⁰

- (33) *Daigakusē-wa* [[*atama-ga yoku-na-ru*]
college.student-TOP [[head-NOM better-become-PRS]
hon]-*o* *motto yomu-beki-da*.
book]-ACC more read-should-COP
'College students should read more books such that (one's) mind improves (if one reads them).' (Grosu & Hoshi 2016: 4)

Pseudo relatives are similar to IGRs in that the head noun is outside the relative clause and that their interpretations involve pragmatic bridging, such as 'if one reads them' in (33). Unlike IGRs, however, pragmatic bridging in pseudo relatives is not limited to metonymy-based inferences, and it does not need to be represented as a syntactic gap of some kind. Moreover, unlike IGRs (see (22)–(23)), cleft and postposing sentences may be constructed based on pseudo relatives. For instance, (34) is a cleft counterpart of the pseudo relative in (33). As in the case of (33), the interpretation of (34) involves non-metonymic pragmatic bridging.

- (34) [*Atama-ga yoku-na-ru-no*]-*wa* *kono hon-da*.
[brain-NOM good-become-PRS-NMLZ]-TOP this book-COP
'It is this book that (one's) mind improves (if one reads it).'

Also, it will be suggested in Section 6 that IGRs do not exist in languages where the head noun precedes a relative clause. By contrast, pseudo relatives are attested in such languages (see the English translation in (33)). The present paper does not analyse pseudo relatives; see Kurosawa (2002: 326–328) for a Dynamic Syntax account of pseudo relatives.

An IGR interpretation, however, is possible with free relatives (Itô 1986). In free relatives, the relative clause is followed by *no*, which I assume is a pronominal (Grosu & Hoshi 2016: 3). As illustrated in the second clause in (35), the IGR reading is allowed when the head position is occupied by *no*.¹¹

- (35) [[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]
[[that writer-NOM next.work-as wrote]
shōsetsu-mē]-*wa* *nagai-ga* [[*kono sakka-ga*
novel-title]-TOP long-but [[this writer-NOM

¹⁰ Reviewers #1 and #3 are thanked for directing my attention to the present point. In particular, the cross-linguistic consideration of pseudo relatives is owed to Reviewer #1.

¹¹ I wish to thank an anonymous reviewer of *Natural Language & Linguistic Theory* for bringing this point to my attention.

jikaisaku-toshite Ø *kaita*] *no*]-*wa* *mijikai*.
 next.work-as wrote] one]-TOP short

‘The title of the novel which that writer wrote as his next work is long, but the title of the novel which this writer wrote as his next work is short.’

Relatives have also been extensively examined in Japanese descriptive grammars, where a series of studies by Hideo Teramura (1975–1978, 1980) stand out. His insight has taken a new turn in typological research in the light of the General Noun-Modifying Clause Construction (GNMCC). Matsumoto et al. (2017) suggest that many Eurasian languages possess a uniform construction covering a broad range of clausal noun-modifiers. A typical GNMCC-language is Japanese, where the single noun-modifying structure covers what are standardly called *relative clauses*, *appositive clauses*, etc. (Matsumoto 2017). In this view, IGRs would fall in the domain of GNMCC.¹² This characterisation may attain uniformity in grammar descriptions, but it blurs the distinctions between IGRs and other noun-modifying structures. For instance, IGRs involve a gap, but appositive clauses do not.

From a different perspective, IGRs may be construed as a type of ‘filler-gap mismatch’ constructions (Bouma et al. 2001, Borsley 2015, Bresnan et al. 2015).

(36) *That he might be wrong, he didn't think of* _____. (Borsley 2015: 996)

(37) **He didn't think of that he might be wrong.*

In the filler-gap dependency environment in (36), *think of* selects a *that*-clause, but it normally does not license a clausal complement, as shown in (37). In the case of IGRs, the non-relative version of an IGR is not ungrammatical but semantically inappropriate. This has been shown in (3) and repeated here as (38).

(38) †*Sono sakka-ga jikaisaku-toshite shōsetsu-mē-o kaita.*
 that writer-NOM next.work-as novel-title-ACC wrote
 ‘The writer wrote the title of a novel as his next work.’

IGRs may then be treated as a semantic variant of filler-gap mismatches. Still, the construction has not been described in the literature on filler-gap dependencies, either.

The description of IGRs thus constitutes the empirical findings of the present study. Since (i) the data are new and (ii) relative constructions are a central topic in diverse syntactic theories, a question emerges: *in what framework we approach the data*. In this paper, we adopt Dynamic Syntax (DS; Kempson et al. 2001, Cann et al. 2005). There are two primary reasons for this.

First, DS is a parsing-oriented formalism; a structure is incrementally built up based on left-to-right parsing. This incremental process of structure building deals with a wide range

¹² In her earlier (1997) work, Matsumoto cites (ii) below, stating that the relation between the embedded subject and the head noun is ‘metonymical’ because the denotation of *te* ‘hand’ and the body are in a part–whole relation. As far as I see, she only cites two examples of this type (Matsumoto 1997: 132) and does not describe their syntactic properties, let alone provide a formal analysis.

(ii) [[*Nuimono-o suru*] *te*]-*mo yasume-nai.*
 [[sewing-ACC do] hand]-also rest-NEG
 ‘(She) does not rest (her) hand that is sewing.’ (Matsumoto 1997: 132)

of IGR data. To mention a few, the difference between restrictive and non-restrictive IGRs with respect to negation can be reduced to the timing at which a certain structure-building action (i.e. LINK-evaluating action) is executed (see Section 4). Incremental structure building in DS also accounts for why IGR interpretations are not available for clefts and postposing constructions (see Section 5) and predicts that IGRs are possible only in languages with pre-nominal relative clauses (see Section 6). Another important theoretical feature of DS is that the representations are semantic. They are thus well suited to express metonymic relations.

Second, the previous analyses of relatives in DS are straightforwardly applicable to IGRs, with a minimum enrichment of the structure-building rules established in the literature. As will be illustrated in Section 3, relative constructions of all sorts are analysed based on two types of structure-building rules: (i) to introduce a structure related to a pre-existing structure and (ii) to interpret the relation between these structures. In Section 4, the rule of type (i) for head-external relatives is used for IGRs without any modifications. We need to formulate rules of type (ii) for IGRs, but they minimally differ from the rules for head-external relatives, *minimally* in that their sole difference pertains to the presence of a metonymic relation. The rules are otherwise identical, and they are uniformly definable (see the Appendix), capturing syntactic parallelisms between head-external relatives and IGRs (e.g. island-insensitivity).

On these grounds, the present paper adopts DS as the theoretical scaffolding. It remains to be seen how the data are handled within other frameworks, including not only the mainstream generative theories but also other frameworks such as Head-Driven Phrase Structure Grammar (e.g. Sag et al. 2003) and Lexical-Functional Grammar (e.g. Bresnan et al. 2015). Alternative analyses will have to not only capture a variety of restrictive and non-restrictive IGR data but also explain (i) why IGR readings are not possible with right-displacement constructions other than relatives (i.e. clefts, postposing) and (ii) why IGRs seem to be possible only in languages where a relative clause precedes the head noun. Such alternative approaches will then have to be carefully compared with the DS approach, both empirically and theoretically.¹³

3. Framework

3.1. Basic machinery

DS is a grammar formalism which explicates the ways a string of words is incrementally parsed and mapped to a semantic structure. This mapping process is direct in that no

¹³ Reviewer #1 kindly outlined an analysis of IGRs in the mainstream generative framework. The analysis hinges on examples, such as (i) in footnote 4 (which is judged acceptable by the consultant of Reviewer #1). In this analysis, which is partly informed by Moulton & Shimoyama (2019: Section 5.3), the gap (with a null case marker/postposition) directly corresponding to the head noun is posited in the relative clause, and the structure is licensed just in case the metonymy condition is satisfied. The reviewer also suggested that (i) the cleft/postposing data in Section 5 may follow if one delves into the metonymy condition and posits appropriate constraints on it and that (ii) the cross-linguistic data in Section 6 may be addressed from a processing point of view. The details of the suggested analysis are left out here; see also Section 7 for prospective topics for formal studies on the metonymy condition, which were also raised by Reviewer #1. I would like to develop the suggested account (as well as other possible alternative accounts in non-mainstream frameworks) and compare them with the DS account in future work. I am grateful to Reviewer #1 for these valuable suggestions.

intermediate level of syntactic representation is hypothesised (Kempson et al. 2001, 2011, 2016, Cann et al. 2005, Howes & Gibson 2021).

A DS structure is represented as a binary-branching semantic tree. To illustrate, the left-to-right parse of (39) gradually builds up a tree in the manner indicated in (40).

(39) *Naomi-ga ki-ta.*
 Naomi-NOM come-PST
 ‘Naomi came.’

(40) (a) Initial state

?t, ◇

(b) Parsing *Naomi-ga*

?t
 /
Naomi' : e, ◇

(c) Parsing *Naomi-ga ki-*

?t, ◇
 / \
Naomi' : e *come'* : e→t

(d) Final state (ignoring tense)

come'(Naomi') : t, ◇
 / \
Naomi' : e *come'* : e→t

A final state varies depending on what string of words is parsed in what context, but the initial state is always set out as (40a). In each tree-state, the node under development is designated by ◇, and each tree-update is motivated by a ‘requirement’. In (40a), only a single node exists, and it is annotated with ?t, a requirement that this node will be decorated with semantic content of type t. As in standard semantic theories, two basic types are defined: ‘t’ for the type of truth-evaluable content and ‘e’ for the type of entities. Complex types include ‘e→t’, the type of functions that take type-e content and return type-t content. In (40), *Naomi'* is of type e, *come'* is of type e→t, and *come'(Naomi')* is of type t. Note that the DS structures are semantic; *Naomi'* and *come'* are thus not natural-language content.

In DS, three types of tree-update actions are distinguished:

- **Lexical action:** Every word (or morpheme) lexically encodes a set of actions. The parse of a word obligatorily triggers the execution of its encoded actions.
- **Computational action:** Computational actions are not lexically encoded. A parser may run a computational action at any time as long as its input conditions hold at the tree state.
- **Pragmatic action:** Pragmatic actions are also not encoded in words and may be run as long as the input conditions are satisfied. Unlike computational actions, pragmatic actions make reference to contextual (possibly non-linguistic) information.

Execution of lexical actions is obligatory, whilst that of computational and pragmatic actions is optional. That is, a sequence of lexical actions is interspersed with computational and pragmatic actions at the parser’s discretion.

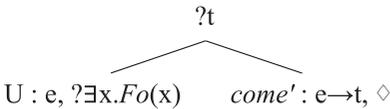
Lexical actions are particularly essential for Japanese due to its pro-drop nature; a single verb may form a complete sentence on its own, as in (41).

(41) *Ki-ta.*

come-PST

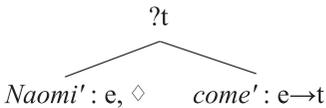
'(Naomi) came.' (uttered in a context where Naomi came)

A verb is then assumed to encode the lexical actions to build a schematic propositional structure, with the argument nodes decorated with a 'meta-variable', which acts as a temporary label until its value (i.e. semantic content) is assigned. In this way, though covert elements such as *pro* are not postulated, tree nodes may be inhabited by slot-holding meta-variables that will be assigned a value by the time structure building is completed. In (41), the actions encoded in *ki-* 'come' update the initial state in (40a) into (42).

(42) Parsing *Ki-*

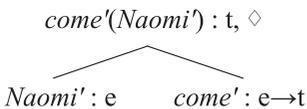
U is a meta-variable, and $?\exists x.Fo(x)$ requires that this meta-variable will be assigned a value (see the [Appendix](#) for the predicate *Fo*). Since the DS framework is 'non-encapsulated' (Cann et al. 2005: 377), non-linguistic information is available for building a tree. In the context where Naomi came, the parser may assign the value *Naomi'* to the meta-variable *U*. This action, called SUBSTITUTION, is an instance of pragmatic actions.

(43) SUBSTITUTION



As the execution of pragmatic actions is optional, the parser is not forced to run SUBSTITUTION at this stage. Still, if the parser did not run it here, the requirement $?\exists x.Fo(x)$ would remain in the tree, and the tree update would crash. In (43), the daughter nodes are specified for content and a type. This means that the content-type pair at the root node can be computed by means of functional application and type deduction. This process, called ELIMINATION, is an instance of computational actions.

(44) ELIMINATION



As computational actions are optional, the parser does not have to run ELIMINATION here. But if it were not run, the requirement $?t$ would remain in the tree, and the tree update would crash.

In general, the parse of a word sequence is successful when it reaches a 'well-formed' tree. A tree is well-formed if no requirements remain in the tree, as in (44). In DS, parsability is related to 'grammaticality': a word sequence is grammatical if there exists a parse route that maps the word string onto a well-formed tree. According to this notion of grammaticality, the word sequence in (41) is said to be grammatical because it can be mapped onto the well-formed tree in (44).

3.2. Head-external relatives

As a theoretical basis for analysing IGRs, let us illustrate how DS treats head-external relatives (Kurosawa 2003, Cann et al. 2005, Kempson & Kurosawa 2009, Seraku 2013). To this end, the basic machinery set out above must be enriched with further mechanisms.

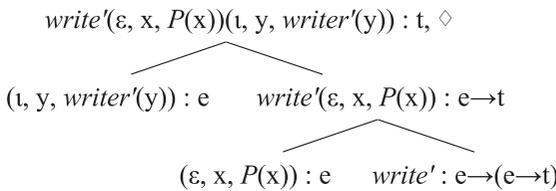
First, type-e terms are expressed as a triple of an operator, a variable, and a restrictor in the epsilon calculus. For indefinite reference, *a man* is expressed as $(\epsilon, x, man'(x))$ with the epsilon operator ϵ . This term picks out some element of the set denoted by the restrictor *man'*. For proper names, the iota operator ι , which models Russellian uniqueness, is employed, as in $(\iota, x, Naomi'(x))$.

Second, we introduce 'LINK', a structure-pairing device based on a shared type-e item. LINK has been utilised for various constructions, including relatives and clefts. For illustration, consider the head-external relative in (45).

- (45) *[[Sono sakka-ga \emptyset_i kaita] shōsetsu]-ga shuppansareta.*
 [[that writer-NOM wrote] novel]-NOM was.published
 'The novel which the writer wrote was published.'

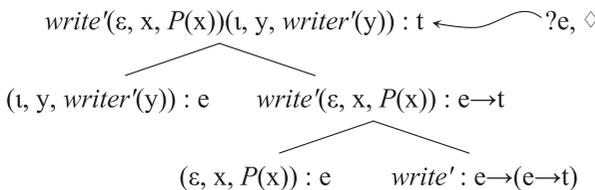
The parse of the relative clause yields (46), where $(\epsilon, x, P(x))$ is a 'gap' term with a maximally abstract predicate *P* (Kempson & Kurosawa 2009: 65).

- (46) Parsing *Sono sakka-ga kaita* (ignoring tense)



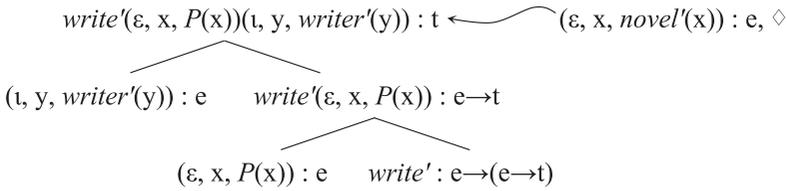
This structure is then LINKed to a type-e-requiring node, as in (47). The introduction of LINK is formulated as the computational action of LINK ADJUNCTION (see [4] in the Appendix).

- (47) LINK ADJUNCTION



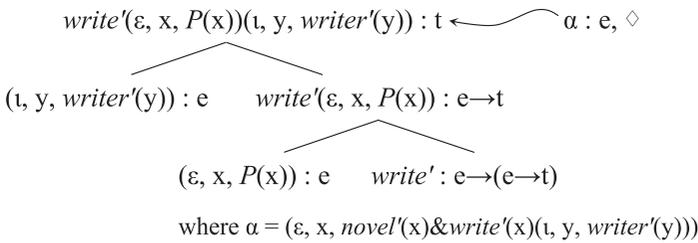
LINK ADJUNCTION is a general rule for launching a LINK relation, used for both head-external relatives and IGRs. The LINKed node is suitable for parsing the head noun *shōsetsu* 'novel', as shown in (48). (LINK ADJUNCTION is an optional rule, but if it is not run, a type-e-requiring node is not created, and the head noun cannot be processed.)

(48) Parsing *Sono sakka-ga kaita shōsetsu*



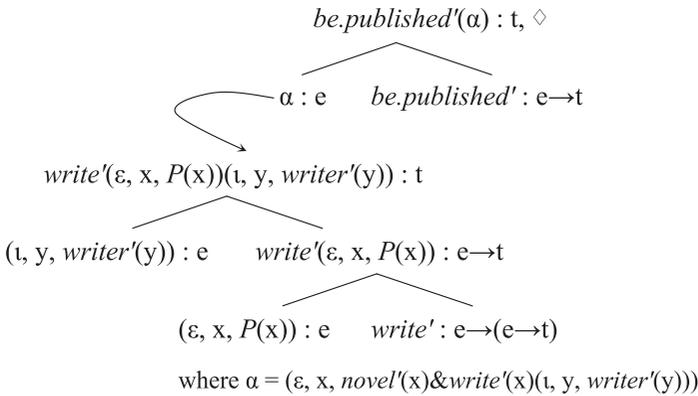
To ensure that the head noun is modified by the relative clause, the content of the relative clause is reflected in that of the head noun. This process is formulated as the computational action of LINK EVALUATION (see [5] in the Appendix).

(49) LINK EVALUATION



The composite term α correctly denotes the novel which the writer wrote. The current node will then be identified as the subject node by *-ga* and become the argument of *shuppansareta* ‘was published.’¹⁴ Finally, ELIMINATION (i.e. functional application, type deduction) gives rise to the tree state in (50).

(50) Parsing the whole string in (45) + ELIMINATION



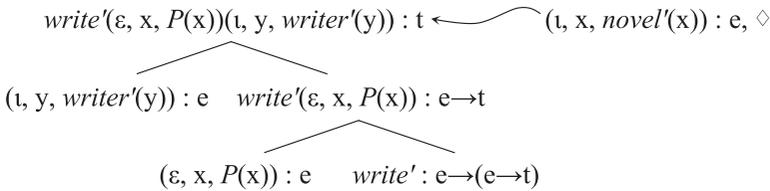
(45) is a case of restrictive relatives. (51) illustrates its non-restrictive counterpart.

¹⁴ The nominative particle *-ga* may mark an object NP in certain environments; see Seraku (2021) for a uniform account of subject and object NPs marked by *-ga*. Also, passives are not analysed here; see Cann (2011) and Marten & Gibson (2016).

- (51) [[*Sono sakka-ga* \emptyset_i *kaita*] ***ano shōsetsu***]*-ga shuppansareta*.
 [[that writer-NOM wrote] that novel]-NOM was.published
 ‘That novel, which the writer wrote, was published.’

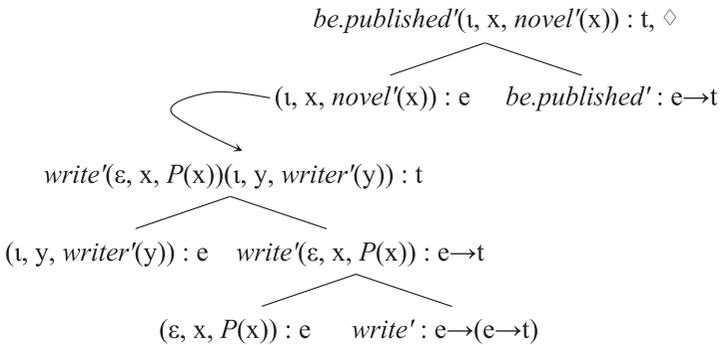
As in restrictive relatives, LINK ADJUNCTION creates a LINKed node, and it is decorated by the head NP *ano shōsetsu*. At this point, the tree state in (52) emerges (cf. (48)).

- (52) Parsing *Sono sakka-ga kaita ano shōsetsu*



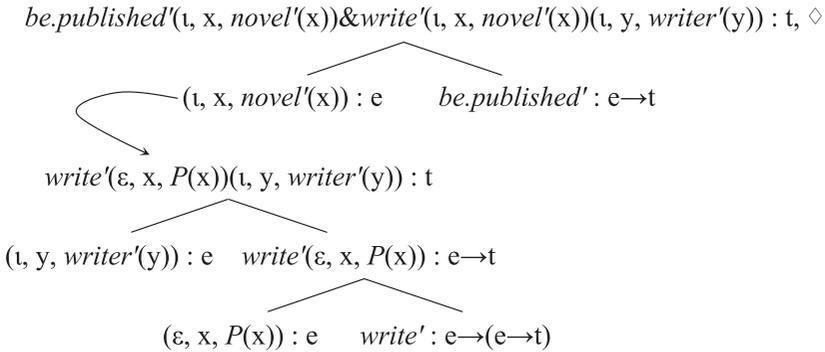
In the case of restrictive relatives, LINK EVALUATION was applied here (i.e. immediately after the head NP is parsed; see (48)–(49)). In the case of non-restrictive relatives, however, the parse proceeds; the current node, marked with \diamond in (52), is specified as the subject node by *-ga* and becomes the argument of *shuppansareta* ‘was published’. The tree state after ELIMINATION is presented in (53).

- (53) Parsing the whole string in (51) + ELIMINATION



It is at this stage (i.e. after the matrix structure is fully developed) that the LINK relation for non-restrictive relatives is evaluated. This is achieved by LINK EVALUATION_(NON-REST) (Cann et al. 2005: 92; cf. Kempson & Kurosawa 2009: 67) (see [8] in the Appendix). Its effect is to conjoin the proposition of the relative clause and that of the matrix clause. In the conjoined proposition, the gap term $(\varepsilon, x, P(x))$ has been replaced with the term for the head NP.

(54) LINK EVALUATION_(NON-REST)



In sum, DS formalises the dynamic, time-linear update of interpretation, modelled as an incremental growth of a semantic tree based on lexical, computational, and pragmatic actions. The tree may involve paired structures, introduced and interpreted by LINK.

4. Account

This section proposes a simple account of IGRs within DS, *simple* in that we only need to define variants of LINK EVALUATION. LINK consists of two actions: (i) to launch a LINK relation and (ii) to evaluate it. We use the same action of type (i) for IGRs and head-external relatives, with their differences reduced to minimally different specifications of the actions of type (ii).

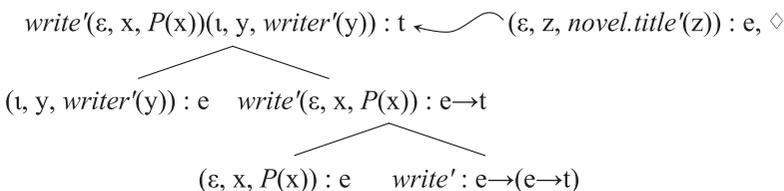
4.1. Restrictive IGRs

First of all, consider the example of IGRs in (2), repeated here as (55).

- (55) [[*Sono sakka-ga jikaisaku-toshite* Ø *kaita*]
 [[that writer-NOM next.work-as wrote]
shōsetsu-mē]-ga *happyōsareta*.
 novel-title]-NOM was.announced
 ‘The title of the novel which the writer wrote as his next work was announced.’

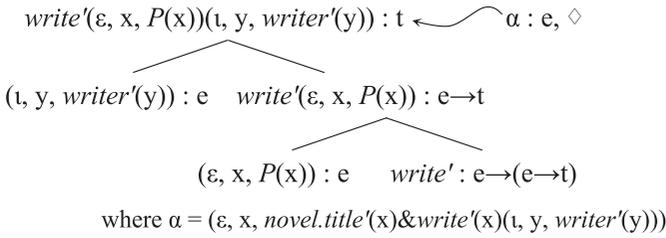
The parse of the relative clause engenders a structure where the gap is expressed as (ε, x, P(x)). Then, LINK ADJUNCTION introduces a type-e-requiring node, on which the head noun *shōsetsu-mē* ‘novel title’ is parsed. At this stage, the tree in (56) emerges (disregarding *jikaisaku-toshite* ‘as his next work’ for the sake of simplicity).

(56) Parsing *Sono sakka-ga (jikaisaku-toshite) kaita shōsetsu-mē*



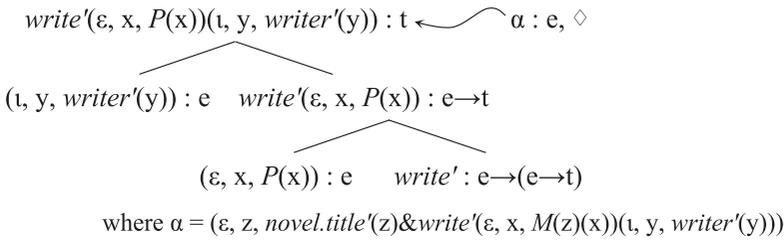
Thus far, the parse has been identical to that for the head-external relative in (45). Since computational actions are optional, the parser could execute LINK EVALUATION, as in (57).

(57) LINK EVALUATION



This tree is legitimate, but it only models the absurd reading in which the writer wrote the title of a novel (rather than a novel itself) as his next work. To capture the IGR reading, we define a variant of LINK EVALUATION: LINK EVALUATION_(IGR). This action, which updates (56) to (58), introduces a term with a metonymy predicate *M*.

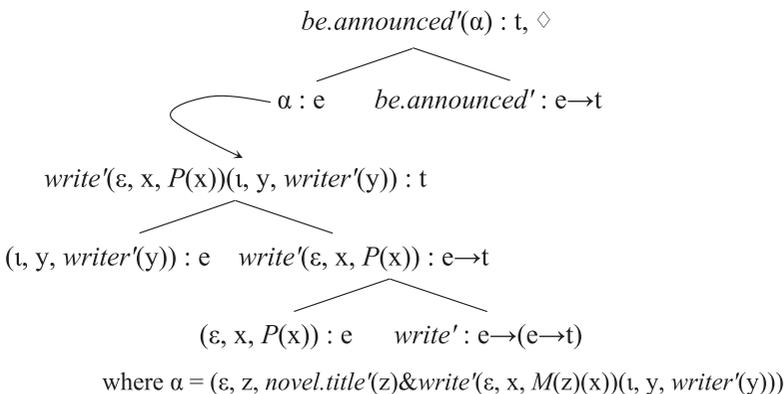
(58) LINK EVALUATION_(IGR)



M is a two-place relation; *x* (a variable in the gap position) stands in a metonymy relation (e.g. whole–part relation) to *z* (a variable restricted by *novel.title'*). (As mentioned in footnote 6, it is a residual issue to define a possible range of metonymy relations and flesh out the predicate *M*.) In (58), α denotes an entity *z*, such that (i) *z* is a novel title and (ii) *z* is metonymically related to *x*, such that the writer wrote *x*. That is, LINK EVALUATION_(IGR) outputs a composite term based on (i) the head noun and (ii) the relative clause, with the gap term being replaced with a term denoting an entity metonymically related to the content of the head noun.

The rest of the process is as usual. The current node in (58) is identified as the subject node by *-ga* and selected by the matrix predicate *be.announced'*. Finally, ELIMINATION (i.e. functional application, type deduction) outputs the tree state in (59).

(59) Parsing the whole string in (55) + ELIMINATION



The current node is decorated with the formula representing the propositional content of (55): ‘The title of the novel which the writer wrote (as his next work) was announced.’

The analysis illustrated in (58)–(59) might look complicated, but what is newly proposed is only a variant of LINK EVALUATION, an action independently motivated in previous studies. As in the case of LINK EVALUATION, LINK EVALUATION_(IGR) produces a term reflecting the content of the head noun and that of the relative clause. Their difference lies in the treatment of a gap term. Unlike LINK EVALUATION, LINK EVALUATION_(IGR) adds a metonymy predicate *M*, so that the embedded predicate selects as its argument a term denoting an entity metonymically related to the content of the head noun, rather than the content of the head noun itself. LINK EVALUATION and LINK EVALUATION_(IGR) are uniformly defined in [7] in the Appendix.

This LINK-based analysis accounts for why the metonymic interpretation does not obtain for non-relative examples such as (60) (= (21)).

- (60) *Sono shōsetsu-mē-ga omoshiroi.*
 that novel-title-NOM interesting
 ‘The title of the novel is interesting.’ (* with the reading ‘The novel is interesting.’)

In our analysis, a metonymic reading arises through the evaluation of a LINK relation. In (60), *shōsetsu-mē* is not parsed on a LINKed node, and LINK EVALUATION_(IGR) cannot be applied.

The analysis also models that the head noun is not directly modified by the relative clause. In the IGR in (55), what is restricted is the set of novels, not the set of novel titles. This is indeed what we find in the term *a* in (59); the embedded predicate *write'* selects as its internal argument ($\epsilon, x, M(z)(x)$), a term denoting a novel, not the title of a novel.

The introduction of a metonymy predicate is also relevant to the free-relative counterpart of IGRs. Consider the second clause in (61) (= (35)).

- (61) [[*Sono sakka-ga jikaisaku-toshite* \emptyset *kaita*]
 [[that writer-NOM next.work-as wrote]
shōsetsu-mē]-*wa* *nagai-ga* [[*kono sakka-ga*
 novel-title]-TOP long-but [[this writer-NOM
jikaisaku-toshite \emptyset *kaita*] *no*]-*wa* *mijikai.*
 next.work-as wrote] one]-TOP short
 ‘The title of the novel which that writer wrote as his next work is long, but the title of the novel which this writer wrote as his next work is short.’

As usual, LINK ADJUNCTION is executed after the parse of the relative clause. I assume that the pronominal *no* in (61) puts a meta-variable at the LINKed node. This meta-variable is updated (i.e. SUBSTITUTION) into ($\epsilon, z, novel.title'(z)$), provided that *no* is interpreted with respect to *shōsetsu-mē* ‘novel title’ in the preceding clause.

- (62) Parsing *kono sakka-ga (jikaisaku-toshite) kaita no* + SUBSTITUTION
- $$write'(\epsilon, x, P(x))(t, y, writer'(y)) : t \leftarrow (\epsilon, z, novel.title'(z)) : \epsilon, \diamond$$
- $$\begin{array}{c} \swarrow \quad \searrow \\ (t, y, writer'(y)) : \epsilon \quad write'(\epsilon, x, P(x)) : \epsilon \rightarrow t \\ \swarrow \quad \searrow \\ (\epsilon, x, P(x)) : \epsilon \quad write' : \epsilon \rightarrow (\epsilon \rightarrow t) \end{array}$$

Then, LINK EVALUATION_(IGR) is applied, creating a term with a metonymy predicate *M*, namely, the term α in (58). This term denotes the title of the novel which the writer wrote.

Finally, our analysis models the island-insensitivity of IGRs as well as head-external relatives. For these constructions, the same computational action, LINK ADJUNCTION, is used. As defined in [4] of the Appendix, one of its input conditions is $\langle D \rangle (Fo(\alpha))$. $\langle D \rangle$ is a tree-node operator allowing the parser, which looks for a gap term, to look inside the structure of a syntactic island. In DS, a complex NP and an adverbial clause are analysed to involve a LINK relation, and any element within a LINKed structure is visible to the parser due to the operator $\langle D \rangle$ (Cann et al. 2005: 145). Therefore, IGRs and head-external relatives are island-insensitive.

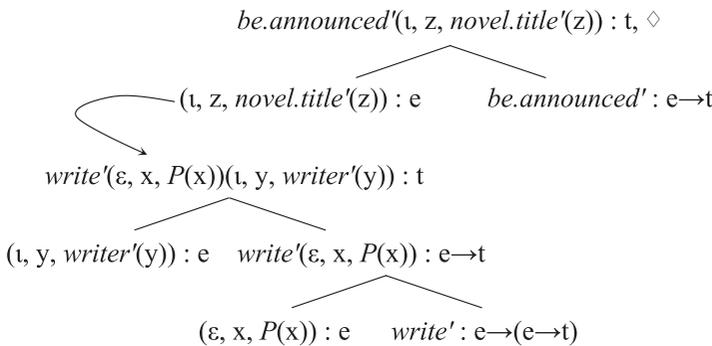
4.2. Non-restrictive IGRs

Let us turn to non-restrictive cases, such as (63) (= (27)).

- (63) [[*Sono sakka-ga jikaisaku-toshite* \emptyset *kaita*]
 [[that writer-NOM next.work-as wrote]
ano shōsetsu-mē]-ga *happyōsareta*.
 that novel-title]-NOM was.announced
 ‘The title of the novel, which the writer wrote as his next work, was announced.’

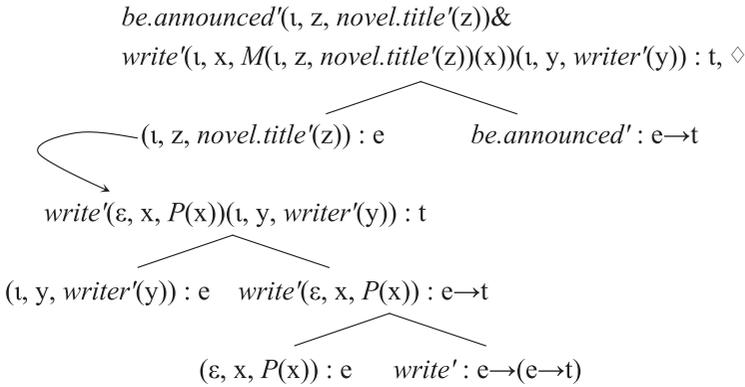
To account for the IGR in (63), we define LINK EVALUATION_(IGR_NON-REST), a variant of LINK EVALUATION_(NON-REST). This action is also executed after the matrix clause is parsed (cf. (54)); (64) displays the tree state immediately before this action is applied.

- (64) Parsing the whole string in (63)



As illustrated in (65), LINK EVALUATION_(IGR_NON-REST) conjoins the proposition of the matrix clause with that of the relative clause where a metonymy predicate *M* is introduced.

(65) LINK EVALUATION_(IGR_NON-REST)



The term $(t, x, M(t, z, novel.title'(z))(x))$ metonymically refers to the novel in question. This analysis of non-restrictive IGRs differs from the standard DS analysis of non-restrictive head-external relatives solely in terms of a metonymy predicate. LINK EVALUATION_(NON-REST) and LINK EVALUATION_(IGR_NON-REST) are uniformly defined in [10] in the Appendix.

LINK EVALUATION_(IGR_NON-REST) is run after the matrix clause is processed, whilst LINK EVALUATION_(IGR) is run after the head noun is processed. This difference in the timing of action-running models the restrictive/non-restrictive distinction with respect to negation. Consider the non-restrictive IGRs in (66) (= (29)).

- (66) #[[Ryū-ga ∅ kaita] **ano shōsetsu-mē**]-ga
 [[Ryū-NOM wrote] that novel-title]-NOM
zanshinna-no-de-wa-nai.
 unique-NMLZ-COP-TOP-NEG
 [[Haruki-ga ∅ kaita] **ano shōsetsu-mē**]-ga
 [[Haruki-NOM wrote] that novel-title]-NOM
zanshinna-no-da.
 unique-NMLZ-COP

‘It is not that the title of the novel_i, which Ryū wrote, is unique. It is that the title of the novel_i, which Haruki wrote, is unique.’ [non-restrictive]

In the first sentence, LINK EVALUATION_(IGR_NON-REST) is run after the matrix clause (including the negator) is parsed. Before the action is run, the top node of the matrix structure is decorated with the annotations in (67) (cf. (64)).

- (67) After the whole string in the first sentence in (66) is parsed
 $\neg unique'(t, z, novel.title'(z)) : t, \diamond$

The negator only applies to the proposition of the matrix clause. LINK EVALUATION_(IGR_NON-REST) conjoins this negated proposition with the (non-negated) proposition of the relative clause. This is why the relative clause does not fall in the negation scope in non-restrictive-IGRs.

In restrictive IGRs, LINK EVALUATION_(IGR) is run before the negator is parsed. Consider the restrictive IGRs in (68) (= (28)).

- (68) [[Ryū-ga Ø *kaita*] *shōsetsu-mē*]-ga *zanshinna-no-de-wa-nai*.
 [[Ryū-NOM wrote] novel-title]-NOM unique-NMLZ-COP-TOP-NEG
 [[Haruki-ga Ø *kaita*] *shōsetsu-mē*]-ga *zanshinna-no-da*.
 [[Haruki-NOM wrote] novel-title]-NOM unique-NMLZ-COP
 ‘It is not that the title of the novel which Ryū wrote is unique. It is that the title of the novel which Haruki wrote is unique.’ [restrictive]

In the first sentence, LINK EVALUATION_(IGR) is run after the head noun *shōsetsu-mē* ‘novel title’ is parsed. Therefore, by the time the negator is parsed, the top node of the matrix structure has been decorated with the proposition reflecting the relative clause, as can be seen in (69) (cf. (59)).

- (69) After *zanshinna* ‘unique’ in the first sentence in (68) is parsed
unique'(α) : t, \diamond
 where $\alpha = (\epsilon, z, novel.title'(z) \& write'(\epsilon, x, M(z)(x))(t, y, Ryū'(y)))$

The negator, once parsed, will take scope over the proposition in (69), which itself reflects the propositional content of the relative clause. This is why the relative clause falls in the negation scope in restrictive IGRs.

4.3. Summary

We have developed a uniform account of head-external relatives and IGRs by defining variants of LINK-evaluating rules, which have been independently proposed in extant studies (e.g. Cann et al. 2005, Kempson & Kurosawa 2009). The ensuing sections will look at a broader picture: Section 5 will be devoted to non-relative rightward-displacement constructions in Japanese, and Section 6 to IGR-comparable data in several languages beyond Japanese.

5. Cross-constructional consideration

In this section, we show that our analysis of IGRs, together with the independently motivated DS machinery, accounts for why a metonymy reading is unavailable in non-relative rightward-displacement constructions in Japanese: postposing and clefts.¹⁵

5.1. Postposing

(23) is repeated here as (70).

- (70) #*Sono sakka-ga jikaisaku-toshite* Ø *kaita-yo*,
 that writer-NOM next.work-as wrote-FP
kono shōsetsu-mē(-o).
 this novel-title(-ACC)
 ‘That writer wrote x_i as his next work, this novel’s title _{i} .’

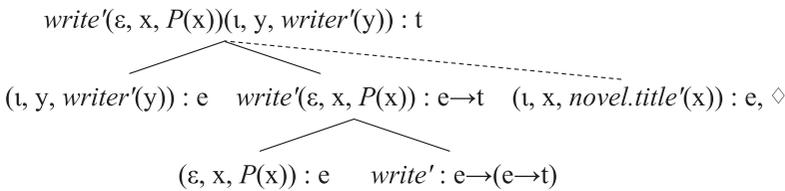
(70) is grammatical but semantically inappropriate. If the postposed item *shōsetsu-mē* ‘novel title’ is replaced with *shōsetsu* ‘novel,’ as in (71), the resulting sentence is grammatical and interpreted appropriately.

¹⁵ In preparing for this section, I benefitted from several helpful comments provided by an anonymous reviewer of *Natural Language & Linguistic Theory*.

(71) *Sono sakka-ga jikaisaku-toshite Ø kaita-yo,*
 that writer-NOM next.work-as wrote-FP
kono shōsetsu(-o).
 this novel(-ACC)
 ‘That writer wrote x_i as his next work, this novel._i’

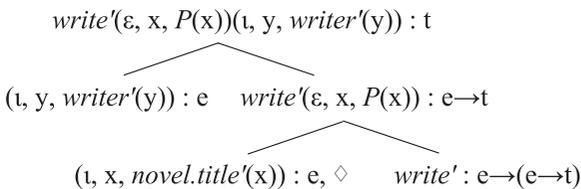
Seraku & Ohtani (2016) present a DS treatment of Japanese postposing, according to which the postposed item *shōsetsu-mē* in (70) is parsed on an ‘unfixed’ node (see also Cann et al.’s (2005: 524) FINAL-*ADJUNCTION). In DS, the position of a node in a tree may be initially underspecified and fixed subsequently (Cann et al. 2005: 59–67).

(72) Parsing the whole string in (70) except for the accusative *-o*



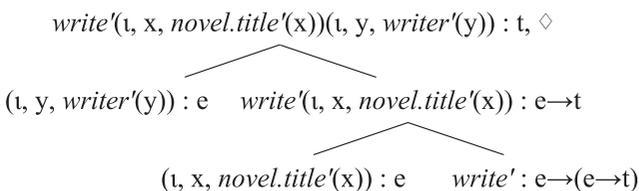
The dashed line indicates that the position of the node is underspecified. There are two ways in which this underspecification is resolved, depending on whether the postposed element is case-marked. If the accusative case *-o* is present, the parser runs its lexical actions, which resolve the unfixed node in the object position. If the accusative case *-o* is absent, the parser may execute the computational action of UNIFICATION, which merges the unfixed node with the object node. In either way, the unfixed node is identified as the object node.

(73) Parsing the whole string in (70) (+ UNIFICATION)



After ELIMINATION (i.e. functional application, type deduction) is applied, the final state in (74) emerges. This tree models the anomalous reading of (70).

(74) ELIMINATION



In the tree-update processes above, a metonymic predicate cannot be introduced. First, it is held that the function of case markers is purely structural: to resolve an unfixed node (Cann

et al. 2005: Section 6.2.1). Thus, they cannot introduce content-related decorations (such as a metonymy predicate). Second, UNIFICATION is a general action which simply merges two nodes, and it cannot be manipulated to add decorations. Our analysis, therefore, captures only the literal, absurd interpretation of (70).

In the case of (71), the postposed item *shōsetsu* ‘novel’ is parsed on an unfixed node. The resulting tree is identical to (74), except that all instances of $(t, x, \text{novel.title}'(x))$ are replaced with $(t, x, \text{novel}'(x))$. This tree correctly represents the interpretation of (71): ‘That writer wrote x_i as his next work, this novel_{*i*}.’

5.2. Clefts

Essentially the same form of analysis is applicable to clefts. Consider (75) (= (22)).

- (75) #[*Sono sakka-ga jikaisaku-toshite* Ø *kaita-no*]-*wa*
 [that writer-NOM next.work-as wrote-NMLZ]-TOP
kono shōsetsu-mē(-o)-da.
 this novel-title(-ACC)-COP
 ‘It is this novel’s title_{*i*} that the writer wrote x_i as his next work.’

(75) is grammatical but semantically anomalous. Compare (75) with (76), where the focus *shōsetsu-mē* ‘novel title’ has been replaced with *shōsetsu* ‘novel’.

- (76) [*Sono sakka-ga jikaisaku-toshite* Ø *kaita-no*]-*wa*
 [that writer-NOM next.work-as wrote-NMLZ]-TOP
kono shōsetsu(-o)-da.
 this novel(-ACC)-COP
 ‘It is this novel_{*i*} that the writer wrote x_i as his next work.’

It has been reported that Japanese clefts with an accusative-marked focus are often degraded but not unacceptable (e.g. Hiraiwa & Ishihara 2012: 144). That is, although (75)–(76) are less acceptable when the focus is accusative-marked, they are grammatical, and only (76) semantically makes sense.

A DS account of Japanese clefts has been proposed in Seraku (2013: Chapter 5). His analysis is complicated due to the lexical actions encoded in the nominaliser *no-*, the topic particle *-wa*, and the copula *-da*. Setting aside the details, the gist of his analysis is that (i) the focus is parsed on an unfixed node, and (ii) this node unifies with the gap node in the presupposition structure. As for (ii), the node unification occurs through the parse of the accusative *-o* (if *-o* is present) or the application of UNIFICATION (if *-o* is absent). For the same reasons as stated towards the end of Section 5.1, there is no room for introducing a metonymic predicate in these tree-update processes. Therefore, only the absurd reading of (75) is obtained.

Finally, the analysis successfully handles (76). After the focus *shōsetsu* ‘novel’ is parsed on an unfixed node, it unifies with the object node (which is decorated with a gap term) within the presupposition structure. This process takes the form of lexical actions (if *-o* is present) or UNIFICATION (if *-o* is absent). The resulting tree correctly represents the interpretation of (76): ‘It is this novel_{*i*} that the writer wrote x_i as his next work.’

6. Cross-linguistic consideration

In this section, we look at several languages beyond Japanese. A pressing issue is whether IGRs are found in languages other than Japanese.

First of all, consider the English examples in (77)–(78).

(77) *The title of [the novel_i [which the writer wrote \emptyset_i as his next work]] was announced.*

(78) *#[The novel title_i [which the writer wrote \emptyset_i as his next work]] was announced.*

(77) is a case of head-external relatives, whilst (78) is meant to be an English counterpart of the Japanese IGR in (2). But the latter only allows the literal, anomalous reading. A further illustration is made with a different pair of examples (cf. (14)).

(79) *Can you return the plate for [the meal_i [which you finished eating \emptyset_i]]?*

(80) *#Can you return [the plate_i [which you finished eating \emptyset_i]]?*

These examples suggest that IGRs are disallowed in English.

Next, consider French. (81)–(82) show the same contrast as observed in (77)–(78).

(81) *Le titre du [roman_i [que l'écrivain a écrit \emptyset_i
the title of.the [novel [which the.writer have write.PTCP
pour son prochain travail]] a été annoncé.
for his next work]] have COP.PTCP announce.PTCP
'The title of the novel which the writer wrote for his next work was announced.'*

(82) *#[Le titre_i [que l'écrivain a écrit \emptyset_i
[the title [which the.writer have write.PTCP
pour son prochain travail]] a été annoncé.
for his next work]] have COP.PTCP announce.PTCP
'The (novel) title which the writer wrote for his next work was announced.'*

In French, *roman titre* 'novel title' is illicit, and this is why only *titre* 'title' is used as the matrix subject in (82), with the assumption that *titre* is interpretable as 'the title of a novel, a book, etc.' in that it co-occurs with *écrivain* 'writer' and *a écrit* 'wrote'. Also, consider (83)–(84).

(83) *Pouvez-vous rendre l'assiette du [plat_i
can-you return the.plate of.the [meal
[que vous avez fini de manger \emptyset_i]]?
[which you have finish.PTCP of eat]]
'Can you return the plate for the meal which you finished eating?'*

(84) *#Pouvez-vous rendre [l'assiette_i
can-you return [the.plate
[que vous avez finie de manger \emptyset_i]]?
[which you have finish.PTCP of eat]]
'Can you return the plate which you finished eating?'*

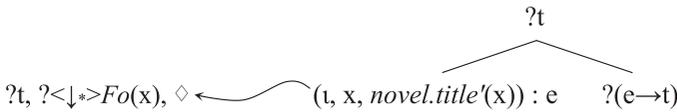
In (83), the relative clause modifies the head noun *plat* ‘meal’. This is morphologically evident; *plat* is masculine, and it triggers the masculine form *fini*. In (84), *finie* is a feminine form, and it agrees with the feminine *assiette* ‘plate’. That is, (84) only has the awkward reading that the person ate a plate. Thus, IGRs are disallowed in French, too.

Our account predicts that IGRs are not possible in English and French. In these languages, the head noun **precedes** a relative clause. As explicated below, structure building based on this word order prevents an IGR reading. Consider the English relative in (78), repeated here as (85). Our analysis of English relatives is based on Cann et al. (2005: Chapter 3).

(85) #[**The novel title**_i [*which the writer wrote* \emptyset_i *as his next work*]] *was announced*.

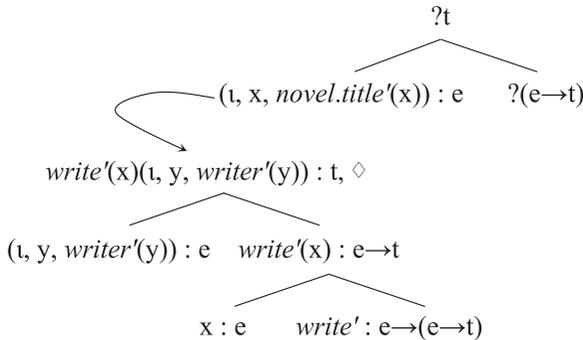
The head NP *the novel title* is processed on the matrix subject node, and this node is related to an emerging propositional structure by LINK ADJUNCTION (for English relatives).

(86) Parsing *The novel title* + LINK ADJUNCTION



?<↓*>Fo(x) requires that a node in the emerging structure will be decorated with x, a variable shared by (t, x, *novel.title'(x)*). The structure is fleshed out by the relative clause, and ELIMINATION (i.e. functional application, type deduction) applies. As shown in (87), the object node is decorated with the variable x, satisfying the requirement ?<↓*>Fo(x).

(87) Parsing *The novel title which the writer wrote (as his next work)* + ELIMINATION



This tree, however, causes a problem. The gap node is decorated with a specific variable x, shared by (t, x, *novel.title'(x)*). The only available reading will then be the one where the writer wrote a title as his next work, an absurd reading. On the other hand, in Japanese, where the head noun **follows** a relative clause, the parse of a relative clause is not constrained by the head noun; formally, a requirement like ?<↓*>Fo(x) is absent. Therefore, a gap node can be decorated with a general term (ε, x, P(x)), which itself is independent of any concrete term and may be related metonymically to the head noun at a subsequent stage.

One may wonder whether it is possible to introduce a requirement involving a metonymy predicate like $? \langle \downarrow * \rangle Fo(\varepsilon, y, M(x)(y))$, instead of $? \langle \downarrow * \rangle Fo(x)$, in (86). With such a requirement, the object node can only be decorated with a specific term ($\varepsilon, y, M(x)(y)$), and the parser cannot interpret a LINK relation properly (i.e. cannot execute LINK EVALUATION).

One might then wonder whether it is possible to postulate the English analogue of LINK EVALUATION_(IGR). This computational action, even if defined, only updates the matrix structure (more specifically, the node for the head noun) and cannot introduce any decoration (such as a metonymy predicate) to the embedded structure. Thus, an IGR reading cannot be obtained.

To recapitulate, in languages such as English and French, where the head noun **precedes** a relative clause, the structure building for a relative clause is constrained by the head noun, and this constrained process bars an IGR interpretation. Can we then say that IGRs are always licensed if the head noun **follows** a relative clause?

First, IGRs are possible in Korean. Consider (88)–(89). Though almost all IGR examples in Section 2.1 may be reproduced in Korean, space prevents me from citing more of them.¹⁶

- (88) [[\emptyset *ipeynthu wunyeng-ul tamtanga-nun*]
 [[event running-ACC take.care.of-ATT]
notong-inwen]-ul *nullye-ya.han-ta*.
 work-human.number]-ACC increase-should-DECL
 ‘The number of workers in charge of the event running should be increased.’ (cf. (11))
- (89) [[*Ta* \emptyset *mek-un cepsi*]-nun *iccokey noh-useyyo*.
 [[all eat-ATT] plate]-TOP here place-IMP.HON
 ‘Please put the plate here after you finish eating (a meal on the plate).’ (cf. (14))

Examples such as (88)–(89) have not been explored in previous studies on Korean relatives (see Kim 2016, Park et al. 2020, and references therein).

Second, consider (90), an example from Mandarin Chinese.

- (90) [[*Nei.ge zuo.zhe zai xie zhe* \emptyset *de*]
 [[that.CLF writer IPFV write IPFV de]
xiao.shuo ming.zi] *bei gong.bu le*.
 novel title] PASS announce PFV
 ‘The title of the novel which the writer is writing was announced.’ (cf. (2))

The relative clause modifies the head NP *xiao.shuo ming.zi* ‘novel title,’ and the sentence has a semantically coherent IGR reading that the writer is writing a novel. (Mandarin disallows a partial modification (cf. (5)); if the adjective ‘long’ precedes *xiao.shuo ming.zi* ‘novel title,’ it only means ‘the long title of a novel’.) Still, not all IGR structures in Japanese are possible in Mandarin. Thus, (91) only has the literal, absurd reading.

¹⁶ One could also create an example comparable to the Japanese IGR in (2) with the head NP *soseI ceymok* ‘novel title’. This example, however, is not an equivocal case of IGRs because unlike the case of Japanese (see (5)), *caymiišnun soseI ceymok* ‘interesting novel title’ is ambiguous between ‘the interesting title of a novel’ and ‘the title of an interesting novel’.

- (91) #[[*Wo chi* Ø *de*] ***cai.dan***] *shi zhe.ge*.
 [[1SG eat de] menu] COP this.CLF
 ‘This is the menu I eat.’ (cf. (15))

In sum, the order of a relative clause and the head noun seems to affect the formation of IGRs, but there would be other factors, too. Our claim, then, is that IGRs are licensed **only if** the head noun follows a relative clause. This takes the form of a necessary condition, declaring that (i) if the head noun precedes a relative clause in a language L (e.g. English, French), IGRs **should** be disallowed in L, and (ii) if the head noun follows a relative clause in L (e.g. Japanese, Korean, Mandarin), IGRs **may** be allowed in L. That is, we are making a stronger claim for languages where the head noun precedes a relative clause.

It goes far beyond the scope of this paper to examine this cross-linguistic claim against a variety of languages, and further work is required to see whether (and to what extent) IGRs are possible in a given language and to identify the pertinent factors other than the order of a relative clause and the head noun.¹⁷

7. Conclusion

We have described a hitherto undocumented type of relatives in Japanese, IGRs, and have articulated a formal account of IGRs within DS. The theoretical and empirical benefits of the proposed account are summarised as follows:

- The account **unifies** IGRs and head-external relatives, relegating their differences to the ways the head noun is construed against the relative clause. The uniformity of this analysis is supported by syntactic parallelisms (e.g. island-insensitivity) and by the surface identity of the relative clause part. (In general, the surface identity does not necessarily motivate a uniform analysis, but it is significant for parsing-oriented formalisms such as DS.)
- The account is **simple** in that it is based on (i) the single LINK-introducing action and (ii) the minimally different LINK-interpreting actions, such as LINK EVALUATION and LINK EVALUATION_(IGR). Apart from the metonymy predicate *M*, the other mechanisms have all been independently motivated and established in the DS literature.
- The account brings **cross-constructional** implications. It accounts for why a metonymic interpretation is unavailable in rightward-displacement constructions other than relatives, such as clefts and postposing.
- The account brings **cross-linguistic** implications. It ‘predicts’ that IGRs are disallowed in languages where the head noun precedes a relative clause, and it ‘expects’ that IGRs may be allowed in languages where the head noun follows a relative clause.

Given that IGRs have not been investigated in previous work, it is not possible to fully reveal their syntactic, semantic, and pragmatic properties in this single study. For instance, we have not surveyed reconstruction effects with respect to binding, quantification, and so forth. This is partly because the judgments could be elusive; in fact, different scholars have

¹⁷ Reviewer #1 suggested that, given that Japanese and Korean are the only known languages where head-internal relatives are subject to the Relevancy Condition, it might be worth checking whether (a full range of) IGRs are found in languages that exhibit (i) the head-external relatives with pre-nominal relative clauses (like Japanese and Korean), and (ii) the head-internal relatives to which the Relevancy Condition does not apply (unlike Japanese and Korean). Such a survey might shed further light on the nature of the metonymy condition and the Relevancy Condition, as well as their possible interrelations. I wish to thank the reviewer for suggesting an interesting avenue of research.

presented different judgements about reconstruction effects in head-external relatives (e.g. Hoji 1985, Hoshi 2004, Whitman 2013). These issues must be carefully addressed for Japanese IGRs and the comparable constructions observed in Korean and, to a lesser extent, in Mandarin (and possibly other languages).

Also, we modelled a metonymy relation in terms of the predicate *M*, but its content was not formalised. To elucidate it, it may be worth exploring similarities and differences between the Metonymy Condition (MC) on IGRs and the Relevancy Condition (RC) on head-internal relatives (Kuroda 1992: 147). As pointed out by Reviewer #1, each of them imposes stronger constraints than mere discourse coherence or pragmatic bridging.¹⁸ Recently, Tancredi et al. (2021: 12–13, 18) have argued that the RC holds between two eventualities expressed by ‘hierarchically adjacent’ constituents. In this connection, it will be profitable to survey the exact domain in which the MC operates. Further, Grosu & Hoshi (2019) show that head-internal relatives are ‘integrated’ constructions. The reader is referred to Grosu & Hoshi (2019: 5) for the notion of integration, but if a relative clause is not integrated into the matrix clause, a negator in the matrix clause cannot take scope over the relative clause. In this respect, non-restrictive IGRs are not integrated; a negator in the matrix clause cannot take scope over the IGR clause (see (29)). This is indicative that, unlike the RC, the MC applies to both integrated and non-integrated constructions. In future work, a more comprehensive description must be provided, with distinct types of operators other than negation.

We have seen that IGRs pose intriguing puzzles for grammar modelling. As suggested by Reviewer #2, the intrinsic interplays of syntax, semantics, and pragmatics in the incremental projection of interpretation in IGRs might be particularly well captured by ‘non-encapsulated’ frameworks such as DS (Cann et al. 2005: 377). As a non-encapsulated model, DS has been applied to various dialogue phenomena (e.g. quantifier data in ‘split utterances’; see Howes & Gibson 2021: 273 for references); see also Seraku (2023) for an analysis of Japanese dialogue. A range of the IGR data uncovered in the present paper can be viewed as a further challenge to the articulation of natural language grammars at the syntax–semantics–pragmatics interface. More research is required to see whether the non-encapsulated feature of the DS architecture is particularly useful for taking up the challenge.

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¹⁸ The same reviewer is thanked for directing my attention to Tancredi et al. (2021) and Grosu & Hoshi (2019) in the light of the issues discussed in the text.

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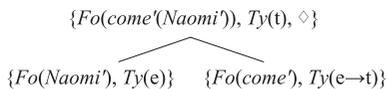
Appendix

This appendix summarises the basics of the Dynamic Syntax formalism (Kempson et al. 2001) and defines the LINK-related rules for head-external relatives and IGRs in Japanese.

Basic formalism

A node, if fully developed, is decorated with a set of statements. A ‘content’ statement is notated as in $Fo(Naomi')$ with a formula predicate Fo , and a ‘type’ statement is notated as in $Ty(e)$ with a type predicate Ty . Thus, the tree in (44) is more formally represented as in [1].

[1] Stricter representation of (44)



A tree is constructed through a combination of computational, lexical, and pragmatic actions. They are formulated as a conditional statement: *IF ... THEN ... ELSE ...* The IF-line specifies an input condition; if it is met at the current node, the parser looks at the-THEN line; otherwise, the-ELSE line applies. The THEN- and ELSE-lines may specify actions in the form of $make(\alpha)$, $go(\alpha)$, and $put(\alpha)$, designating the action to make a node α , the action to go to a node α , and the action to place a decoration α , respectively. For instance, the lexical entries for *ki-* ‘come’ are defined as in [2].

[2] Entries for *ki*- 'come' (cf. (42))
 IF $?Ty(t)$
 THEN $make(\langle \downarrow_0 \rangle); go(\langle \downarrow_0 \rangle);$
 $put(Fo(U), Ty(e), ?\exists x.Fo(x)); go(\langle \uparrow_0 \rangle);$
 $make(\langle \downarrow_1 \rangle); go(\langle \downarrow_1 \rangle); put(Fo(come'), Ty(e \rightarrow t))$
 ELSE abort

Tree-node relations are designated by the tree-node operators, such as $\langle \downarrow_0 \rangle$ and $\langle \downarrow_1 \rangle$ (and their inverses, $\langle \uparrow_0 \rangle$ and $\langle \uparrow_1 \rangle$) in the Logic of Finite Trees (Blackburn & Meyer-Viol 1994). From the perspective of the current node, $\langle \downarrow_0 \rangle$ refers to the argument-daughter node, and $\langle \downarrow_1 \rangle$ to the functor-daughter node. The lexical actions in [2], then, yield the tree in [3].

[3] Parsing *ki*- 'come' (cf. (42))

$$\begin{array}{c} \{?Ty(t)\} \\ \swarrow \quad \searrow \\ \{Fo(U), Ty(e), ?\exists x.Fo(x)\} \quad \{Fo(come'), Ty(e \rightarrow t), \diamond\} \end{array}$$

The present paper also uses the following operators: $\langle D \rangle(\alpha)$ states that the decoration α holds at some node below the current node (possibly across a LINK relation). $\langle L \rangle(\alpha)$ states that the decoration α holds at the node LINKed from the current node. $\langle L^{-1} \rangle(\alpha)$ states that the decoration α holds at the node from which the current node is LINKed.

LINK-related rules

There is a single action to launch a LINK relation: LINK ADJUNCTION. This action, defined in [4], is used for both head-external relatives and IGRs. [4] has been proposed in previous studies (see, e.g., Kempson & Kurosawa 2009: 66).

[4] LINK ADJUNCTION
 IF $Ty(t)$
 THEN IF $\langle D \rangle(Fo(\alpha))$
 THEN $make(\langle L^{-1} \rangle); go(\langle L^{-1} \rangle);$
 $put(?Ty(e), ?\exists x.Fo(x[\alpha]))$
 ELSE abort
 ELSE abort

Each type of relatives has its own LINK-evaluating rule. [5] is used for restrictive head-external relatives, and [6] for restrictive IGRs. In [5], $\psi[y/(\epsilon, x, P(x))]$ means that the gap term is replaced with y in ψ . (ψ here stands for the content of the relative clause.) In [6], $\psi[(\epsilon, \mathbf{x}, M(\mathbf{y})(\mathbf{x}))]/(\epsilon, x, P(x))]$ means that the gap term is replaced with a term with a metonymy predicate M in ψ . [5] has been proposed in previous studies (e.g. Kempson & Kurosawa 2009: 66), whereas [6] is proposed in the present study.

[5] LINK EVALUATION
 IF $Fo(\epsilon, y, \varphi(y)), Ty(e)$
 THEN IF $\langle L \rangle(Fo(\psi[(\epsilon, x, P(x))]))$
 THEN $put(Fo(\epsilon, y, \varphi(y) \& \psi[y/(\epsilon, x, P(x))]))$
 ELSE abort
 ELSE abort

[6] LINK EVALUATION_(IGR)
 IF $Fo(\epsilon, y, \varphi(y)), Ty(e)$
 THEN IF $\langle L \rangle(Fo(\psi[(\epsilon, \mathbf{x}, M(\mathbf{y})(\mathbf{x}))]/(\epsilon, x, P(x))]))$
 THEN $put(Fo(\epsilon, y, \varphi(y) \& \psi[(\epsilon, \mathbf{x}, M(\mathbf{y})(\mathbf{x}))]/(\epsilon, x, P(x))]))$
 ELSE abort
 ELSE abort

[5]–[6] can be unified through abstraction over the substituent of a gap term.

```
[7] Unifying [5]–[6]
IF      Fo( $\epsilon$ ,  $y$ ,  $\varphi(y)$ ), Ty( $\epsilon$ )
THEN IF <L>(Fo( $\psi$ [( $\epsilon$ ,  $x$ , P( $x$ ))]))
      THEN put(Fo( $\epsilon$ ,  $y$ ,  $\varphi(y)$ & $\psi$ [( $\alpha'$ ( $\epsilon$ ,  $x$ , P( $x$ ))]))
      ELSE abort
ELSE abort where  $\alpha$  is  $y$  or ( $\epsilon$ ,  $x$ , M( $y$ )( $x$ ))
```

LINK-evaluating rules for non-restrictive head-external relatives and IGRs are given in [8]–[9]. Unlike [5]–[7], [8]–[9] conjoin two propositions, as specified in the inner THEN-line. Due to this difference, [5]–[7] are not unified with [8]–[9]. [8] has been proposed in previous studies (e.g. Cann et al. 2005: 92), whereas [9] is proposed in the present study.

```
[8] LINK EVALUATION(NON-REST)
IF      Fo( $\psi$ [( $\alpha$ )], Ty( $t$ ))
THEN IF <L>(Fo( $\varphi$ [( $\epsilon$ ,  $x$ , P( $x$ ))]))
      THEN put(Fo( $\psi$ & $\varphi$ [( $\alpha'$ ( $\epsilon$ ,  $x$ , P( $x$ ))]))
      ELSE abort
ELSE abort where  $\alpha$  is a term for the head noun
```

```
[9] LINK EVALUATION(IGR_NON-REST)
IF      Fo( $\psi$ [( $\alpha$ )], Ty( $t$ ))
THEN IF <L>(Fo( $\varphi$ [( $\epsilon$ ,  $x$ , P( $x$ ))]))
      THEN put(Fo( $\psi$ & $\varphi$ [( $\epsilon$ ,  $x$ , M( $\alpha$ )( $x$ ))]( $\epsilon$ ,  $x$ , P( $x$ ))]))
      ELSE abort
ELSE abort where  $\alpha$  is a term for the head noun
```

As [5]–[6] can be unified through abstraction over the substituent of a gap term, as in [7], [8]–[9] can also be unified in the same manner, as in [10].

```
[10] Unifying [8]–[9]
IF      Fo( $\psi$ [( $\alpha$ )], Ty( $t$ ))
THEN IF <L>(Fo( $\varphi$ [( $\epsilon$ ,  $x$ , P( $x$ ))]))
      THEN put(Fo( $\psi$ & $\varphi$ [( $\beta'$ ( $\epsilon$ ,  $x$ , P( $x$ ))]))
      ELSE abort
ELSE abort where  $\alpha$  is a term for the head noun,
      and  $\beta$  is  $\alpha$  or ( $\epsilon$ ,  $x$ , M( $\alpha$ )( $x$ ))
```