

Interpreting NPs as predicates of individual concepts¹

Filipe Hisao Kobayashi
University of Salzburg

version of March 20, 2026

Abstract

Since Montague 1973, it has been recognized that quantificational DPs can, at least sometimes, quantify over individual concepts rather than individuals (e.g., *every governor changed*). This paper addresses a puzzle first observed by Nathan (2006): sentences of the form ‘[Det NP] *changed*’ admit two interpretations, and one of these is available only if the NP is headed by a relational noun. Previous accounts derive the two interpretations via independent mechanisms, but I argue that this division is not as clear-cut, since sentences with non-functional relational nouns exhibit unexpected mixed readings. I thus propose a new unified account of this data, arguing that suitable predicates of individual concepts are derived from NPs through the interaction of polymorphic versions of two type-shifting operations from Partee 1986—namely, *IOTA* and *IDENT*—and existential quantifiers within the NP. The resulting analysis is both simpler and empirically more adequate than previous proposals.

1 Introduction

Quantificational DPs sometimes quantify over intensional entities. For example, (1) can be interpreted as conveying that the current governor of every relevant state will be replaced by someone new. On this reading, *every governor* isn’t quantifying over ordinary individuals such as Ann or Beth but rather over intensional objects such as the role of the governor of Maine. This is reflected by the fact that this interpretation of (1) can only be paraphrased by the conjunction of sentences of the form α *changed* if α is a definite description rather than a proper name.

- (1) Every governor will change.
 \approx *Ann will change, Beth will change, and ...*
 \approx *the governor of Maine will change, and the governor of Vermont will change, and ...*

This has been recognized since Montague (1973), who proposed that such DPs quantify over *individual concepts* (ICs), i.e., functions from indices of evaluation to individuals. Under this view, the intensional entity ‘the governor of Maine’ is modeled as that function that maps any index t to the unique governor of Maine at t . Once we assume that determiners like *every* range over ICs, the compositional analysis of (1) requires little modification—we need only take NPs and VPs to denote predicates of ICs rather than of individuals:

- (2) $\llbracket \text{every governor changed} \rrbracket^t = \forall u_{se}. \llbracket \text{governor} \rrbracket^t(u) \rightarrow \llbracket \text{changed} \rrbracket^t(u)$

The present paper investigates how NPs are interpreted in these configurations. Specifically, it focuses on the fact that NPs like *governor* lead a double life: in simple sentences it suffices to treat them as denoting the *et*-predicate in (3a), but, to account for (1), we also need it to denote the *(se)t* predicate in (3b).²

¹To be added.

²Throughout the paper, I use x, y, z for variables of type e and u, v for variables of type se .

- (3) a. $\llbracket \text{governor} \rrbracket^t = \lambda x. \exists z. \text{governor}(z)(x)(t)$ *et*
 b. $\llbracket \text{governor} \rrbracket^t = \lambda u. \exists z. u = (\lambda i. \iota x. \text{governor}(z)(x)(i))$ *(se)t*

This raises two questions. The first is whether we truly need to assume that *governor* has the two interpretations in (3). This question is pressing since the *(se)t* interpretation technically subsumes the *et* one: a predicate of individuals can always be represented as a predicate of individual concepts, but not vice versa. Thus, following Montague, one might assume that NPs always denote predicates of concepts. If, however, both interpretations are required, we must explain how they are related.

A major challenge in addressing these issues comes from an observation due to Nathan (2006) that sentences of the form ‘[Det NP] *changed*’ admit two distinct interpretations. For example, (1) can be true in a situation in which the set of governors remains stable over time: the sentence is true as long as no state has the same governor as before, and thus could be true if all governors simply swapped positions. Following Schwager (2007), I refer to this interpretation as *pointwise change*.

The second interpretation is illustrated by (4). Unlike (1), this sentence cannot be true in a scenario in which the set of books on my shelf remains stable through time. For example, if the same books remain on the shelf but are simply rearranged, the sentence is judged to be false. Following Schwager (2007), I refer to this interpretation as *set change*.

- (4) Every book on my shelf will change.
≈ every book that is on my shelf now will be replaced by a book that isn't on my shelf

Like pointwise change, set change involves quantification over ICs: for example, if *Middlemarch* is currently on my shelf, (4) does not entail that *Middlemarch* will change. Therefore, the difference between set and pointwise change must lie not in whether quantification over ICs occurs, but in the nature of the ICs that *governor* and *book on my shelf* make available. The challenge posed by set change, however, is that it is not immediately clear what these ICs are: whereas *every governor* naturally seems to range over ICs of the form *the governor of α* , there are no obvious descriptions that identify the relevant ICs in the domain of *every book on my shelf*.

Nathan (2006) claims furthermore that whether a sentence can give rise to pointwise change is dependent on certain formal properties of the NP involved. Specifically, he proposes that only NPs headed by relational nouns readily allow for pointwise change, whereas other kinds of NPs give rise only to set change.³ The distribution therefore suggests that structural properties of NPs determine which predicates of concepts they can denote.

In this paper, I propose an account of how NPs are interpreted as predicates of ICs that can naturally account for Nathan’s observation. I take NPs to truly lead a double life as predicates of type *et* and *(se)t*, where the former is basic and the latter is derived by type-shifting operations—following Nathan (2006) in this respect. However, unlike Nathan (2006), who derives pointwise and set change via two independent (albeit related) type-shifters, I propose a single mechanism for turning NPs into predicates of ICs—specifically, an operator built upon the polymorphic versions of Partee’s (1986) type-shifters IOTA and IDENT:

- (5) $\llbracket \uparrow_{\text{IC}} \text{NP} \rrbracket^t = \llbracket \text{IDENT} \rrbracket^t(\lambda i. \llbracket \text{IOTA} \rrbracket^i(\llbracket \text{NP} \rrbracket^i))$
 $= \lambda u. u = (\lambda i. \iota x. \llbracket \text{NP} \rrbracket^i(x))$

³As discussed later in this paper, certain contexts may nevertheless make pointwise-change readings available.

The \uparrow_{IC} -operator composes with the intension of an NP and yields a predicate true of a single concept: the one that identifies the unique member of NP at any index. By itself, this operator has very limited application, as it only creates singleton predicates of ICs. However, I show that the desired results arise through its interaction with existential quantifiers within the NP. In my proposal, then, the differences between (1) and (4) follow not from different shifting mechanisms but from the different internal structures of the NPs involved.

A central claim of this paper is that set change in fact underlies pointwise change. Evidence comes from sentences with non-functional relational nouns like *senator*, previously identified as problematic by Frana (2013, 2017) and Schwager (2007). Crucially, those sentences have a mixed behavior, which is reflected by the following paraphrases:

- (6) a. Every book on my shelf changed.
≈ every book that was on my shelf was replaced by one that wasn't
- b. Every governor changed.
≈ for every state α , the governor of α was replaced by someone who wasn't
- c. Every senator changed.
≈ for every state α , every senator of α was replaced by someone who wasn't

Crucially, *senator* sentences show properties of both pointwise change (relativization by state) and set change (a requirement of full replacement). This is thus the key evidence for my unified account of Nathan's observation.

The proposal furthermore brings together apparently unrelated phenomena. Specifically, the \uparrow_{IC} -operator interacts with existential quantifiers in a way that closely parallels the analysis of interrogative clauses in Karttunen (1977). In that proposal, questions are generated through the interaction of *wh*-interrogatives, the existential quantifiers, and a type-shifter, namely IDENT. This suggests that the mechanisms underlying quantification over ICs are not specific to sentences with *change* but reflect more general properties of natural language grammar.

The paper is organized as follows: § 2 motivates the analysis of quantificational DPs as ranging over ICs; § 3 discusses Nathan's observation; § 4 proposes a new perspective on this puzzle; § 5 develops the account based on the ideas discussed in the previous section; § 6 addresses further empirical consequences of the proposal; § 7 compares the present proposal with previous ones; finally, § 8 concludes.

2 Quantification over individual concepts

In this section, I review Montague's (1973) analysis of DPs as quantifiers over ICs. I begin with Partee's temperature paradox, which motivates the analysis of certain verb phrases (VPs) as predicates of concepts. I then turn to Montague's variant of the paradox involving quantificational DPs, which leads us to the core assumptions relevant to the present paper: namely, (i) that quantifiers range over concepts, and (ii) that NPs, like VPs, can denote predicates of concepts. For ease of exposition, my presentation departs in many respects from technical details of Montague's fragment, but its central insights are preserved.

2.1 VPs as predicates of individual concepts

As reported in Montague 1973, Barbara Partee observed that certain verbs are intensional with respect to their subject position. She demonstrated this via the invalid argument in (7): although *the temperature* and *ninety* are asserted to be co-referential in the second premise, substituting *ninety* for *the temperature* as the subject of *rises* fails to preserve the truth of the first premise (and, furthermore, yields a nonsensical sentence). This puzzle is referred to as either *the temperature paradox* or *Partee’s paradox*.

- (7) The temperature rises.
 The temperature is ninety.
 ∴ Ninety rises.

Partee’s paradox shows that *rise* cannot be interpreted as a predicate of individuals. This is also reflected in our intuitions about the meaning of the first premise of (7): a temperature value such as 90°F cannot itself be said to rise. Rather, rising seems to be a property attributed to the values taken by a temperature as time progresses. Montague’s (1973) thus proposed a solution in which *rise* denotes a property of individual concepts—i.e., of functions from indices of evaluation (here, intervals) to individuals. We can then conceive of *rise* as denoting that function that is true of any concept that yields higher values as time progresses.

To illustrate this solution concretely, I adopt the approach to intensionality developed in Keshet 2010, where linguistic expressions are mapped to their *extensions* at index t via the function $\llbracket \cdot \rrbracket^t$, but their *intensions* can be made available for composition via the \wedge -operator defined below. This choice is merely for presentational purposes: it allows to tell whether an intensional operator combines with the intension of its sister just by looking at the sentence’s syntactic representation.

$$(8) \quad \llbracket \wedge \alpha \rrbracket^t := \lambda t'. \llbracket \alpha \rrbracket^{t'}$$

I now provide a simpler and less general solution than the one actually presented in Montague 1973 and delay the discussion of its shortcomings to the next subsection. In *the temperature rises*, we can say that the VP composes with the intension of *the temperature*, which is made available via the \wedge -operator, as shown in (9).⁴ However, in *the temperature is ninety*, the identity copula *be* composes with the extensions of both DPs, as shown in (10).

$$(9) \quad \wedge[\text{the temperature}] \text{ rises} \quad \rightsquigarrow \llbracket \text{rise} \rrbracket^t(\lambda t'. \llbracket \text{the temperature} \rrbracket^{t'})$$

$$(10) \quad \text{the temperature [is ninety]} \quad \rightsquigarrow \llbracket \text{the temperature} \rrbracket^t = \llbracket \text{ninety} \rrbracket^t$$

The puzzle is thus resolved: although *the temperature* and *ninety* are co-extensional, truth-preserving substitution is not possible because *rise* composes with their intensions, which need not be identical.

Although there was initial skepticism about the generality of the phenomenon (e.g., Bennett 1974, Jackendoff 1979), subsequent work showed that it is quite widespread (for overviews, see Janssen 1984 and Löbner 2020). For instance, Bennett (1974) was concerned that Partee’s puzzle involves nouns like *temperature* and *price* which are related to numerical values. However, unlike *rise*, *change* can compose with DPs whose NPs are headed by a wider range of noun

⁴This is in fact Lasersohn’s (2005) analysis of these sentences.

phrases. Löbner (1981), for example, offers the following version of Partee’s paradox without any number-related noun such as *temperature* or *price*:

- (11) The mayor changed.
 The mayor is Helga’s husband.
 ∴ Helga’s husband changed.

We can even construct versions of Partee’s sentence with nouns that have nothing to do with roles such as *mayor* or *husband*, since *Ann’s desk will change* can be said to convey that Ann will buy a new desk to replace her old one.

- (12) Ann’s desk will change.
 Ann’s desk is the desk I built.
 ∴ The desk I built will change.

I assign *rise* and *change* the lexical entries in (13) and (14), where I use t_{beg} and t_{end} to represent the left and right boundaries of t . Nothing hinges on this particular analysis—Montague himself just treated them as denoting non-logical constants—but they may prove to be useful when assessing the adequacy of the analyses to come.

- (13) $\llbracket \text{rise} \rrbracket^t := \lambda u : t_{\text{beg}}, t_{\text{end}} \in \text{dom}(u). u(t_{\text{beg}}) < u(t_{\text{end}})$ (se)t
 (14) $\llbracket \text{change} \rrbracket^t := \lambda u : t_{\text{beg}}, t_{\text{end}} \in \text{dom}(u). u(t_{\text{beg}}) \neq u(t_{\text{end}})$ (se)t

Above, I use the notation in Heim and Kratzer (1998) for presuppositions to indicate the fact that *change* and *rise* presuppose that their argument is defined at the beginning and at the end of the time of evaluation. This seems accurate: sentence (15) suggests that there was an emperor both before and after the changing event took place on November 15, 1889—it cannot be felicitously uttered in a context in which the monarchy was abolished. Likewise, (16) is infelicitous in the same context, as it presupposes there was a president before the change.

- (15) The emperor of Brazil changed on November 15, 1889.
 (16) The president of Brazil changed on November 15, 1889.

2.2 DPs as quantifiers over individual concepts

The solution to the temperature paradox we sketched above is fairly simple: all we needed was to assume that *rise* was a predicate of ICs. However, the puzzle posed by such VPs goes beyond the basic sentences from Partee’s paradox. Once we consider data with quantificational DPs, many other parts of the grammar have to be fine-tuned to account for them.

Montague (1973) illustrated the issue by presenting the following argument, which is analogous to Partee’s but differs from it in that it involves unambiguously quantificational DPs instead of definite descriptions:

- (17) A price rises.
 Every price is a number.
 ∴ A number rises.

Like Partee’s original example, the above argument has the form of a valid argument, yet the conclusion doesn’t follow.

The issue is that, under standard assumptions, we cannot even directly interpret such sentences: quantificational DPs are of type $(et)t$, but VPs like *rise* are of type $(se)t$. This issue of composition could be solved by assuming that the subject QRs leaving a trace of type e :

- (18) a. a price $\lambda_x [\wedge t_x \text{ rises}]$
 b. $\exists x. \text{price}(x)(t) \wedge \llbracket \text{rise} \rrbracket^t(\lambda t'. x)$

Although the DP’s trace is of type e , we can compose its intension with *rises* via the \wedge -operator. The problem is that this will not derive an adequate interpretation: the intension of a trace maps all indices to the same individual, and therefore such an object can never rise.⁵

Alternatively, we could change the denotation of *rise*: rather than a predicate of ICs, it could perhaps be interpreted as a predicate of intensions of generalized quantifiers (along the lines of the analysis of *seek* in Montague 1973):

$$(19) \llbracket \text{rises}' \rrbracket^t = \lambda Q. \mathbf{rise}'(Q)(t) \quad (s(se)t)t$$

However, this analysis will also fail: sentence (20) has a reading in which the universal quantifier scopes over the disjunction, which can be verified in a scenario in which half of the prices rise and the other half lower. However, if *rise* and *lower* are predicates of intensions of generalized quantifiers, as in (20), then disjunction has to scope over *every*.

- (20) Every price either will rise or lower.

$$(21) \llbracket \wedge \text{every price} \rrbracket^t(\lambda Q. \llbracket \text{rise}' \rrbracket^t(Q) \vee \llbracket \text{lower}' \rrbracket^t(Q)) \\ = \llbracket \text{rise}' \rrbracket^t(\lambda t'. \llbracket \text{every price} \rrbracket^{t'}) \vee \llbracket \text{lower}' \rrbracket^t(\lambda t'. \llbracket \text{every price} \rrbracket^{t'})$$

The only remaining option is to change the denotation of quantificational DPs themselves. Montague (1973) proposed to treat them as generalized quantifiers over ICs, where the NP restrictor is treated as a predicate of ICs providing the quantifier’s restriction: (from now on, when I refer to an NP interpreted as a predicate of ICs I add an IC subscript)

$$(22) \llbracket \text{a price} \rrbracket^t = \llbracket \text{a} \rrbracket^t(\llbracket \text{price}_{\text{IC}} \rrbracket^t) \quad ((se)t)t \\ = \lambda V. \exists u. \llbracket \text{price}_{\text{IC}} \rrbracket^t(u) \wedge V(u)$$

This suffices to invalidate the quantified version of Partee’s paradox in (17). As shown in (23), *a price rises* is interpreted as stating that some price concept is also a rising concept, while *every price is a number* merely states that every price concept is co-extensional with some number concept. Since the second premise can be true even if no price concept is also a number concept, substitution of *number* for *price* is not expected to be truth-preserving.

- (23) a. $\llbracket \text{a price rises} \rrbracket^t = \exists u. \llbracket \text{price}_{\text{IC}} \rrbracket^t(u) \wedge \llbracket \text{rises} \rrbracket^t(u)$
 b. $\llbracket \text{every price is a number} \rrbracket^t = \forall u. \llbracket \text{price}_{\text{IC}} \rrbracket^t(u) \rightarrow \exists v. \llbracket \text{number}_{\text{IC}} \rrbracket^t(v) \wedge u(t) = v(t)$

⁵Note that this is even the case if we assume traces have a more complex structure, as in (Fox 2002). This is discussed in § 7 when I compare my account of Nathan’s observation with Frana’s (2017).

Further motivation that NPs are interpreted as predicates of ICs comes from the fact that they can themselves be modified by such predicates. For example, Maribel Romero is credited in Schwager with pointing out that relative clauses can be headed by VPs that are irreducible predicates of ICs, as shown in (24) (see also Frana 2017). It is not just relative clauses, however: in (25), *unpredictable*, also a predicate of ICs, can modify NPs as well (e.g. *The price is unpredictable. The price is ninety. ∴ Ninety is unpredictable*).

(24) The price [that is rising now] will lower tomorrow.

(25) The unpredictable price is finally stable.

Montague’s analysis raises an issue however. Although we have some intuitions as to why VPs like *rise* and *change* need to be interpreted as predicates of ICs, the same is not true for NPs—the motivation for analyzing NPs in this way was merely to obtain a smooth compositional interpretation of these sentences. One question for which we do not have a clear answer is the following: given that *price* and *governor* must be interpreted as predicates of ICs, which ICs qualify as price or governor concepts? One might dismiss this as a matter of lexical semantics—asking which concepts are governor concepts might be no different from asking which entities qualify as a sandwich.

However, the answer to this question has important consequences, as it affects the entailments that hold between sentences containing verbs like *change*. Consider the following two arguments, one valid and the other invalid:⁶

(26) The governor of Massachusetts changed.

∴ A governor changed.

(27) The governor I want to marry changed.

∴ A governor changed.

Suppose we stick to the analysis of non-quantificational DPs presented in § 2.1. On this view, the premise of (26) states that the concept expressed by the description *the governor of Massachusetts* bears the property of having changed, while the premise of (27) states that the concept expressed by *the governor I want to marry* did:

(28) a. $\llbracket \text{change} \rrbracket^t(\lambda i. \iota x. \llbracket \text{governor of Massachusetts} \rrbracket^i(x))$

b. $\llbracket \text{change} \rrbracket^t(\lambda i. \iota x. \llbracket \text{governor I want to marry} \rrbracket^i(x))$

The conclusion of these arguments, however, involves quantification over ICs, and *governor* is interpreted as a predicate of ICs:

(29) $\exists u. \llbracket \text{governor}_{\text{IC}} \rrbracket^t(u) \wedge \llbracket \text{change} \rrbracket^t(u)$

The validity of (26) therefore shows that the concept expressed by *the governor of Massachusetts* is included in $\llbracket \text{governor}_{\text{IC}} \rrbracket^t$, whereas the invalidity of (27) shows that the concept expressed by *the governor I want to marry* is not.

This contrast suggests that determining which ICs belong to $\llbracket \text{governor} \rrbracket^t$ is necessary for explaining the entailments between sentences containing *change*, and is therefore a question that must be addressed by compositional semantics. An even stronger argument for this conclusion comes from Nathan’s observation, to which we now turn.

⁶The premise of (27) is in fact ambiguous. See § 6.3 for discussion.

	Conn.	Me.	Mass.	N.H.	N.Y.	R.I.	Vt.
2025	Ann	Beth	Cleo	Deb	Ella	Flo	Gia
2026	Beth	Cleo	Deb	Ella	Flo	Gia	Ann

Table 1: CONEG governors in 2025 and 2026

3 On Nathan’s observation

In this section, I discuss Nathan’s (2006) observation that sentences of the form ‘[Det NP] *changed*’ admit two distinct interpretations whose distribution is sensitive to the linguistic form of the NP. This makes a strong case for the view that grammar itself, rather than pragmatics, constrains the kinds of ICs an NP can be true of. However, I will argue that this distinction between the two interpretations is not as clear-cut as Nathan assumes.

The two interpretations are illustrated in (30), when judged against the scenario in Table 1. The scenario describes a situation in which the Coalition of Northeastern Governors (CONEG), a real-world non-partisan organization composed of the governors of seven Northeast U.S. states,⁷ maintained all its members, but the governor of every relevant state changed. Sentence (30a) is judged to be true, but (30b) isn’t: the intuition is that this second sentence could only be true if everyone who was a member of CONEG in 2025 was replaced by someone who wasn’t.

- (30) a. Every CONEG governor changed in 2026. *true*
b. Every member of CONEG changed in 2026. *false*

This contrast shows, first, that the NPs in these sentences are not interpreted as predicates of ordinary individuals: if they were, *CONEG governor* and *member of CONEG* would denote contextually equivalent predicates and the two sentences would be equivalent. Second, it shows that simply assigning these NPs IC denotations, as in (31), explains nothing: without a principled account of which ICs these NPs are true of, the contrast remains mysterious.

- (31) a. $\forall u. \llbracket \text{CONEG governor}_{\text{IC}} \rrbracket^t(u) \rightarrow \llbracket \text{change} \rrbracket^t(u)$
b. $\forall u. \llbracket \text{member of CONEG}_{\text{IC}} \rrbracket^t(u) \rightarrow \llbracket \text{change} \rrbracket^t(u)$

Nathan (2006) observes that this is not an isolated contrast but a systematic one: sentences of the form ‘[Det NP] *changed*’ generally admit two readings, here referred to as pointwise and set change (after Schwager 2007). Focusing on sentences with *every*, we can render these two readings as in (32).

- (32) $\llbracket \text{every NP}_{\text{IC}} \text{ changed} \rrbracket^t$
a. *Pointwise change*:
 $= \forall z. \llbracket \text{change} \rrbracket^t(\lambda i. \iota x. \llbracket \text{NP} \rrbracket^i(z)(x))$
b. *Set change*:
 $= (\forall x. \llbracket \text{NP} \rrbracket^{t_{\text{beg}}}(x) \rightarrow \llbracket \text{NP} \rrbracket^{t_{\text{end}}}(x)) \wedge |\llbracket \text{NP} \rrbracket^{t_{\text{beg}}} \leq |\llbracket \text{NP} \rrbracket^{t_{\text{end}}}|$

⁷Namely, Connecticut (Conn.), Maine (Me.), Massachusetts (Mass.), New Hampshire (N.H.), New York (N.Y.), Rhode Island (R.I.) and Vermont (Vt.)

The above rendition of the pointwise change reflects the fact that *every New England governor changed* seems to yield the same interpretation as *the governor of every New England state changed*. It is harder to render the set change reading by referring to individual concepts. Set change is characterized as follows: ‘*every NP changed*’ is true whenever every member of $\llbracket \text{NP} \rrbracket^{t_{\text{beg}}}$ is replaced by an entity not previously in $\llbracket \text{NP} \rrbracket^{t_{\text{beg}}}$. The second conjunct in (32b) ensures that members are replaced rather than simply removed.

Set change interpretations are particularly puzzling. They involve quantification over concepts, as shown by the following invalid argument:

- (33) A portrait on my wall will change.
 Every portrait on my wall is a portrait painted by me.
 ∴ A portrait painted by me will change.

However, unlike pointwise change, it is not clear what these concepts are — which is why its definition in (32b) does not resort to quantification over ICs. For example, suppose my wall has three portraits in a row. If *every portrait on my wall* ranged over concepts such as *the rightmost portrait* or *the middle portrait*, we would predict that merely reorganizing the portraits suffices to make the sentence true. The question, then, is what constraints on IC domains can rule out position-based concepts while still allowing the sentence to be true when portraits are genuinely replaced.

The formula for pointwise change in (32a) presupposes that the NP is interpreted as a relational noun, and this is no coincidence. That is the second point of Nathan’s observation: sentences of the form ‘*Det NP changed*’ can give rise to pointwise or set change, but pointwise readings are only available when the NP is headed by a relational noun without its argument being saturated.⁸ The data in (34) and (35) illustrate this: examples with relational nouns like *temperature* and *husband* naturally receive pointwise change readings, while those with non-relational nouns like *portrait* and *furniture* only admit set change. Note that even though *member* is a relational noun, we only get the set-change reading in (30b) because its internal argument is saturated by the DP *CONEG*.

- (34) *Pointwise change*
- a. Every temperature changed.
 ≈ *the temperature of every relevant thing changed*
 - b. Every husband changed.
 ≈ *the husband of every relevant person changed*
- (35) *Set change*
- a. Every portrait on my wall changed.
 ≈ *every portrait that was on my wall was replaced by one that wasn’t*
 - b. Every piece of furniture changed.
 ≈ *every piece of furniture was replaced by one that wasn’t*

Crucially, these two readings are not mutually exclusive for sentences in which the NP is headed by a relational noun: such sentences are typically ambiguous between the two readings. For instance, both of the following sentences could be truthfully uttered in the given scenario:

⁸In § 5 I discuss the circumstances under which pointwise-readings are available with seemingly non-relational nouns.

- (36) *Scenario*. The current school deans are Ann, Beth, and Cleo, but we don't know which person is the dean of which school. Next year, Ann and Beth will switch positions and Cleo will be replaced by someone new.
- a. Exactly one school dean will change next year.
 - b. Every school dean will change next year.

Sentence (36a) is judged as true because there is exactly one person who is a school dean now who won't be next year (set change). Sentence (36b) can be judged as true because the dean of every school will change next year (pointwise change).

The fact that these sentences give rise to exactly these two kinds of readings suggests that NPs—differently from VPs like *rise* and *change*—are not irreducible predicates of ICs: if they were, nothing would prevent them from denoting arbitrary sets of concepts that could give rise to readings other than the ones discussed above. Thus, one strategy to account for these facts is to take NPs to have a basic meaning as *et* predicates, which are then shifted into a suitable predicate of ICs via type-shifting operations. The systematicity of these interpretations would then follow from the nature of these operations.

This is exactly the nature of Nathan's (2006) own proposal. His solution to the existence and distribution of pointwise and set change readings is to propose the existence of two different type-shifting operators that yield predicates of type (*set*): one takes an argument of type *set* and gives rise to set change; the other takes an argument of type *set* and gives rise to pointwise change. Leaving detailed discussion to § 7, this analysis faces two immediate problems. First, although the two type shifters are not completely unrelated to each other, this analysis merely stipulates the distribution rather than explaining it. Second, it has empirical shortcomings as it assumes a clean binary division between the two readings.⁹

The empirical problem becomes clear when we consider sentences in which the NP is headed by a non-functional relational noun—one that can be true of more than one individual for a given argument, such as *senator*, since a state can have multiple senators. That these nouns pose problems for Nathan 2006 was also observed by Schwager (2007) and Frana (2017), though they reach different conclusions than I do. To see the issue, consider the following scenario. In the US, each state has two senators: the senior senator, who has held the seat longest, and the junior senator. Suppose that from 2025 to 2026, every New England senior senator became the junior senator of a different New England state, as illustrated in Table 2. Crucially, the set of New England senators remains the same throughout. Under these circumstances, (37a) is judged as false while (37b) is true.

- | | | |
|------|--|-----------------|
| (37) | a. Every New England senator changed in 2026. | <i>not true</i> |
| | b. Half of the New England senators changed in 2026. | <i>true</i> |

I interpret these data as showing that sentences with *senator* have a mixed set- and pointwise reading. The fact that (37b) is true tells us that a senator changing from being a senator of some state to another state counts as a change. But the fact that (37a) is not true shows that a senator

⁹It should be noted, however, that accounting for the pointwise vs set change contrast was not the primary goal of Nathan. Rather, that work is primarily concerned with the interpretation of concealed questions, and Nathan's two-operator analysis is designed to also explain why relational nouns license concealed question readings more easily than sortal nouns.

	Conn.		Me.		Mass.		N.H.		R.I.		Vt.	
	Sn.	Jr.										
2025	A ₁	A ₂	B ₁	B ₂	C ₁	C ₂	D ₁	D ₂	E ₁	E ₂	F ₁	F ₂
2026	A ₂	F ₁	B ₂	A ₁	C ₂	B ₁	D ₂	C ₁	E ₂	D ₁	F ₂	E ₁

Table 2: New England senators in 2025 and 2026

changing from being a junior senator of a state to becoming its senior senator doesn't.¹⁰ The mixed character of the senator reading is brought out by comparing the paraphrases of all three sentence types:

- (38) a. Every book on my shelf changed.
≈ every book that was on my shelf was replaced by one that wasn't
- b. Every governor changed.
≈ for every state α , the governor of α was replaced by someone who wasn't
- c. Every senator changed.
≈ for every state α , every senator of α was replaced by someone who wasn't

The *senator* paraphrase has the structure of a pointwise-change reading — it quantifies over states — but it also imposes a replacement condition within each state, as in set-change readings.

The existence of the mixed reading for *senator* suggests that perhaps even the basic case with *governor* can be viewed in this way — the underlying set change component just happens to be vacuous when the noun is functional, since each state has exactly one governor. Thus, we could in principle also have paraphrased (38b) as:

- (39) Every governor changed.
≈ for every state α , every governor of α was replaced by someone who wasn't

This suggests that set change underlies all these readings and that, rather than assuming two different type-shifters as Nathan does, we can account for these data via a single type-shifting mechanism. In the next section, I provide a concrete implementation of this idea.

4 Towards a structural account

In this section, I provide a new perspective on Nathan's observation. First, I offer a semantic characterization of the kinds of ICs involved in set change interpretations, via two constraints I call *property* and *identity preservation*. Then, I show how we can account for the pointwise interpretations through the scopal interaction between these constraints and an existential quantifier. This section provides a formal characterization that will later be derived compositionally. The account developed here is not yet the final proposal: it provides a formal characterization of the relevant constraints, which will be derived compositionally in § 5 from more basic type-shifting operators.

¹⁰Kaufmann, in Schwager (2007), makes a similar point about the NP *bodyguard of Arnold*.

4.1 Set change via identity preservation

In this subsection, I provide the IC-based characterization of set change that was deferred in § 3. I do this by defining a function **PredIC** which maps NP intensions to predicates of individual concepts that yield set change interpretations. For the moment, I set compositionality aside and assume that (40a) is interpreted as in (40b), where D stands for the determiner’s silent domain restriction (von Stechow 1994).

- (40) a. Every $_D$ book on my shelf changed.
 b. $\forall u \in D. u \in \mathbf{PredIC}(\llbracket \text{book on my shelf} \rrbracket_\epsilon) \rightarrow \llbracket \text{change} \rrbracket^t(u)$
 where $\llbracket \alpha \rrbracket_\epsilon := (\lambda i. \llbracket \alpha \rrbracket^i)$

To derive set change, we will need to impose two conditions on **PredIC** and one general condition on D . I motivate each condition in turn, using the following scenario:

- (41) *Scenario.* My shelf fits exactly four books. On Monday, the books on my shelf were A, B, C, and D in this order. On Tuesday, the books on my shelf were B, E, F in this order.
 a. Exactly two $_D$ books on my shelf changed. *true*
 b. Exactly three $_D$ books on my shelf changed. *false*

The scenario in (41) illustrates that merely repositioning a book does not count as a change—if it were, (41b) would be true. This shows that the relevant domain of quantification cannot consist of concepts that identify books by position. That is, $D \cap \mathbf{PredIC}(\llbracket \text{book on the shelf} \rrbracket_\epsilon)$ cannot be the following set of ICs:

- (42) a. [mon \rightarrow A, tue \rightarrow B] *\approx the 1st book from the left*
 b. [mon \rightarrow B, tue \rightarrow E] *\approx the 2nd book from the left*
 c. [mon \rightarrow C, tue \rightarrow F] *\approx the 3rd book from the left*
 d. [mon \rightarrow D] *\approx the 4th book from the left*

Representing ICs as above helps us detect the problem: we cannot have two different concepts picking out book B at two different points in time. This is the key characteristic of set change: concepts must be “sticky,” in the sense that if a concept picks out B at index t , then it must pick out B at every other index in which B is a book on the shelf. I encode this via the following definition, which I call *identity preservation*:

- (43) *Identity preservation*
 $\mathbf{IdentPres}(N)(u) := \forall t_1, t_2 \in \text{dom}(u). u(t_2) \in N(t_1) \rightarrow u(t_1) = u(t_2)$

Identity preservation by itself will not yield set change, however. Consider the set of concepts in (44), in which every concept is identity preserving relative to *book on the shelf*. Because (44d) picks out D on Monday and G on Tuesday, we have a total of three rather than two changing concepts.

- (44) a. [mon \rightarrow A, tue \rightarrow E]
 b. [mon \rightarrow B, tue \rightarrow B]
 c. [mon \rightarrow C, tue \rightarrow F]

- d. [mon → D, tue → G]

A natural requirement, then, is that *book on the shelf* can only be true of concepts that *always* point to books on the shelf. This condition, which I call *property preservation*, is defined as follows:¹¹

- (45) *Property preservation*
PropPres(N)(u) := $\forall i \in \text{dom}(u). u(i) \in N(i)$

There's one last condition to consider. The ICs in (46) are both identity and property preserving relative to *book on the shelf*, but they have three rather than two changing concepts.

- (46) a. [mon → A, tue → E]
 b. [mon → B, tue → B]
 c. [mon → C, tue → F]
 d. [mon → D, tue → E]

The problem now is that we have two overlapping concepts: both (46a) and (46d) change into book E on Tuesday. This should not be possible: if we take A to have changed to E, we can't also take D to have changed into E. This is clearer in a scenario in which there are two books and one is replaced and the other is removed—we would say that one, not two, books changed. I thus take the relevant set of ICs to obey the following non-overlap condition from Gupta (1980):

- (47) *No overlap*
NO(U) := $\forall u, v \in U. (\exists t \in \text{dom}(u) \cap \text{dom}(v). u(t) = v(t)) \rightarrow u = v$

The following two sets of ICs both satisfy the conditions introduced above: they are property and identity preserving relative to *book on the shelf* and no two concepts overlap. If D is resolved to either set, we derive the attested truth conditions of the sentences in (41), since each contains exactly two changing concepts.

- | | | | |
|------|---|------|---|
| (48) | a. [mon → A, tue → E]
b. [mon → B, tue → B]
c. [mon → C, tue → F]
d. [mon → D] | (49) | a. [mon → A, tue → F]
b. [mon → B, tue → B]
c. [mon → C, tue → E]
d. [mon → D] |
|------|---|------|---|

Note that there's no reason to prefer one set over the other. Typically, contextual factors will make one resolution more salient than the other. For instance, if we observed A being removed right before E being placed on the shelf, (48) would probably be more salient. Sometimes, when one has no idea about how the changes took place, one may say that two books changed and one was removed without being able to say which books changed and which was removed.

We thus have three conditions in total: identity preservation, property preservation, and non-overlap. These three conditions fall into two groups: property and identity preservation make reference to the denotation of the NP, whereas non-overlap is a general constraint on sets of ICs. I thus propose that **PredIC** is defined as follows:

¹¹A shifter that only requires property preservation is proposed in Nathan 2006 and Grosu and Krifka 2007. Nathan makes the point that property preservation by itself is not restrictive enough, however.

$$(50) \quad \mathbf{PredIC} := \lambda N. \lambda u. \mathbf{IdentPres}(N)(u) \wedge \mathbf{PropPres}(N)(u) \quad \langle\langle s, \langle e, t \rangle \rangle, \langle\langle s, e \rangle, t \rangle\rangle$$

Non-overlap, in contrast, is treated as a condition on possible domain restrictions:

$$(51) \quad \llbracket \text{every}_D \text{ book on my shelf changed} \rrbracket^t \\ = \mathbf{NO}(D) \wedge \forall u \in D. u \in \mathbf{PredIC}(\llbracket \text{book on my shelf} \rrbracket_\epsilon) \rightarrow \llbracket \text{change} \rrbracket^t(u)$$

All that remains is to verify that the above yields set change interpretations. Consider a sentence of the form ‘every_D NP changed.’ Property preservation ensures that every IC in $D \cap \mathbf{PredIC}(\llbracket \text{NP} \rrbracket_\epsilon)$ maps each index to an individual in the extension of NP at that index. Thus, only changes relative to the extension of NP are counted. Identity preservation ensures that if an IC picks out an individual x that remains in the extension of the NP at a later index, it must continue to pick out x . Therefore, a concept can only change reference if the individual it tracks has left the extension of the NP. Finally, non-overlap ensures that no two ICs in D can pick out the same individual at the same index, preventing overcounting. Together, these conditions guarantee that the sentence is true just in case every individual in the extension of NP at the beginning of the evaluation interval has been replaced by a different individual that wasn’t. This is exactly the set change interpretation.

4.2 Pointwise-change via local identity preservation

Identity preservation is the main driving force of set change: this is the condition that guarantees that an IC can only change if it’s replaced. At first glance, identity preservation seems to be disobeyed in pointwise change, as it is incompatible with the swapping scenarios in which the extension of the NP remains constant through time. However, I argue that this violation is merely apparent — we can still see identity preservation at work even in pointwise change.

Suppose we are in a swapping scenario: after the election, the set of governors remains the same but each state has a different governor from before. The following sentence is judged to be true in such a scenario:

$$(52) \quad \text{Every governor changed.}$$

If (52) is interpreted via **PredIC**, we get the following:

$$(53) \quad \forall u \in D. u \in \mathbf{PredIC}(\llbracket \text{governor} \rrbracket_\epsilon) \rightarrow \llbracket \text{change} \rrbracket^t(u) \\ \Leftrightarrow \forall u \in D. u \in \mathbf{PredIC}(\lambda i. \lambda x. \exists z. \text{governor}(z)(x)(i)) \rightarrow \llbracket \text{change} \rrbracket^t(u)$$

The above formula is not satisfied in the scenario described. For example, suppose Ann used to be the governor of Maine and now she’s the governor of Vermont. Because $\mathbf{PredIC}(\llbracket \text{governor} \rrbracket_\epsilon)$ only contains concepts that are identity preserving relative to *governor (of somewhere)*, any concept that picks out Ann when she’s the governor of Maine will also pick her out when she’s the governor of Vermont. It doesn’t matter which state Ann is the governor of: as long as Ann is a governor, she must be identified by the same concept.

In our swapping scenario, then, no concept in $\mathbf{PredIC}(\llbracket \text{governor} \rrbracket_\epsilon)$ changes. The problem is that, to derive pointwise change readings, we need *every governor* to range over concepts expressed by descriptions of the form *the governor of α* . Such concepts, however, will never be identity preserving when there’s swapping.

Rather than abandoning **PredIC** for pointwise change, I propose that in these cases identity preservation is evaluated more locally. Although the concept *the governor of Maine* is not identity preserving relative to the NP *governor (of somewhere)*, this concept is identity preserving relative to the NP *governor of Maine*— whenever Ann is the governor of Maine, *the governor of Maine* refers to her. More generally, any IC expressed by a description of the form *the governor of α* is identity preserving relative to the NP *governor of α* . In light of this fact, I propose that the issue can be resolved if the existential quantifier binding the internal argument of *governor* takes scope over **PredIC**:

$$(54) \quad \lambda u. \exists z. u \in \mathbf{PredIC}(\lambda i. \lambda x. \text{governor}(z)(x)(i))$$

This predicate will be true of the concept *the governor of Maine* since there is an α — namely, Maine— such that *the governor of Maine* is identity preserving relative to the NP *governor of α* . More generally, then, (54) will be true of any concept of the form *the governor of α* , and therefore yield pointwise change interpretations.¹²

The proposal above supports a unified perspective of pointwise and set change interpretations. The crucial evidence for this account, however, comes from nouns like *senator*. Suppose that in a sentence such as *every senator changed* we also have existential closure scope over **PredIC**:

$$(55) \quad \lambda u. \exists z. u \in \mathbf{PredIC}(\lambda i. \lambda x. \text{senator}(z)(x)(i))$$

The difference now is that *senator* is not functional and we can thus detect the effects of identity preservation. For example, the IC *the junior senator of Maine* will not be in (55), since it isn't necessarily identity preserving relative to *senator of Maine*— if Ann was the junior senator of Maine and then becomes the senior senator of that state, the IC *the junior senator of Maine* would no longer refer to Ann even though she's still in the extension of *senator of Maine*. We thus predict that changes from junior to senior senator of the same state won't count as a change— only changes from one state to another. I leave the discussion of which ICs are in the denotation of (55) to § 5, after I present the actual proposal.

In this section, I have thus shown that it is possible to provide a unified account of the different interpretations of sentences of the form '[Det NP] *changed*.' The key ingredient is a type-shifting operator that introduces identity and property preservation. Cases that might appear to violate identity preservation— such as pointwise change interpretations of sentences with *governor*— still involve the same operation, applied to the NP at a more local level. This is supported by sentences involving non-functional relational nouns such as *senator*, in which the effects of identity preservation remain detectable. The question that remains, however, is where exactly these conditions come from. In the next section, I present a proposal in which **PredIC** is derived from the combined application of two well-known type-shifters and conditions such as identity preservation don't need to be stipulated.

¹²The idea that pointwise change is derived by having an existential quantifier bind the internal argument of the relational noun across quantification over worlds is already in Nathan 2006, who proposes a shifter that turns the intension of a relational noun R_{eet} into $\lambda u. \exists z. \mathbf{PropPres}(\lambda i. \lambda x. R(z)(x)(i))$. My account differs in two respects: **PredIC** also encodes identity preservation and, as will spelled out in the next section, the operator that shifts the NP into a predicate of ICs is distinct from the one that binds the internal argument of the noun.

5 Shifting NPs into predicates of individual concepts

In this section, I present my account of Nathan’s observation. First, I propose that a single operator is responsible for shifting NPs into predicates of individuals. This operator is defined in terms of the polymorphic versions of Partee’s (1986) IDENT and IOTA. Suitable predicates of individual concepts will then be created via the interaction of this operator and existential quantifiers, in a way that closely parallels the analysis of interrogatives in Karttunen 1977. I show this by deriving the interpretation of each of our key sentences.

5.1 The basic ingredients: IOTA and IDENT

I propose that NPs are turned into predicates of ICs via the interaction of the polymorphic versions of two type shifting operations from Partee 1986: IOTA and IDENT.

$$(56) \quad \begin{array}{ll} \text{a. } \llbracket \text{IOTA}_\alpha \rrbracket^t := \lambda f. \iota a. f(a) & (\alpha t)\alpha \\ \text{b. } \llbracket \text{IDENT}_\alpha \rrbracket^t := \lambda x. \lambda y. y = x & \alpha \alpha t \end{array}$$

To illustrate, consider the NP *governor of Maine*: applying IOTA_e yields the unique governor of Maine at the index of evaluation; and applying IDENT_{se} to the intension of $[\text{IOTA}_e \text{ NP}]$ yields a predicate true of exactly the concept *the governor of Maine*, as shown in (57).

$$(57) \quad \begin{array}{ll} \text{a. Step \#1} & \\ \llbracket \text{IOTA}_e \rrbracket^t(\llbracket \text{governor of Maine} \rrbracket^t) = (\iota x. \text{gov}(\text{maine})(x)(t)) & \\ \text{b. Step \#2} & \\ \llbracket \text{IDENT}_{se} \rrbracket^t(\llbracket \text{IOTA governor of Maine} \rrbracket_e) = \lambda u. u = (\lambda i. \iota x. \text{gov}(\text{maine})(x)(i)) & \end{array}$$

I package these two operations into a single operator \uparrow_{IC} , to simplify syntactic representations that follow:

$$(58) \quad \begin{aligned} \llbracket \uparrow_{\text{IC}} \rrbracket^t &= \lambda N. \llbracket \text{IDENT}_{se} \rrbracket^t(\lambda i. \llbracket \text{IOTA}_e \rrbracket^t(N(i))) & (set)(se)t \\ &= \lambda N. \lambda u. u = (\lambda i. \iota x. N(i)(x)) \end{aligned}$$

Furthermore, I adopt the abbreviation in (59) to improve readability; **the**(*P*) should be read as ‘the concept *the P*.’ We can thus rewrite (57b) as (60).

$$(59) \quad \mathbf{the}(P) = \lambda i. \iota x. P(x)(i)$$

$$(60) \quad \llbracket \uparrow_{\text{IC}} \rrbracket^t(\llbracket \text{governor of Maine} \rrbracket_e) = \lambda u. u = \mathbf{the}(\text{gov}(\text{maine}))$$

Finally, to ensure that predicates of ICs created by \uparrow_{IC} can compose with determiners, I take natural language determiners to be polymorphic:

$$(61) \quad \begin{array}{ll} \text{a. } \llbracket \text{the}_\alpha \rrbracket^t = \lambda A. \iota a. A(a) & (\alpha t)\alpha \\ \text{b. } \llbracket \text{every}_\alpha \rrbracket^t = \lambda A. \lambda B. \forall a. A(a) \rightarrow B(a) & (\alpha t)(\alpha t)t \\ \text{c. } \llbracket \text{a}_\alpha \rrbracket^t = \lambda A. \lambda B. \exists a. A(a) \wedge B(a) & (\alpha t)(\alpha t)t \end{array}$$

We now have two possible ways of interpreting sentence (62). The first was already discussed in § 2, where *change* composes directly with the intension of *the_e governor of Maine*. However, (64) is also possible, where we first shift the NP *governor of Maine* into a predicate of ICs, and then have *change* compose with the extension of *the_{se} governor of Maine*. Both structures yield the exact same interpretation, however.¹³

(62) The governor of Maine changed.

(63) a. $\wedge[\text{the}_e \text{ governor of Maine}] \text{ changed}$
 b. $\llbracket \text{change} \rrbracket^t(\llbracket \text{the}_e \text{ governor of Maine} \rrbracket) = \llbracket \text{change} \rrbracket^t(\mathbf{the}(\text{gov}(\text{maine})))$

(64) a. $[\text{the}_{se} \uparrow_{\text{IC}}[\text{governor of Maine}]] \text{ changed}$
 b. $\llbracket \text{change} \rrbracket^t(\lambda u. u = \mathbf{the}(\text{gov}(\text{maine}))) = \llbracket \text{change} \rrbracket^t(\mathbf{the}(\text{gov}(\text{maine})))$

An immediate issue is that the \uparrow_{IC} -operator can only ever yield predicates of ICs that are true of a single concept. This may be a welcome result for NPs like *governor of Maine* or *student taller than every other student*, but not for others like *book on the shelf*:

(65) $\llbracket \uparrow_{\text{IC}} \wedge[\text{book on the shelf}] \rrbracket^t = \lambda u. u = \mathbf{the}(\text{book.on.the.shelf})$

If this were the only possible translation of *book on the shelf* as a predicate of ICs, the sentence *every book on the shelf changed* would be incorrectly predicted to only be felicitously uttered when there is a single book on the shelf.

Applied in isolation, \uparrow_{IC} only handles the simplest cases — sentences such as *the governor of Maine changed*. In the following subsections, however, I show that the present proposal can in fact cover all the relevant data involving quantification over ICs once we allow \uparrow_{IC} to attach to different constituents within the NP.

5.2 Sentences with *governor*

We start with the pointwise change interpretation of sentences with nouns like *governor*. The goal is to explain how (66a) gets to be interpreted as (66b) in a system that relies on the \uparrow_{IC} -operator. We have already seen that directly shifting *governor* will not work, but the solution was already hinted at in § 4: we must allow \uparrow_{IC} to apply to a sub-constituent of this NP.

(66) a. Every governor changed.
 b. The governor of every state changed.

Our starting point is the observation that relational nouns don't require their complements to be overtly pronounced, as shown in (67). Furthermore, when the complement is not pronounced, the NP is interpreted as having its internal argument bound by an existential quantifier. Thus, *every governor arrived* is equivalent to *every governor of somewhere arrived*.

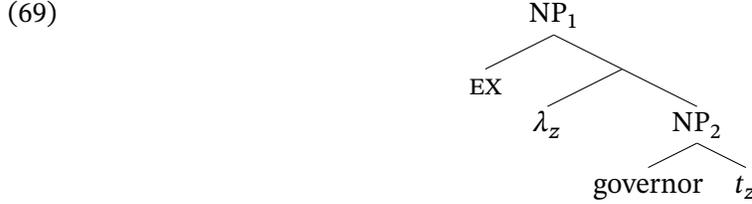
(67) Ann is the governor (of a state).

¹³This equivalence allows for the present system to capture the so-called *Gupta's Syllogism* (Dowty, Wall, and Peters 1981, Lasersohn 2005, Romero 2008). I leave a full discussion of this matter to future work.

The standard account of this phenomenon is straightforward: the basic meaning of these nouns is transitive, but they can be detransitivized through an operation that binds the noun’s internal argument (for an overview, see Barker 2011). I take this to be performed by EX, which binds the first argument of any boolean 2-place predicate:

$$(68) \quad \llbracket \text{EX} \rrbracket^t = \lambda R. \lambda a. \exists b. R(b)(a) \quad (\alpha\beta t)\beta t$$

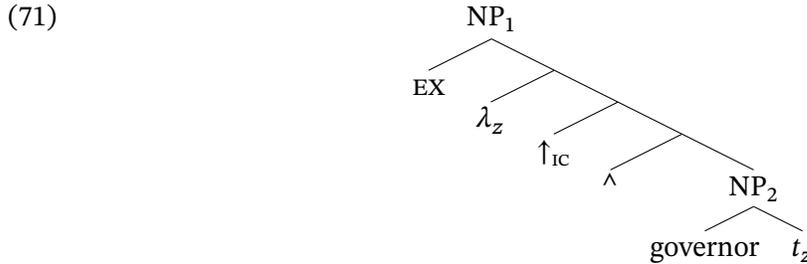
In light of this, an NP headed by *governor* has the following complex structure:



There are two $\langle e, t \rangle$ nodes in this structure and \uparrow_{IC} could apply to either — this is where the advantage of treating \uparrow_{IC} -operator as a null operator present in syntax becomes apparent. If \uparrow_{IC} targets NP_1 , we get a singleton predicate of IC:

$$(70) \quad \llbracket \uparrow_{\text{IC}} \rrbracket^t(\llbracket \text{NP}_1 \rrbracket_\epsilon) = \lambda u. u = (\lambda i. \iota x. \exists z. \text{governor}(z)(x)(i))$$

However, suppose it attaches to NP_2 instead, as shown in (71). First, it creates the predicate of ICs in (72), which is true of the concept *the governor of z*, where z is a free variable. However, after this variable is bound by EX, we get the predicate in (73). This is exactly the predicate of ICs we were after: the one true of all concepts of the form *the governor of α* , for some α .



$$(72) \quad \llbracket \uparrow_{\text{IC}} \rrbracket^t(\llbracket \text{NP}_2 \rrbracket) = \lambda u. u = \mathbf{the}(\text{governor}(z))$$

$$(73) \quad \llbracket \text{NP}_1 \rrbracket^t = \lambda u. \exists z. u = \mathbf{the}(\text{governor}(z))$$

The predicate in (73) will yield the desired pointwise change interpretation of (66a). The LF in (74a) assumes that *governor* has the structure in (71), and it is interpreted as in (74b). The sentence is predicted to be true if, and only if, every concept of the form *the governor of α* , for some α , bears the property of having changed. Via some elementary predicate logic equivalencies, (74b) shows that the sentence is correctly predicted to be equivalent to *the governor of every state changed* (once the domain of quantification is properly restricted).

$$(74) \quad \text{a. Every NP}_1 \text{ changed.}$$

- b. $\forall u. (\exists z. u = \mathbf{the}(\text{governor}(z))) \rightarrow \llbracket \text{changed} \rrbracket^t(u)$
 $\Leftrightarrow \forall u. \forall z. u = \mathbf{the}(\text{governor}(z)) \rightarrow \llbracket \text{changed} \rrbracket^t(u)$
 $\Leftrightarrow \forall z. \llbracket \text{changed} \rrbracket^t(\mathbf{the}(\text{governor}(z)))$

An advantage of this proposal is that it accounts for the fact that pointwise change is possible even if relational nouns have an indefinite DP as their internal argument. This is illustrated by the fact that (75a) has a reading that can be paraphrased as (75b).

- (75) a. Every governor of a New England state changed.
 b. The governor of every New England state changed.

Under my proposal, (75a) would have the same structure as (71), the only difference being that the internal argument of *governor* is bound by *a New England state* rather than EX.¹⁴

This proposal bears a close resemblance to Karttunen’s (1977) analysis of interrogative clauses. Karttunen proposed that propositions are turned into questions (i.e., sets of propositions) via the interaction of an operation he called the proto-question rule and the meaning of *wh*-phrases. The proto-question rule is nothing but an instantiation of IDENT_α , namely IDENT_{st} ,¹⁵ and, as such, it always yields singleton sets of propositions if used by itself. Multiple alternatives can be generated, however, once an existential quantifier — the *wh*-phrase — binds a variable within the scope of IDENT_{st} from outside:

- (76) $[\text{CP who } \lambda_x [\text{C}' \text{IDENT}_{st} \wedge [t_x \text{ came}]]]$
 (77) a. $\llbracket \text{C}' \rrbracket^{g,t} = \lambda p. p = \text{came}(x)$
 b. $\llbracket \text{CP} \rrbracket^{g,t} = \lambda p. \exists x. p = \text{came}(x)$

The fact that we can use polymorphic IDENT_α and existential quantifiers to generate sets of elements other than propositions is explicitly explored in Charlow 2019 to account for the scope of indefinites. Particularly relevant is Demirok (2019), who uses Charlow’s theory to interpret DPs such as *whose dog* as sets of individual concepts. This suggests rather than being specific to sentences with *change*, these mechanisms are very general and seem to be relevant to other aspects of natural language semantics.

5.3 Sentences with *book*

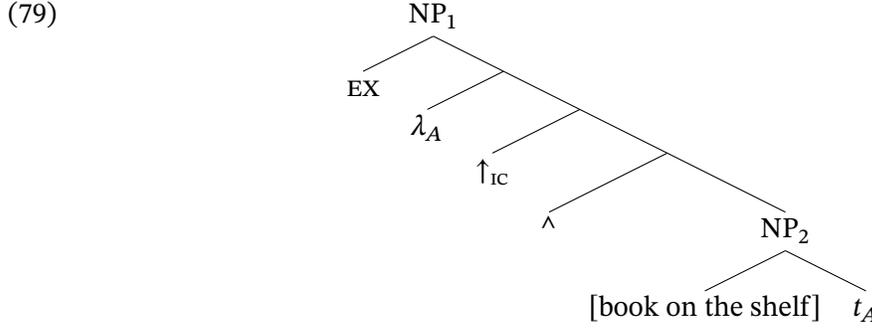
We now turn to set change interpretations of sentences such as (78). Both strategies we’ve seen so far will fail: applying \uparrow_{IC} directly to *book on the shelf* yields a singleton set, and, since *book on the shelf* is not a relational noun, there is no internal argument for EX to bind.

- (78) Every book on the shelf changed.

¹⁴Nathan (2006) reports that sentences like (75a) are odd and lack pointwise change interpretations, but I’ve been unable to find speakers that agree with these judgments. It is possible that Nathan’s judgments are due to some preference of interpreting the indefinite outside of its host DP.

¹⁵This is not completely accurate, as Karttunen took interrogatives to denote sets of *true* propositions. In my exposition of Karttunen 1977, I thus follow Hamblin 1973 in taking questions to denote sets of all possible answers. This does not bear on the present discussion, however.

I propose that we can account for these sentences without introducing any new operators. The idea is to have EX bind a trace of types other than e : specifically, in the LF in (79), it binds an trace of type et , which is interpreted as a modifier, in the sense that it composes with *book on the shelf* via Heim and Kratzer’s (1998) *Predicate Modification* (i.e., via intersection).



The interpretation proceeds as shown in (80) and (81), where $\mathbf{the}_A(P)$ should be read as ‘the concept *the unique P in A*.’ The resulting predicate of ICs is thus true of any IC of the form *the unique book on the shelf in A*, for some set of individuals A .

(80) $\llbracket \uparrow_{IC} \rrbracket^t(\llbracket \text{NP} \rrbracket^c) = \lambda u. u = \mathbf{the}_A(\text{book.shelf})$ where $\mathbf{the}_A(P) = (\lambda i. \lambda x. P(x)(i) \wedge x \in A)$

(81) $\llbracket \text{NP}_1 \rrbracket^t = \lambda u. \exists A. u = \mathbf{the}_A(\text{book.shelf})$

Admittedly, these are rather odd concepts, but they are the right objects to derive set change. Here are a couple of concrete examples:

(82) a. $\lambda i. \lambda x. \text{book.shelf}(x)(i) \wedge x \in \{a\}$ $\Leftrightarrow \mathbf{the}_{\{a\}}(\text{book.shelf})$
b. $\lambda i. \lambda x. \text{book.shelf}(x)(i) \wedge x \in \{a, b\}$ $\Leftrightarrow \mathbf{the}_{\{a,b\}}(\text{book.shelf})$

The first maps any t to A if A is a book on the shelf at t and is undefined otherwise. Such concepts can never change, since there’s a unique individual that they can map indices to. More interesting is the second kind of concept, which maps any index t to A when A is a book on the shelf and B isn’t, to B when B is a book on the shelf and A isn’t, and is undefined otherwise. Unlike (82a), these concepts can change, but under only one condition: if (82b) picks out book A in t_1 , it can only pick out B in t_2 if A is no longer a book on the shelf at that index. This is due to the uniqueness presupposition of IOTA, and, as we will see, it is also the source of the restrictiveness associated with set change readings.

Consider the following sentences again, from § 4.1:

- (83) *Scenario.* My shelf fits exactly four books. On Monday, the books on my shelf were A, B, C, and D in this order. On Tuesday, the books on my shelf were B, E, F in this order.
- a. Exactly two_D books on my shelf changed. *true*
b. Exactly three_D books on my shelf changed. *false*

Here’s a possible value for D which would yield the attested judgments:

(84) $\{ \mathbf{the}_{\{a,e\}}(\text{book.shelf}), \mathbf{the}_{\{c,f\}}(\text{book.shelf}), \mathbf{the}_{\{b\}}(\text{book.shelf}), \mathbf{the}_{\{d\}}(\text{book.shelf}) \}$

The first two concepts change referent from Monday to Tuesday, the third picks out *b* on both days, and the fourth is only defined on Monday. Thus, it is true that exactly two members of *D* changed and it is false that exactly three did.

The above shows that our analysis of *book on the shelf* can yield the attested interpretation of the sentences in (83). But does it predict unattested readings? The first potential issue is “over-counting:” if *D* was resolved to (85), we would predict that it would be possible to count three rather than two changing books.

$$(85) \{ \mathbf{the}_{\{a,e\}}(\text{book.shelf}), \mathbf{the}_{\{c,f\}}(\text{book.shelf}), \mathbf{the}_{\{b\}}(\text{book.shelf}), \mathbf{the}_{\{d,e\}}(\text{book.shelf}) \}$$

As discussed in § 4.1, these readings can be ruled out by requiring the silent domain restrictor of determiners to obey Gupta’s (1980) non-overlap condition, repeated below.

$$(86) \mathbf{NO}(U) := \forall u, v \in U. (\exists t \in \text{dom}(u) \cap \text{dom}(v). u(t) = v(t)) \rightarrow u = v$$

More pressing is whether the proposal predicts *every book on the shelf changed* to be true in a reorganizing scenario — say, the shelf goes from ABC to BCA. To derive such a reading, we would need an IC that picks out book A at t_1 and book B at t_2 . The natural candidate is $\mathbf{the}_{\{a,b\}}(\text{book.shelf})$, but this concept is undefined at t_1 since both books A and B are books on the shelf then. No concept in (81) can thus pick out book A at t_1 and book B at t_2 , and the unattested reading is correctly blocked.

Another way to show that the analysis yields set change is that the concepts in (81) are both property and identity preserving relative to *book on the shelf* (the definitions are repeated below). It is straightforward to see that they satisfy property preservation: for any *A*, *the book on the shelf in A* will necessarily refer to a book on the shelf. Moving on to identity preservation, suppose that for some *A* *the unique book on the shelf in A* refers to an individual *x* at t_1 , and that *x* that is among the books on the shelf at t_2 . Then, if this concept is defined in t_2 , it has to refer to *x*, since *x* is a book on the shelf then and is also a member of *A*.

$$(87) \mathbf{PropPres}(N)(u) := \forall i \in \text{dom}(u). u(i) \in N(i)$$

$$(88) \mathbf{IdentPres}(N)(u) := \forall t_1, t_2 \in \text{dom}(u). u(t_2) \in N(t_1) \rightarrow u(t_1) = u(t_2)$$

Because the proposal derives an interpretation for NPs as sets of concepts whose members are all property and identity preserving concepts, we can conclude that it correctly derives set change (once we also require silent restrictors to be non-overlapping).¹⁶

We can now derive both the pointwise and set change interpretations of a sentence such as (89). We get pointwise change when EX binds the internal argument across \uparrow_{IC} , as shown in (89a). We get set change when one EX binds the internal argument under the scope of \uparrow_{IC} , but another binds a modifier from above, as in (89b).

$$(89) \text{ Exactly three governors changed.}$$

¹⁶An apparent challenge to the present analysis is that the sentence *every book changed* can be used to convey that every book *that is on the shelf* changed. This is standardly accounted via the silent domain restriction of determiner (von Stechow 1994), but the problem here is that the property of being on the shelf must be a part of the concepts themselves. That is, we don’t want *every book changed* to be true only if everything that was a book ceases to be a book. The solution to this issue is simple: we allow the \uparrow_{IC} -operator itself to have a silent domain restrictor (IOTA, more specifically). For readability, I omit this variable from the formulas in the main text.

- a. $\text{EX } \lambda_x \uparrow_{\text{IC}} \wedge [\text{governor } t_x]$
- b. $\text{EX } \lambda_A \uparrow_{\text{IC}} \wedge [[\text{EX governor}] t_A]$

It is possible to account for these data without resorting to quantification over objects of type *et*. An alternative analysis would be to postulate an extra silent operator \leq_{AT} , which relates pluralities to their atomic parts. Then, we could derive the same set of ICs as follows:

- (90) a. $\text{EX } \lambda_x \uparrow_{\text{IC}} [[\text{book on the shelf}] [\leq_{\text{AT}} t_x]]$
- b. $\lambda u. \exists z. u = (\lambda i. \iota x. \text{book.shelf}(x)(i) \wedge x \leq_{\text{AT}} z)$

The equivalence of the two implementations follows from the fact that, for any non-empty set of atomic individuals X , there is some individual z such that $X = \{ y \mid y \leq_{\text{AT}} z \}$.

I conclude this subsection by pointing out a crucial assumption of the proposal. For set change to be derived, we must assume that EX can only bind traces of an extensional type. To see the problem, suppose that it can leave a trace of type *set*, as shown in (91), yielding the predicate of ICs in (92).

- (91) $\text{EX } \lambda_{\mathcal{A}} \uparrow_{\text{IC}} [\wedge [\text{book on the shelf}] t_{\mathcal{A}}]$
- (92) $\lambda u. \exists \mathcal{A}. u = (\lambda i. \iota x. \text{book.shelf}(x)(i) \wedge x \in \mathcal{A}(i))$

The predicate in (92) is not composed exclusively of identity preserving concepts. For example, a possible value for \mathcal{A} would be the property *be on the leftmost position*, which means that the concept *the unique book on the shelf that is in the leftmost position* is a member of (92). Therefore, structures like (91) must be blocked. I assume, then, that EX is restricted to binding traces of extensional type—a stipulation I leave for future work to derive from independent principles.

5.4 Sentences with *senator*

Finally, I discuss the mixed interpretation of sentences with *senator*:

- (93) Every senator changed.

Using our strategy for *governor*, illustrated in (94), would yield a set of concepts that are only defined for states with a unique senator. If instead we use our strategy for *book on the shelf*, illustrated in (95a), we would get full set change, failing to account for the fact that (93) can be true when every pair of senators swapped positions.

- (94) a. $\text{EX } \lambda_z [\uparrow_{\text{IC}} \wedge [\text{senator } t_z]]$
- b. $\lambda u. \exists z. u = \mathbf{the}(\text{senator}(z))$
- (95) a. $\text{EX } \lambda_A [\uparrow_{\text{IC}} \wedge [[\text{EX senator}] t_A]]$
- b. $\lambda u. \exists A. u = \mathbf{the}_A([\text{EX senator}]_{\clubsuit})$

The solution is to combine both strategies, i.e., an LF with two EX operators taking scope over \uparrow_{IC} . This is shown in (96). The resulting predicate is true of any concept of the form *the senator of z that is in A* , for some individual z and set of individuals A .

- (96) a. $\text{EX } \lambda_A \text{EX } \lambda_z [\uparrow_{\text{IC}} \wedge [[\text{senator } t_z] t_A]]$

	Maine		Vermont	
	Sn.	Jr.	Sn.	Jr.
2025	Ann	Beth	Cleo	Deb
2026	Beth	Cleo	Deb	Ann

Table 3: The senators of Maine and Vermont in 2025 and 2026

- b. $\lambda u. \exists A. \exists z. u = \mathbf{the}_A(\text{senator}(z))$

Consider the scenario on Table 3, where each of Ann and Cleo becomes the junior senator of the state they were previously the senior senator of. In this scenario, we can truthfully say (97a), but not (97b).

- (97) a. Two_D senators changed. *true*
b. Four_D senators changed. *false*

Assuming that D resolves to the set of concepts in (98) yields the correct judgments of the sentences in (97). They allow us to consider Ann and Cleo swapping positions as a change, but Beth’s promotion from junior to senior senator of Maine is not counted.

- (98) a. $\mathbf{the}_{\{\text{ann,cleo}\}}(\text{senator}(\text{maine}))$
b. $\mathbf{the}_{\{\text{beth}\}}(\text{senator}(\text{maine}))$
c. $\mathbf{the}_{\{\text{ann,cleo}\}}(\text{senator}(\text{vermont}))$
d. $\mathbf{the}_{\{\text{deb}\}}(\text{senator}(\text{vermont}))$

Sentence (97b) would only be true if we had one concept that picked Ann on 2025 and Beth on 2026. Our best candidate would be $\mathbf{the}_{\{\text{ann,beth}\}}(\text{senator}(\text{maine}))$, but this concept is undefined in 2025. This confirms that mixed reading of sentences with non-functional relational nouns follows from the interaction of the two EX operators, without any additional machinery.

5.5 A note on pointwise change with non-relational nouns

Sometimes, NPs headed by non-relational nouns will yield pointwise change. Consider the following scenario. Suppose that a linguistic department’s lounge has three paintings. Each of these paintings is chosen by a special committee: the leftmost painting is chosen by the syntacticians in the department, the middle one is chosen by the semanticists in the department, and the rightmost one is chosen by the phonologists in the department. Each of these committees makes their choice independently. Suppose that things are as described in Table 4. Some speakers I consulted agree that the following is true:

- (99) This year, every painting on the wall changed.

I propose a simple solution to cases such as this. It is well known that non-relational nouns can be type-shifted into relational nouns (again, see Barker 2011 for an overview). I assume that this is done by the silent operator π which introduces a contextually salient relation R :

- (100) $\llbracket \pi_R \rrbracket^t := \lambda x. \lambda y. R(x)(y)(t)$

	last year	this year
Painting chosen by syntacticians	A	B
Painting chosen by semanticists	B	D
Painting chosen by phonologists	C	A

Table 4: Lounge paintings scenario

	2025	2026
Linguistics & Philosophy	Ann	Ann
Natural Language Semantics	Beth	Ella
Semantics & Pragmatics	Cleo	Flo
Journal of Semantics	Deb	Ella

Table 5: Journal editor scenario

The idea is that in cases like this, the context provides a salient relation R that allows pointwise change to be derived as for *governor*:

$$(101) \quad \text{EX } \lambda_x \uparrow_{\text{IC}} \wedge [[\text{painting on the wall}] [\pi_R t_x]]$$

Thus, in a nutshell (99) is interpreted as *every committee’s painting on the wall changed*.

6 Further refinements

In this section, I address some further empirical and theoretical issues raised by the proposal. The subsections are largely independent of each other: § 6.1 focuses on the non-overlap condition; § 6.2 discusses quantification over “concepts of individual concepts;” and § 6.3 analyzes an ambiguity identified by Kaufmann in Schwager (2007).

6.1 On non-overlap

So far, I have been assuming that the domain of quantification of quantifiers is subject to the non-overlap condition in (102), from Gupta 1980. The problem, however, is that this condition is in fact too strong—specifically, it blocks some attested pointwise change interpretations.

$$(102) \quad \mathbf{NO}(U) := \forall u, v \in U. (\exists t \in \text{dom}(u) \cap \text{dom}(v). u(t) = v(t)) \rightarrow u = v$$

Consider the scenario described in Table 5 where three out of four journals had their editors replaced (for convenience, let us assume that every journal has a single editor). Under these circumstances, it is possible to truthfully utter the following sentence:

$$(103) \quad \text{Three journal editors changed from 2025 to 2026.}$$

The issue is that our non-overlap condition would rule this out: because Ella is the editor of both *Natural Language Semantics* and of *Journal of Semantics* in 2026, the two concepts *the editor of Natural Language Semantics* and *the editor of the Journal of Semantics* are overlapping. Thus,

non-overlap would not allow both of them to be in the same domain of quantification and (103) would come out as false.

It is important to contrast (103) from the cases which motivated non-overlap to begin with. Consider (104), for example: if we allow for two concepts to pick out painting C on Tuesday, we would be able to count two rather than one changing picture.

(104) *Scenario*: On Monday, there are two paintings on the wall: A and B. On Tuesday, there is only one painting on the wall, where painting A was: C.

Two paintings on the wall changed. *false*

It is in fact possible to formally distinguish the two kinds of overlap. To do this, let us compare two pairs of concepts: (105) is the one we want to ban from the domain of quantifiers, and (106) is the one we want to allow.

(105) a. **the**_{a,c}(painting.wall)

b. **the**_{b,c}(painting.wall)

(106) a. **the**(editor(nls))

b. **the**(editor(jos))

The key difference is that, under certain conditions, one can infer the reference of one concept in (105) from the reference of the other. Specifically, in all those worlds in which (105a) refers to painting C, (105b) either refers to painting C as well or is undefined. Furthermore, in all those worlds in which (105a) refers to painting A, (105b) either refers to painting B or is undefined. There's no such dependency between the concepts in (106): the editor of *Natural Language Semantics* being Ella says nothing about who the editor of the *Journal of Semantics* is.

It is possible to state a condition that blocks any domain U from having this kind of unacceptable overlap:

(107) $\forall u, v \in U. u \neq v \rightarrow \neg \exists x. \forall t \in \text{dom}(u) \cap \text{dom}(v). u(t) = x \leftrightarrow v(t) = x$

This above condition states that there can be no individual x such that u and v always agree on whether they refer to x . Nonetheless, such a condition seems rather arbitrary and tailored specifically to the data at hand. Unlike non-overlap, which also has application in domains such as counting, (107) seems too specific to the present problem.

Accounting for the nature of this constraint goes beyond the scope of the present paper. However, I would like to suggest a different way of approaching the problem: I propose that instead of focusing on properties of sets of concepts, we would be looking at propositions.

Consider the following two propositions, which we get by composing *change* with our two offending concepts in (105):

(108) a. $\lambda i. \llbracket \text{change} \rrbracket^i(\mathbf{the}_{\{a,c\}}(\text{painting.wall}))$

b. $\lambda i. \llbracket \text{change} \rrbracket^i(\mathbf{the}_{\{b,c\}}(\text{painting.wall}))$

Consider an index i such that both propositions above are defined. Now, suppose (108a) is true at i . Then, i is an index in which only one of A and C is a painting on the wall at the beginning of i , and then only the other one of them is a painting on the wall at the end of i . Crucially, from

this we can infer that (108b) is also true: since C is only a painting on the wall at the beginning or at the end of i , then $\mathbf{the}_{\{b,c\}}$ (painting.wall) must also have changed (it can't be undefined because we assume that both propositions are defined at i). If we had instead assumed that (108a) was false at i , then we would also have assumed that (108b) was false, by the same reasoning. This discussion shows that the two propositions have the same truth value at indices in which they are both defined, which means they are always contextually equivalent.

This issue doesn't arise with non-overlapping contexts. For example, there are indices in which both propositions in (109) are defined and yet only one of them is true. For example, perhaps A and C swapped, but B remained in place.

- (109) a. $\lambda i. \llbracket \text{change} \rrbracket^i(\mathbf{the}_{\{a,c\}}(\text{painting.wall}))$
 b. $\lambda i. \llbracket \text{change} \rrbracket^i(\mathbf{the}_{\{b,d\}}(\text{painting.wall}))$

Similarly, there are also indices in which both propositions in (110) are defined but only one of them is true. For example, if we know that Ella is the editor of both Natural Language Semantics and the Journal of Semantics, the sentence *the editor of Natural Language Semantics changed* is logically independent from *the editor of the Journal of Semantics changed*.

- (110) a. $\lambda i. \llbracket \text{change} \rrbracket^i(\mathbf{the}(\text{editor}(\text{nls})))$
 b. $\lambda i. \llbracket \text{change} \rrbracket^i(\mathbf{the}(\text{editor}(\text{jos})))$

The discussion above shows that, perhaps, the issues with overlapping contexts is that they give rise to contextually equivalent propositions— however, note that it also relied on the concepts in (108) being restricted by a set with only two members. This suggests the possibility that perhaps our over-counting cases are ruled out by some general principle of redundancy avoidance. The idea would be to rule out sentences of the form '[$every_D$ NP] VP' whenever there are two elements of D such that applying the denotation of VP to them yield equivalent propositions. I leave a full derivation of this condition from more general pragmatic principles for future research.

6.2 Concepts of individual concepts

The main text has focused exclusively on the issue of quantification over concepts. However, in the literature on concealed questions and specificational sentences (Heim 1979, Romero 2005), it has been argued that sometimes we also need to deal with entities that are even more complex: functions from indices to individual concepts (i.e., type *sse*), or also called concepts of individual concepts. In this section, I show how my proposal can easily be generalized to these cases. Although I draw extensively from Romero 2005, the data in this section has not been discussed elsewhere, as far as I am aware.

We have seen in § 2.2 that the predicate *unpredictable* appears to be a predicate of ICs in constructions such as (111). A simple analysis of this data is given in (111): the subject denotes the unique relevant price whose value is unpredictable, and *change* takes that concept as its argument. Suppose that we are in a context in which the price of milk is unpredictable, then (111) is going to be true if yesterday the price of milk was \$4 and today it is \$5.

- (111) The unpredictable price changed.

- (112) a. the_{se} [unpredictable [EX λ_z ↑_{IC} ^[price z]]] changed
 b. [[changed]]^t(u. [[unpredictable]]^t(u) ∧ ∃z. u = **the**(price(z)))

Sentence (111) has, however, another reading. Suppose I own a vegetable stand where the price of tomatoes is the unique unpredictable price. One day, I start growing my own tomatoes, and their price stabilizes— but now the price of potatoes, which I’ve stopped growing, becomes unpredictable. In this scenario, *the unpredictable price changed* would be true because the price of tomatoes was the unpredictable price but now the price of potatoes is. Thus, *change* can sometimes be used to compare individuals at two different points in time, but it can also be used to compare concepts at two different points in time.

My solution to this puzzle is essentially the one in Romero 2005 for concealed questions and specificational sentences. First, I assume that *change* is polymorphic:

$$(113) \quad \llbracket \text{change}_{s\alpha} \rrbracket^t = \lambda f. f(t_{\text{beg}}) \neq f(t_{\text{end}}) \quad (s\alpha)t$$

In (111), we are dealing with *change_{se}*, which tracks individuals across time, but for our new reading of (111), we will need *change_{sse}*.

To account for this other reading, all we need is for *change_{sse}* to compose with the *intension of the unpredictable price*. This is shown below:

$$(114) \quad \begin{aligned} \text{a. } & \llbracket \text{the}_{se} [\text{unpredictable} [\text{EX } \lambda_z \uparrow_{IC} \wedge [\text{price } z]]] \rrbracket \text{ changed}_{sse} \\ \text{b. } & \llbracket \text{changed}_{sse} \rrbracket^t(\lambda i. u. \llbracket \text{unpredictable} \rrbracket^t(u) \wedge \exists z. u = \mathbf{the}(\text{price}(z))) \\ & \Leftrightarrow (u. \llbracket \text{unpredictable} \rrbracket^{t_{\text{beg}}}(u) \wedge \exists z. u = \mathbf{the}(\text{price}(z))) \\ & \quad \neq (u. \llbracket \text{unpredictable} \rrbracket^{t_{\text{end}}}(u) \wedge \exists z. u = \mathbf{the}(\text{price}(z))) \end{aligned}$$

This is exactly the reading that was described: for some interval *t*, the concept that was unpredictable at the beginning of *t* was *the price of tomatoes* but the concept that is unpredictable at the end of *t* is *the price of potatoes*.

The above analysis is quite simple: we didn’t need to introduce any new machinery other than a polymorphic meaning for *change*. As we learned in § 2.2, however, things get more complex when we look into quantified sentences. Suppose a scenario similar to the one above, but the prices of tomatoes, carrots and onions were all unpredictable, and after a change in my farm, the unpredictable prices are the prices of potatoes, yam and eggplants. I could then say:

- (115) Every unpredictable price changed.
 ≈ *every price concept that was unpredictable was replaced by some price concept that wasn’t*

The above appears to be a set change interpretation of quantification over concepts of concepts.

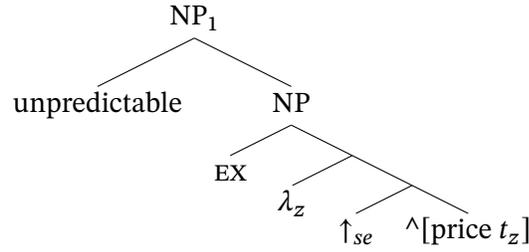
I propose that we can account for these readings if we generalize the meaning of ↑_{IC} itself, which I henceforth refer to as ↑_{sα}.

$$(116) \quad \llbracket \uparrow_{s\alpha} \rrbracket^t = \lambda N. \llbracket \text{IDENT}_{s\alpha} \rrbracket^t(\lambda i. \llbracket \text{IOTA}_{\alpha} \rrbracket^t(N(i))) \quad (s\alpha t)(s\alpha)t$$

Thus, while ↑_{se} creates predicates of ICs from predicates of individuals, ↑_{sse} creates predicates of concepts of concepts from predicates of ICs.

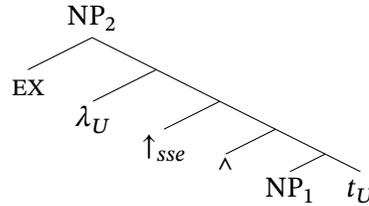
To analyze (115), we first shift *price* into a predicate of ICs so that it can be modified by *unpredictable*, as we have already seen. We then get the predicate of ICs in (118).

(117)

(118) $\llbracket \text{NP}_1 \rrbracket^t = \lambda u. \llbracket \text{unpredictable} \rrbracket^t(u) \wedge \exists z. u = \text{the}(\text{price}(z))$

Our goal now is to derive a set change interpretation for quantification over concepts of concepts. Thus we will use the same strategy for set change presented in § 5.3, but with higher types. This is shown in (119), where U is a trace of type $(se)t$, i.e., U is a set of individual concepts.¹⁷

(119)



The structure in (119) is then interpreted as (120): the set of all concepts of concepts that map an index i to the price concept that is unpredictable at i and is in the set U , where U is a set of concepts. A possible value for U , then is the set containing the concepts *the price of tomatoes* and *the price of potatoes*. The concept of concepts built with such a value for U would yield *the price of tomatoes* when *the price of tomatoes* is unpredictable but the *the price of potatoes* isn't, and vice versa.

(120) $\llbracket \text{NP}_2 \rrbracket^t = \lambda c. \exists U. c = (\lambda i. \lambda u. \llbracket \text{unpredictable} \rrbracket^i(u) \wedge \exists z. u = (\mathbf{the}(\text{price}(z))) \wedge u \in U)$

For readability, we can simplify the above formula as follows:

(121) $\llbracket \text{NP}_2 \rrbracket = \lambda c. \exists U \subseteq \{ \mathbf{the}(\text{price}(z)) \mid z \in D \}. c = (\lambda i. \lambda u. \llbracket \text{unpredictable} \rrbracket^i(u) \wedge u \in U)$

With this denotation for NP_2 we can derive the desired interpretation of (115). All we need is to assume that the domain of quantification contains the following concepts of concepts:

- (122) a. $\lambda i. \lambda u. \llbracket \text{unpredictable} \rrbracket^i(u) \wedge u \in \{ \mathbf{the}(\text{price}(\text{tomato})), \mathbf{the}(\text{price}(\text{potato})) \}$
 b. $\lambda i. \lambda u. \llbracket \text{unpredictable} \rrbracket^i(u) \wedge u \in \{ \mathbf{the}(\text{price}(\text{carrot})), \mathbf{the}(\text{price}(\text{yam})) \}$
 c. $\lambda i. \lambda u. \llbracket \text{unpredictable} \rrbracket^i(u) \wedge u \in \{ \mathbf{the}(\text{price}(\text{onion})), \mathbf{the}(\text{price}(\text{eggplant})) \}$

For example, before I made changes to my farm, (122a) would point to *the price of tomato*, but now it points to *the price of potato*. Since each concept of concepts in this set changes its reference, (115) is predicted to be true.

The analysis in this subsection may seem complex, but it illustrates that the proposal in §5 scales naturally to higher types without any new theoretical machinery.

¹⁷Note that this doesn't violate our constraint against EX binding intensional types: $(se)t$ is a set of intensional individuals but it isn't itself an intensional type.

SCENARIO I	Today	Tomorrow	SCENARIO II	Today	Tomorrow
Almond Milk	\$4	\$5	Almond Milk	\$4	\$6
Oat Milk	\$5	\$4	Oat Milk	\$5	\$5

Table 6: Two price situations

6.3 Kaufmann's ambiguity

Kaufmann in Schwager (2007) observes an ambiguity in sentences in which the subject of an intensional VP is modified. Consider (123):

- (123) The highest price will remain the same.
- a. *Reading A:*
The highest price today is n and the future highest price is also n .
 - b. *Reading B:*
The price of some z is the highest price today, and the price of z will change.

To help us differentiate both readings, consider the scenarios on Table 6. In scenario I, only reading A is satisfied: the highest price today is \$5 and the highest price tomorrow is still \$5. In scenario II, only reading B is satisfied: the highest price today is the price of oat milk and the price of oat will remain the same tomorrow.

Under my current proposal this ambiguity can be resolved as a matter of the relative scope between *highest* and \uparrow_{IC} . Reading A is derived by having \uparrow_{IC} scope over *highest price*:

- (124) a. $the_{se} [\uparrow_{IC} \wedge [highest [price EX]]]$
b. $uu. u = the(highest.price)$

To derive the Reading B, we must first have a way to interpret *highest* as predicate of IC. Although this is not a trivial matter, it will be sufficient for our discussion to assume that there is a way to shift the (simplified) meaning of *highest* in (125a) into the predicate of ICs in (125b) without going into the details of how exactly this is done.

- (125) a. $[[highest]^t = \lambda f. \lambda x. f(x) \wedge \forall y \in f. y \neq x \rightarrow x > y]$
b. $[[highest_{IC}]^t = \lambda U. \lambda u. U(u) \wedge \forall v \in U. u \neq v \rightarrow u(t) > v(t)]$

With $highest_{IC}$, we can account for Reading B by having it outscope \uparrow_{IC} :

- (126) a. $the_{se} [highest_{ic} [EX \lambda_z \uparrow_{IC} \wedge [price z]]]$
b. $uu. \exists z. u = \mathbf{the}(price(z)) \wedge \forall y. y \neq z \rightarrow u > \mathbf{the}(price(y))$

The above description yields the concept of the form *the price of α* whose value at the index of evaluation is greater than the value of any other concept of this form. Thus, when the highest price is the price of oat milk, *the highest price remained the same* will have the same denotation as *the price of oat milk remained the same*.

Sentence (123) has also the reading that was discussed in the previous section, which involves concepts of individual concepts. Suppose that every price will rise (and hence change), but the highest price today is the price of almond milk and tomorrow it will also be the price of almond

milk. We can say, then, that the highest price will remain the same: it will still be the price of almond milk. We can derive this reading by allowing *remain the same* to compose with the intension of (126b). The existence of this reading further supports the scopal account proposed here: it can only be neatly derived if *the highest price* can actually be interpreted as (126b).

7 Previous proposals

In this final section of the paper, I discuss three previous accounts of Nathan’s observation: Nathan 2006, Frana 2013, 2017, and Schwager 2007, in this order, as Frana’s account is an extension of Nathan’s.

7.1 Nathan 2006

Nathan’s (2006) primary concern is the semantics of *concealed questions* (Baker 1968), i.e., DPs that can be paraphrased by embedded questions (e.g., *my favorite movie is obvious* \approx *it’s obvious what my favorite movie is*). In developing his account, Nathan observed that the interpretation of sentences of the form ‘[Det NP] *changed*’ is sensitive to whether NP is headed by a relational noun — a structural distinction that is also relevant for concealed questions: relational nouns license concealed question readings much more readily than sortal nouns (*Ann guessed the capital of France* vs. *??Ann guessed the book*). This partly motivates his proposal that pointwise and set change readings are derived via two different type-shifting operations, one for each kind of noun. However, when focusing on sentences with *change*, this proposal is not fully satisfactory: there is no principled reason why relational and sortal nouns should require different operations, nor why those operations should yield the interpretations they do.

In (127), I present the first of Nathan’s type-shifters, which I call IC_N . This operator takes the intension of a relational noun R and returns the set of concepts which, in my terminology, are all property preserving relative to $R(z)$, for some z . I illustrate in (128) the result of applying IC_N to *governor*: the set of any IC u such that, for some z , u is necessarily the governor of z .

$$(127) \quad \llbracket IC_N \rrbracket^t = \lambda R. \lambda u. \exists z. \forall i \in \text{dom}(u). R(i)(z)(u(i)) \quad (\text{seet})(\text{se})t$$

$$(128) \quad \llbracket IC_N \rrbracket^t(\llbracket \text{governor} \rrbracket_c) = \lambda u. \exists z. \forall i \in \text{dom}(u). \text{governor}(z)(u(i))(i)$$

My account of pointwise change owes to Nathan the insight that pointwise change is generated by having existential closure to take scope over quantification over worlds. A difference between our proposals, however, is that while Nathan packages both operations into a single operator, I take one to be performed by \uparrow_{IC} and the other by EX. An advantage of my proposal comes from the aforementioned fact that pointwise change interpretations are possible when the argument of the relational noun is overtly realized by an indefinite:¹⁸

$$(129) \quad \text{Every governor from a New England state changed.} \\ \approx \text{every New England state had their governor replaced}$$

A more pressing issue is the mixed readings with non-functional relational nouns, such as *senator*. Applying IC_N to *senator*, yields the predicate in (130) which is true of concepts such

¹⁸See Frana 2017 for a solution to this puzzle in which the indefinite in such sentences is interpreted as a predicate rather than a quantifier.

as *the taller senator of Massachusetts* or *the senior senator of Vermont*. As we have discussed, allowing such concepts into the domain of *every senator* would yield unattested interpretations.

$$(130) \quad \llbracket \text{IC}_N \rrbracket^t(\llbracket \text{senator} \rrbracket_{\text{c}}) = \lambda u. \exists z. \forall i \in \text{dom}(u). \text{senator}(z)(u(i))(i)$$

The issue is simple: IC_N only enforces property preservation, but identity preservation is needed for non-functional relational nouns.

Set change is derived by a different operator, which applies to properties of individuals and is sensitive to a contextually supplied relation R :

$$(131) \quad \llbracket \text{IC}_{N_2} \rrbracket^t(R) = \lambda N. \lambda u. \exists z. \forall i \in \text{dom}(u). N(i)(u(i)) \wedge R(i)(z)(u(i)) \quad (\text{set})(\text{set})t$$

Crucially, IC_{N_2} is not completely unrelated to IC_N . This is shown by the fact that it can be defined in terms of the IC_N . This highlights the fact that, in a way, IC_{N_2} can be thought of involving two steps: first the sortal noun is turned into a relational noun, then it is shifted into a predicate of ICs via IC_N .

$$(132) \quad \llbracket \text{IC}_{N_2} \rrbracket^t(R) = \lambda N. \llbracket \text{IC}_N \rrbracket^t(\lambda i. \lambda z. \lambda x. N(i)(x) \wedge R(i)(z)(x))$$

By itself, (131) doesn't yield set change interpretations. Nathan therefore proposes that R is subject to different constraints, illustrated here in (133). Although (132) coupled with these constraints yield the desired interpretations, it leaves unanswered the questions of where these constraints come from. Note, for example, that although sortal nouns can be shifted into relational nouns sensitive to a contextually given relation, such a relation is not subject to the same constraints as (133).

$$(133) \quad \begin{array}{l} \text{a. } \forall t_1, t_2. \forall x. N(t_1)(x) \wedge N(t_2)(x) \rightarrow \exists y. R(t_1)(y)(x) \wedge R(t_2)(y)(x) \\ \text{b. } \forall i. \forall x \in N(i). \exists y. R(i)(y)(x) \wedge \forall z. R(i)(z)(x) \leftrightarrow y = z \\ \text{c. } \forall i. \forall y. \forall x, z \in N(i). (R(i)(y)(x) \wedge R(i)(y)(z)) \leftrightarrow y = z \end{array}$$

7.2 Frana (2013, 2017)

Accounting for Nathan's observation is also not among the main goals of Frana (2013, 2017), as she is also primarily concerned with concealed questions. However, Frana argues in passing that her proposal can be extended to account for Nathan's observation. In this subsection, I argue against this conclusion. It should be noted, however, that the main problem I raise is mostly related to the analysis of sentences with *change* and is not problematic for her analysis of concealed questions.

Frana's proposal is in a sense an extension of Nathan's: she adopts his account of pointwise change interpretations (i.e., IC_N) in full. One of her key innovations is an alternative method of generating set of ICs. Her proposal is framed within the Copy Theory of Movement (Chomsky 1995, Fox 2002) and in fact does not involve direct quantification over concepts.¹⁹ For ease of exposition, I present a notational variant of her proposal in which NPs are interpreted as predicates of ICs via the following operator:

¹⁹More specifically, Frana's actual proposal relies on a modified version of the rule of *trace conversion* of Fox 2002. Frana takes advantage of the fact that under this proposal traces don't have trivial intensions to avoid the need of quantification over ICs.

$$(134) \quad \llbracket \text{IC}_F \rrbracket = \lambda N. \lambda u. \exists z. u = (\lambda i. \iota x. N(i)(x) \wedge x = z) \quad (\text{set})(\text{set})t$$

This operator yields predicates that are a proper subset of the of the predicates my proposal generates for non relational nouns. For example, when applied to *book on the shelf*, IC_F yields the predicate of concepts in (135a). My proposal, on the other hand, yields (135b).

$$(135) \quad \begin{array}{l} \text{a. } \lambda u. \exists z. u = \mathbf{the}_{\{z\}}(\text{book.shelf}) \\ \text{b. } \lambda u. \exists A. u = \mathbf{the}_A(\text{book.shelf}) \end{array}$$

The problem of the proposal is lies in the concepts not present in (135a)—namely, the concepts that can change, such as $\mathbf{the}_{\{a,b\}}(\text{book.shelf})$. A possible solution to this challenge would be to remove the presuppositions I proposed to be triggered by *change*: therefore a concept such as $\mathbf{the}_{\{a\}}(\text{book.shelf})$ would be able to change whenever A ceases to be a book on shelf.²⁰ The problem, however, is that now we can no longer distinguish cases in which a book on the shelf changed from cases in which a book on the shelf is removed.

However, as discussed in § 5.3, it is possible to slightly modify Frana’s proposal into my own proposal. All we need is to change the identity relation to the parthood relation:

$$(136) \quad \llbracket \text{IC}'_3 \rrbracket = \lambda N. \lambda u. \exists z. u = (\lambda i. \iota x. N(i)(x) \wedge x \leq z) \quad (\text{set})(\text{set})t$$

In fact, Fox and Johnson 2016 offer an alternative method for interpreting lower copies that would possibly end up making available the same set of ICs as (136). Therefore, it is possible that the Copy Theory analysis of set change could have the same coverage as my analysis. I leave it as an open question whether such a proposal would be as general as my own, and whether it would also be able to account for mixed interpretations.

I conclude by pointing out that Frana also observes that Nathan’s IC_N cannot be used with non-functional relational nouns. She then proposes one more type shifting which yields a predicate of pairs rather than a predicate of ICs. I argue that my proposal is to be preferred on the grounds that it is much simpler: while Frana proposes independent mechanisms for accounting for each of our key sentences, my proposal can handle all three cases within a unified framework.

7.3 Schwager 2007

Kaufmann in Schwager 2007 entertains different solutions to the puzzle of quantification over ICs. One of her first attempts is in fact very reminiscent of my account of pointwise change. Given the equivalence between *every governor changed* and *the governor of every state changed*, Kaufmann considers the possibility of determiners being ambiguous between their basic meaning Det and a second meaning Det². In this second meaning, the determiner composes with a relational noun and quantifies over its internal argument:

$$(137) \quad \llbracket \text{Det}^2 \rrbracket^t(C) = \lambda R. \lambda P. \llbracket \text{Det} \rrbracket^t(C)(\lambda z. P(\lambda i. \iota x. R(i)(z)(x))) \quad (\text{set})(\text{set})t$$

A basic sentence such as *every governor changed* would then be interpreted as shown in (138), yielding the exact same interpretation as my proposal does.

²⁰This isn’t exactly Frana’s proposal, but she provides an alternative definition of definite determiners that effectively yields the same results.

$$\begin{aligned}
(138) \quad & \llbracket \text{every}^2 \rrbracket^t(C)(\llbracket \text{governor} \rrbracket^t)(\llbracket \text{changed} \rrbracket^t) \\
& = \llbracket \text{every} \rrbracket^t(C)(\lambda z. \llbracket \text{changed} \rrbracket^t(\lambda i. \iota x. \llbracket \text{governor} \rrbracket^i(z)(x))) \\
& = \forall z \in C. \llbracket \text{changed} \rrbracket^t(\mathbf{the}(\text{gov}(z)))
\end{aligned}$$

Kaufmann, however, ends up abandoning this approach because it can't account for either non-functional relational nouns or set change interpretations. She then proposes an account of the pointwise and set change contrast that relies on an interesting interplay between semantics and pragmatics. Here I present a slightly simplified version of her proposal, but the reader is referred to the original paper for its fully accurate rendition.

Kaufmann follows Aloni's (2001) proposal that determiners range over *conceptual covers*, a special kind of set of ICs. Conceptual covers are defined in (139), where I present a slightly modified definition which relativizes covers to sets of individuals. A conceptual cover, then, is a set of concepts U such that, at every index, every individual in a set A is identified by a unique member of U .²¹ We will then call U and A -cover whenever (139) holds.

$$\begin{aligned}
(139) \quad & \text{Conceptual Covers} \\
& \mathbf{CC}(A)(U) := \forall i. \forall x \in A. \exists! u \in U. u(i) = x
\end{aligned}$$

The idea, then, is that in a sentence of the form '[Det NP] VP,' the determiner ranges over a contextually provided NP-cover. In (140), I give a recipe for lifting the denotation of determiners to quantifiers over ICs, where U is the silent domain restriction:

$$(140) \quad \llbracket \text{Det}^2 \rrbracket^t(U) = \lambda N. \lambda P. (\forall t' \subseteq t. \mathbf{CC}(N(t'))(U)) \wedge \llbracket \text{Det} \rrbracket^t(U)(P) \quad (\text{set})((se)t)t$$

Crucially the NP is never interpreted over a predicate of ICs. Instead, the domain of Det^2 is a contextually supplied set of ICs U whose value is constrained by the NP.

To see the proposal in action, consider the following a scenario where the following holds:

$$\begin{aligned}
(141) \quad & \text{a. } \llbracket \text{governor (of somewhere)} \rrbracket^{2025} = \{\text{ann, beth, cleo}\} \\
& \text{b. } \llbracket \text{governor (of somewhere)} \rrbracket^{2026} = \{\text{ann, deb, ella}\}
\end{aligned}$$

The sentence *every governor changed* would be mapped to the formula in (142). Suppose that we are interpreting it relative to the interval that includes 2025 and 2026. Then, U must be that set of concepts such that every member of $\llbracket \text{governor} \rrbracket^t$ is identified by an element in U , at every t that is included in 2025 and 2026. One such U is that set containing ICs of the form *the governor of α* , where α is one of the three relevant states.

$$(142) \quad (\forall i \subseteq t. \mathbf{CC}(\llbracket \text{governor (of somewhere)} \rrbracket^i)(U)) \wedge \forall u \in U. \llbracket \text{changed} \rrbracket^t(u)$$

Kaufmann claims that nouns with roles like *governor* are capable of making such role-based covers salient, and that's the source of pointwise change interpretations. On the other hand, an NP like *book on the shelf* makes no roles salient and therefore can only supply sets of concepts that are *temporally constant*, i.e., concepts that always map to the same individual.

²¹As Kaufmann herself observes, conceptual covers appear to be sometimes too restrictive: *Every price will remain the same* can be uttered even when there are many things with the same price. She speculates that perhaps prices and temperatures denote different kinds of entities, but we saw § 6.1 that even NPs like *journal editor* will give rise to predicates of ICs which may involve overlapping concepts.

This will lead to complications when interpreting sentences with *change*. Consider (143), for example, when uttered in a context in which the books on the shelf on Monday were AB and on Tuesday were BC.

(143) One_U book on the shelf changed.

The problem is that the salient set of concepts—the one that identifies every book by its name—is not actually a *book-cover* on either Monday or Tuesday. For example, the concept that maps indices to Book A is only picks out a book on the shelf on Monday. To solve this issue, Kaufmann proposes a pragmatic principle that essentially does the following: if there’s no salient cover *U* that could make that would make (143) true, we evaluate the sentence as if we were universally quantifying over every possible value for *U*. In our particular example, because there are always two books, there are values for *U* that would yield book-covers on both on Monday and Tuesday, which are shown in (144).

- (144) a. { [mon ↦ a, tue ↦ b], [mon ↦ b, tue ↦ c] }
 b. { [mon ↦ a, tue ↦ c], [mon ↦ b, tue ↦ b] }

Sentence (143) will thus be true only if (145) is true under both values of *U* in (144). Since there is (at least) one changing book in both (144a) and (145), (143) is correctly predicted to be true.

(145) $(\forall t \in \{\text{mon, tue}\}. \mathbf{CC}(\llbracket \text{book on the shelf} \rrbracket^t)(U)) \wedge \exists u \in U. \llbracket \text{change} \rrbracket^t(u)$

I argue that this proposal cannot properly generalize to sentences with non-upward entailing quantifiers. Both sentence (146a) and (147a) are also true in our scenario, but they are incorrectly predicted to be false. The issue is that both formulas in (146b) and (147b) are only true if *U* is resolved to (144b) but not if resolved to (144a). Thus, universally quantifying over all possible *book-covers* won’t yield the right results here.

- (146) a. Less than two books on shelf changed.
 b. $(\forall t \in \{\text{mon, tue}\}. \mathbf{CC}(\llbracket \text{book on the shelf} \rrbracket^t)(U)) \wedge \neg \exists u, v \in U. u \neq v \llbracket \text{change} \rrbracket^t(u) \wedge \llbracket \text{change} \rrbracket^t(v)$
- (147) a. Exactly one book on the shelf changed.
 b. $(\forall t \in \{\text{mon, tue}\}. \mathbf{CC}(\llbracket \text{book on the shelf} \rrbracket^t)(U)) \wedge \exists ! u \in U. \llbracket \text{change} \rrbracket^t(u)$

Another potential issue with the proposal is that, if NPs are interpreted as properties of individuals and Nathan’s is due to pragmatics, I am not sure how the following contrast can be accounted for:

- (148) a. Every CONEG governor changed in 2026.
 b. Every member of CONEG changed in 2026.

We saw that (148a) gives rise to pointwise change, while (148b) set change. The puzzle is that, as properties of individuals, *CONEG governor* and *member of CONEG* are contextually equivalent, so it’s unclear why these two sentences would be interpreted differently.

Finally, it’s also not clear what this proposal predicts for sentences with *senator*, which have mixed properties. As I see it, Kaufmann’s proposal would only have two ways of treating these sentences: either *senator* provides a salient *senator-cover* and the sentence gets a pointwise reading, or it doesn’t provide a salient *senator-cover* and the sentence gets a set change reading.

8 Concluding remarks

This paper developed a unified account of the interpretation of NPs as predicates of individual concepts, motivated by Nathan’s observation that sentences of the form ‘[Det NP] *changed*’ admit two readings. I proposed that both readings are derived by the same operator \uparrow_{IC} , defined in terms of Partee’s IDENT and IOTA, and that the different interpretations arise from the scopal interaction between this operator and existential quantifiers within the NP. Evidence for this unified treatment comes from sentences with non-functional relational nouns like *senator*, which exhibit a mixed behavior that previous accounts cannot capture.

The proposal bears a close parallel to Karttunen’s analysis of interrogative clauses: just as *wh*-phrases interact with IDENT to generate sets of propositions, existential quantifiers interact with \uparrow_{IC} (IDENT+IOTA) to generate suitable predicates of ICs. This parallel suggests that the mechanisms involved are more general and not specific to sentence with *change*.

Several issues remain open. For example, the proposal requires that EX be restricted to binding extensional traces — a stipulation that ideally should follow other more basic principles. Furthermore, the sources of the non-overlap condition on quantifier domains remain uncertain. Although I sketched a way to reduce it pragmatic principles, a full derivation is left for future research. Furthermore, many questions remain on the internal composition of NPs, such as which other operators do we expect to interact with \uparrow_{IC} .

Many of the issues discussed here have parallels in the literature on concealed questions, and the machinery developed in this paper may extend naturally to that domain. I leave a systematic investigation of this connection for future research.

References

- Aloni, Maria (2001). “Quantification under Conceptual Covers”. PhD Thesis. University of Amsterdam.
- Baker, C. L. (1968). “Indirect Questions in English”. PhD thesis. University of Illinois.
- Barker, Chris (2011). “Possessives and relational nouns”. In: *Semantics: An International Handbook of Natural Language Meaning*. Ed. by Claudia Maienborn, Klaus von Heusinger, and Paul Portner. Vol. 2, pp. 177–203.
- Bennett, Michael Ruisdael (1974). “Some Extensions of a Montague Fragment of English”. PhD Thesis. Los Angeles: University of California.
- Charlow, Simon (2019). “The Scope of Alternatives: Indefiniteness and Islands”. In: *Linguistics and Philosophy* 43.4, pp. 427–472.
- Chomsky, Noam (1995). *The Minimalist Program*. Current Studies in Linguistics 28. Cambridge, MA: MIT Press, p. 420.
- Demirok, Ömer (2019). “Scope Theory Revisited: Lessons from Pied-Piping in *Wh*-Questions”. PhD thesis. Massachusetts Institute of Technology.
- Dowty, David R., Robert E. Wall, and Stanley Peters (1981). *Introduction to Montague Semantics*. Dordrecht: Riedel.
- von Fintel, Kai (1994). “Restrictions on Quantifier Domains”. PhD thesis. University of Massachusetts Amherst.
- Fox, Danny (2002). “Antecedent-Contained Deletion and the Copy Theory of Movement”. In: *Linguistic Inquiry* 33.1, pp. 63–96.

- Fox, Danny and Kyle Johnson (2016). “QR Is Restrictor Sharing”. In: *Proceedings of the 33rd West Coast Conference on Formal Linguistics*. Ed. by Kyeong-min Kim et al. Available online via Lingref (Document #3220). Somerville, MA, USA: Cascadilla Proceedings Project, pp. 1–16.
- Frana, Ilaria (2013). “Quantified Concealed Questions”. In: *Natural Language Semantics* 21, pp. 179–218.
- (2017). *Concealed Questions*. Oxford University Press.
- Grosu, Alexander and Manfred Krifka (2007). “*The Gifted Mathematician that You Claim to Be*: Equational Intensional ‘Reconstruction’ Relatives”. In: *Linguistics and Philosophy* 30, pp. 445–485.
- Gupta, Anil (1980). *The Logic of Common Nouns*. New Haven: Yale University Press.
- Hamblin, C. L. (1973). “Questions in Montague English”. In: *Foundations of Language* 10.1, pp. 41–53.
- Heim, Irene (1979). “Concealed Questions”. In: *Semantics from Different Points of View*. Ed. by Rainer Bäuerle, Urs Egli, and von Stechow, Arnim. Berlin: Springer, pp. 51–60.
- Heim, Irene and Angelika Kratzer (1998). *Semantics in Generative Grammar*. Vol. 1185. Blackwell Oxford.
- Jackendoff, Ray (1979). “How to Keep Ninety from Rising”. In: *Linguistic Inquiry* 10.1, pp. 172–177.
- Janssen, Theo M. V. (1984). “Individual Concepts are Useful”. In: *Varieties of Formal Semantics, Proceedings of the Fourth Amsterdam Colloquium*. Ed. by Fred Landman and Frank Veltman. Foris Publications, pp. 171–192.
- Karttunen, Lauri (1977). “Syntax and Semantics of Questions”. In: *Linguistics and Philosophy* 1.1, pp. 3–44.
- Keshet, Ezra (2010). “Split Intensionality: A New Scope Theory of de Re and de Dicto”. In: *Linguistics and Philosophy* 33.4, pp. 251–283.
- Laserson, Peter (2005). “The Temperature Paradox as Evidence for a Presuppositional Analysis of Definite Descriptions”. In: *Linguistic Inquiry* 36.1, pp. 127–134.
- Löbner, Sebastian (1981). “Intensional Verbs and Functional Concepts: More on the ”Rising Temperature” Problem”. In: *Linguistic Inquiry* 12, pp. 471–477.
- (2020). “The Partee Paradox”. In: *The Wiley Blackwell Companion to Semantics*. John Wiley & Sons, Ltd, pp. 1–26.
- Montague, Richard (1973). “The Proper Treatment of Quantification in Ordinary English”. In: *Approaches to Natural Language: Proceedings of the 1970 Stanford Workshop on Grammar and Semantics*. Ed. by K. J. J. Hintikka, J. M. E. Moravcsik, and P. Suppes. Dordrecht: Springer Netherlands, pp. 221–242.
- Nathan, Lance Edward (2006). “On the interpretation of concealed questions”. PhD thesis. Massachusetts Institute of Technology.
- Partee, Barbara H (1986). “Noun Phrase Interpretation and Type-shifting Principles”. In: *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*. Ed. by Jeroen Groenendijk, D. de Jongh, and Martin Stokhof. Dordrecht: Foris, pp. 115–143.
- Romero, Maribel (2005). “Concealed Questions and Specificational Subjects”. In: *Linguistics and Philosophy* 28.6, pp. 687–737.
- (2008). “The Temperature Paradox and Temporal Interpretation”. In: *Linguistic Inquiry* 39.4, pp. 655–667.

Schwager, Magdalena (2007). "Bodyguards under Cover: The Status of Individual Concepts".
In: *Proceedings of Semantics and Linguistic Theory 17*. Ed. by M. Gibson and T. Friedman.
Cornell University. Ithaca, NY.