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SURFACE COMPOSITION AS BRIDGING [*]

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1. INTRODUCTION

The development of explicit theories of dynamic context change has led to a fundamentally new perspective on the interpretation of discourse. In this paper I show that this development also opens up the possibility of approaching subclausal composition along similar lines. More specifically, I argue that a dynamic theory where type-driven rules apply directly to overt surface structures and fill in missing information by building anaphoric bridges is more faithful to natural language semantics than the classical Montagovian approach.

For the purposes of this comparison, the Montagovian approach is to be understood broadly. It is articulated by any compositional theory that fits the description in (M).

(M) *Composition à la PTQ* (essentially static):

- Primary burden on static mechanisms — function application, static variable binding and, possibly, static type shifting.
- Dynamic anaphora irrelevant or marginal for subclausal composition.

This description fits the original PTQ, of course, for good reasons. But it is also true, I would say, of various reconstructions in dynamic frameworks — including Rooth's (1987) extension of Montague Grammar with 'parametrized sets' of Barwise (1987), *Dynamic Montague Grammar* of Groenendijk and Stokhof (1990), as well as *Compositional DRT* of Muskens (1996). Although the latter theories are dynamic, they make no essential use of that fact in subclausal composition. At best, dynamic anaphora crops up on the margins of a basically static system — for example, it may link certain adverbs to existentially closed event arguments of verbs, as in the version of Dynamic Montague Grammar enriched with Existential Disclosure by Dekker (1993).

In contrast, if composition is viewed as a species of bridging then this balance of power is reversed, as in (B).

(B) *Composition as bridging* (essentially dynamic):

- Primary burden on dynamic anaphora mediated by type-driven bridging.
- Function application rare. No static variable binding except to quantify in the external argument.

On this view, subclausal composition is fundamentally a dynamic process. Its primary task is to fill in predictable anaphoric links between basic meanings that come from the lexicon as rough approximations of what is actually needed. When initially combined, these approximations typically do not quite fit. But based on the nature of the mismatch, the missing links can be automatically filled in by type-driven bridging — including Existential Disclosure as an important special case.

Because basic meanings are conceived of as rough approximations to be locally fitted in by type-driven bridging, plain function application — without bridging — is rare. And there is no static variable binding except when the subject (agent or possessor) is quantified into the verbal or nominal predicate. Other anaphoric links — e.g., in long distance dependencies — are established not by static variable binding, but instead by dynamic anaphora mediated by type-driven bridging.

For concreteness, a testable system which articulates this dynamic view of surface composition is spelled out in section 2. This is our sample Bridging Theory. It is a dynamic type-driven system with five compositional rules. Three of these — APPLICATION, PREDICATION, and ABSTRACTION — will be familiar from Montagovian type-driven systems (e.g., Rooth 1985, Muskens 1996) and require little comment. There is nothing new about these static rules except their marginal status in semantic composition. The key innovations concern type-driven bridging. The technical details are negotiable. My focus here is on the basic idea behind the Bridging Theory and some general design features that natural language semantics seems to have and that fall into place when viewed from this dynamic perspective.

The basic idea goes back to the core intuition behind dynamic theories of discourse — namely, that each segment sets up a new context for what follows. Now, if you think about it, there is no good reason why this should not continue to hold all the way down to the lexicon, and this truism is the foundation of the Bridging Theory. More precisely, just as at the level of discourse a text sets up the context for the next sentence so, at the level of syntax, a syntactic head normally sets up the context for a dependent and, in the lexicon, a lexical stem, for an affix.

(∠) CONTEXT-SETTING ORDER

Discourse:	text	∠	sentence			
Syntax:	TOP-dependent	∠	head (H)	∠	other dependent	
Lexicon:	TOP-affix	∠	stem	∠	other affix	

There are some exceptions, which reverse this universal context-setting order. Intuitively, they set up the context because they make better topics (TOP). Just what counts as TOP is a difficult question which, fortunately, we do not have to answer in full. The examples to be considered here contain just two classes of TOP-elements — temporal frames (e.g., -*PST* in (3) below) and dependents in the *initial field* (subscript *if*, as in (8)).[1] Any TOP-dependent (or TOP-affix) sets up the context for the head (or stem), which in turn sets up the context for any other element.

In terms of this universal context-setting order, the Bridging Theory draws a further parallel between the level of discourse and subclausal composition. For example, in the discourse of (1), something is missing — to wit, an antecedent for the definite NP ‘the roof’ in the second sentence.

(1) *Knowledge-based bridging in discourse*

[I bought a house.] ∠ [The roof is leaking.]

⤳ [[I bought a house.] *It has a roof.*] [The roof is leaking.

Fortunately, the context-setting text introduces a suitable discourse referent — by means of the indefinite NP ‘a house’ — and the well-known relation between roofs and houses makes it possible to build a bridge (in italics; see Clark 1977, Asher & Lascarides 1998).

The central claim of the Bridging Theory is that subclausal composition interprets surface structures in much the same way, except that bridging is guided by the nature of the type mismatch, not common knowledge. Typically, something is missing, as in (2) and (3), but it is automatically filled in by type-driven bridging (italics again), so semantic composition proceeds without a hitch.

(2) *Type-driven bridging in the syntax*

[bought^{sth}] ∠ [a house]	box ∠ property
⤳ [bought^{sth}] [*it is* [a house]]	base-elaboration bridge

(3) *Type-driven bridging in the lexicon*

[-PST] ∠ [buy$^{sth}_{then}$-]	temporal frame ∠ box
⤳ [*some time in* [-PST]] [buy$^{sth}_{then}$-]	topic-comment bridge

Roughly speaking, in (2) bridging fills in a pronoun that allows the NP ‘a house’ to elaborate an implicit theme (‘sth’ abbreviating ‘something’) of the verb ‘bought’. In (3) bridging fills in a topic time which is located in the temporal frame denoted by '-PST' and linked to a temporal anaphor in the lexical meaning of the verbal stem 'buy-'. We will return to (2) and (3) in detail once the theory is in place.

There are at least three reasons to believe that the dynamic view of subclausal composition articulated by the Bridging Theory is more faithful to natural language semantics than the static Montagovian approach.

• *Argument One: Dynamics at all levels*.

First of all, the fundamental parallel that the Bridging Theory draws between discourse dynamics and subclausal dynamics predicts that dynamic phenomena should generalize all the way down to the lexicon. A case in point is temporal anaphora, and this indeed does generalize, including even the ambiguities.

Particularly dramatic evidence comes from the comparison of English discourse with lexical serial verb constructions (hereafter *SVCs*) of the Papuan language Alamblak of New Guinea (Bruce 1988). What we find is that the dynamics of narrative time remains the same, regardless of whether it results from successive updates by verbal clauses in English discourse or by verbal stems and affixes in lexical SVCs of Alamblak. [2]

For example, consider the English discourse (4) and the equivalent lexical SVC (5) of Alamblak.[3] I dub this discourse-equivalent variety *List SVC*, to distinguish it from *Plan SVC*, which will be relevant later.

(4) He was sick. He died.

(5) Dbëhna-noh-më-r. ≡ (4)
be.sick-die-PST-3SM

In the English discourse (4) the first clause sets up the context for the second. As a consequence, the time of the sick state determines the temporal frame for the death event, by a similar anaphoric mechanism as in (3). In the lexical List SVC (5) of Alamblak the same temporal relation arises from successive updates by a stative verbal stem (*dbëhna-* 'be sick') and an eventive verbal affix (*-noh* 'die').

The near equivalence, up to tense, between the English discourse of (6) and the lexical List SVC (7) of Alamblak illustrates a similar point for two eventive predicates. In this case we get a temporal ambiguity — the climb can either precede or overlap the search — and this ambiguity again generalizes across both languages.

(6) I climbed a tree. I looked for insects.

(7) Mɨyt ritm muh-hambray-an-m. ≅ (6)
tree insects climb-seek-1S-3P

Such systematic convergence across the levels of discourse and lexicon is a mystery if subclausal composition is static. But if both levels are dynamic in much the same way, then we can have a general theory of temporal anaphora that spans English discourse as well as the Alamblak lexicon.

• *Argument Two: Structural determinism.*

The second central idea of the Bridging Theory is that bridging is guided by type mismatch at the subclausal level and shifts to a less secure basis — for example, common knowledge — higher up, where the only type left is boxes. This provides a natural explanation for the striking shift from the structural determinism of subclausal composition to defeasible defaults at the level of discourse.

For example, the Kwa language Èdó spoken in Nigeria has several varieties of SVCs (Stewart 1998, Baker and Stewart 1999, Baker fw). One variety are List SVCs like (8), which are equivalent to discourse, just as in Alamblak. Another variety are semantically tighter Plan SVCs, exemplified in (9).[4] The syntactic structures are somewhat different, as indicated in the glosses, but in both SVCs the first bracketed VP sets up the context for the second. [5]

(8) Òzó dé LGB nó!dè tìé órè érè nà.

Ozo [$_{if}$ buy.PST LGB yesterday] [$_{H}$ read.PST it today]

'Ozo bought LGB yesterday. He read it today.' (possibly by accident)

(9) Òzó dé LGB (* nó!dè) tìé érè nà.

Ozo [$_{H}$ buy.PST LGB (* yesterday)][$_{ff}$ read.PST today]

'Ozo [bought LGB (*yesterday) and read it] today.' (as planned)

The surface strings may differ by as little as a pronoun but that is enough to trigger a whole cascade of semantic consequences, as (8) and (9) attest. In the List SVC (8) the two actions — Ozo's buying LGB and his reading it — could happen by accident, just as in discourse. But in the Plan SVC (9), without the object pronoun, speakers report the intuition that this chain of actions must have been planned. Also, in the List SVC (8) we can have as many temporal frames as actions, again as in discourse. Not so in the Plan SVC (9), which allows only one temporal frame. This frame can occur after either the first or the second verb and in either case it is understood to span the entire plan. This is not just an implicature since it cannot be cancelled — speakers reject disjoint temporal frames as a contradiction.

These semantic differences are mysterious under the static approach, because it is not clear how the presence or absence of an object pronoun could give rise to semantic differences of this kind. In contrast, they can be made sense of and predicted in full by deterministic type-driven bridging. The essential idea is that the pronoun alters the mismatched type configurations in the structure of (8) and, thereby, the appropriate bridges.

• *Argument Three: Semantic convergence across structural diversity.*

Finally, moving on beyond SVCs, the third argument in favor of the Bridging Theory is that it is both universal and faithful to overt surface structures. Most semanticists take it for granted that semantics is universal. Many also believe, or would like to, that semantics is surface compositional. What few semanticists seem to realize is how difficult it is to reconcile both of these ideals with the ubiquitous phenomenon of semantic convergence across structural diversity.

A case in point is the convergent pair of the English sentence (10) and its near equivalent (11) in West Greenlandic Eskimo. This is a typical instance of semantic convergence across two extremes in the typological spectrum — an isolating tense-based language with rigid word order (English) and a polysynthetic mood-based language with 'free' word order reflecting the information structure (Eskimo).

(10) [In [that room]] [I [quickly [[make-PST [a [new anorak]]] [for [my child]]]]].

(11) Ini taanna sukkasuu-mik qiturna-n-nik
[room that] [[quickly-MOD [child-1S-SG.MOD
anura-liu-us-si-vviga-a-ra nutaa-mik.
[[[[[anorak-make]-for]-APASS]-in]-IND^2]-1S.3S]] new-SG.MOD]

As far as I can see, static compositional theories can claim either universality or surface faithfulness, but not both. The problem is that function application and static variable binding do not tolerate the sort of variation in the bracketing exhibited in (10) and (11), if the basic meanings are kept constant. In contrast, the dynamic Bridging Theory is tolerant in just the right way to maintain universality without giving up strict surface composition.

This, in a nutshell, is the outline of a three-point argument in favor of the Bridging Theory of surface composition. In what follows I first spell out and exemplify the universal principles of that theory (sections 2–3) and then flesh out the details of the above three-point argument for each point in turn (sections 4–6).

2. Bridging Theory of Surface Composition

2.1. *Logic of Change with Centering*

To articulate the view of surface composition as type-driven bridging we first of all need a semantic representation language in which the relevant generalizations can be expressed. This need is almost filled by the *Logic of Change* of Muskens (1995), except that this system ignores the crucial role of centering in anaphora resolution (Grosz *et al* 1995, Walker *et al* 1998). For instance, by default, all anaphoric expressions target the most central — typically, last-mentioned — discourse referent (hereafter *dref*) of the right type. In particular, anaphora mediated by type-driven bridging is invariably top-level. But in Muskens's system the concept of 'the last-mentioned dref of such-and-such a type' is not expressible because dref's are identified by arbitrary indices, like variables. Formally, they are dynamic concepts, not variables, but they emulate variables in this respect.

This won't do for our purposes so I will instead import a centering-friendly view of dynamic anaphora from the system of *Predicate Logic with Anaphora* presented in Dekker (1994). In that system dref's are neither variables nor variable-like concepts. Instead, they are entities that are stacked in the order of introduction and are subsequently retrieved by anaphoric concepts — the concept of the last-mentioned entity, the concept of the entity mentioned just before last, and so on.

I dub this *prominence-guided anaphora* to distinguish it from the classical view of dynamic anaphora, as a species of variable binding (Kamp 1981, Heim 1982, Groenendijk & Stokhof 1990, Muskens 1995, etc). What Dekker (1994) presents is just a minimal extension of predicate logic with prominence-guided anaphora.

That is not quite enough to capture the role of centering in temporal anaphora and other anaphoric relations mediated by type-driven bridging. To meet this need, Dekker's (1994) theory must be extended in two directions.

First, entities must be sorted into six basic types: θ for things, κ for kinds, σ for states / stages, ε for events, τ for times, and ρ for regions. I realize that some of these types are controversial, especially kinds and stages. My position is that, yes, kinds and stages are problematic because they are difficult to define in precise ways, as are events for that matter. Nevertheless, they have to be recognized in the basic ontology underlying natural language semantics in order to make sense, for example, of the interaction of anaphora with centering. Specifically, the six basic types, θ, κ, σ, ε, τ, and ρ, will enable us to capture the fundamental generalization that all anaphora mediated by type-driven bridging is *top-level* — it predictably targets the primary center of the appropriate type. And this generalization, in turn, will be crucial for explaining the structural determinism of subclausal composition.

These desiderata further mandate another extension of Dekker's (1994) theory, orthogonal to the basic ontology. Just like a visual perspective comprises the focal field and the peripheral field, so a discourse perspective comprises two stacks: the top stack (⊤), for topical dref's in the current center of attention, ranked above the bottom stack (⊥), for less prominent dref's in the background. Formally, a stack is one more basic type, **s**, and a discourse perspective is a prominence-ranked pair of stacks — top and bottom (type $s := \mathbf{s} \times \mathbf{s}$). Accordingly, we need two sets of variables for stacking dref's, and two sets of demonstratives for retrieving them.

More precisely, dref's are added to the top stack by *topical variables* ($\mathbf{v}_{n,\,a} \in {}^{\top}Var_a$) and to the bottom stack by *background variables* ($v_{n,\,a} \in {}^{\perp}Var_a$). Similarly, dref's are retrieved from the top stack by *topical demonstratives*, of the form $\mathbf{d}a_n$, and from the bottom stack by *background demonstratives*, of the form da_n. For all demonstratives, $\mathbf{d}a_n$ as well as da_n, the type $a \in \{\theta, \kappa, \sigma, \varepsilon, \tau, \rho\}$

indicates the type of the dref to be retrieved, and the index *n*, how many dref's of that type are to be skipped along the way. For example, $\mathbf{d}\tau_0$ (abbreviated $\mathbf{d}\tau$) will retrieve the currently topmost — i.e., most central — time interval from the top stack. Similarly, $d\varepsilon_1$ will go to the bottom stack, skip the current topmost event and retrieve the next event down the stack. And so on. Table 1 below gives an overview of this system and of the notation conventions we will employ.

Table 1.

Type	Abbr.	Name of objects	$^{\top}Var$	$^{\perp}Var$	$^{\top}Dem$	$^{\perp}Dem$
θ		Things	**x**, **y**, **z**	*x*, *y*, *z*		
κ		Kinds	**k**	*k*		
σ		States / Stages	**s**	*s*		
ε		Events	**e**	*e*		
τ		Times	**t**	*t*		
ρ		Regions	**r**	*r*		
s		Stacks		*c*, *d*		
$\mathbf{s} \times \mathbf{s}$	*s*	Perspectives		*h*, *i*, *j*		
sa		Dynamic *a*-concepts		u_{sa}, v_{sa}	$\mathbf{d}a$, $\mathbf{d}a_1\ldots$	da, $da_1\ldots$
s(*st*)	[ ]	Updates (*aka* boxes)		*J*, *K*		
a[ ]	[*a*]	Dynamic properties		*P*, *Q*		

Intuitively, then, stacks are intended to model sequences of prominence-ranked objects of various types but formally they are primitive objects in the model. To make sure that they behave as intended we will constrain them by means of two projection functions: $\mathbf{p}_n$, which outputs the *n*'th coordinate of the input, and $\mathbf{p}_a$, which outputs the result of retaining just the coordinates of type *a* from the input. We write $\mathbf{p}_{n,a}(c)$ for $\mathbf{p}_n(\mathbf{p}_a(c))$, i.e., the *n*'th object of type *a* on stack *c*.

Intuitively, a stack is uniquely identified by its projections. Also, any object can be added to any stack. These two points are ensured by the following axioms, which replace the axioms of Muskens (1995). (Notation: $\Theta = \{\theta, \kappa, \sigma, \varepsilon, \tau, \rho\}$.)

AX1 $\forall c \forall d(\forall n \forall a \in \Theta(\mathbf{p}_{n,a}(c) = \mathbf{p}_{n,a}(d)) \supset c = d)$

AX2 $\forall c \forall a \in \Theta \forall v_a \exists d(\mathbf{p}_1(d) = v_a \wedge \forall n(n > 1 \supset \mathbf{p}_n(d) = \mathbf{p}_{n-1}(c)))$

AX1 is straightforward. AX2 ensures that for any stack and object there is another stack, where that object is topmost and everything below it is as in the first stack.

We must also replace Muskens's formula $i[v]j$, which says that the *information states* i and j agree up to the value of the *store* v. Instead we need a term $(v \cdot i)$ that designates the new *perspective* obtained from i by adding the value of the *variable* v to the v-appropriate stack of i. That is, the value of v is added to the top stack of i, denoted by $\top_i$, if v is a topical variable, and to the bottom stack of i, $\bot_i$, if v is a background variable. Here is a definition that says this (adapting Dekker 1994).

DEFINITION 1. For any variables $\mathbf{u} \in {}^{\top}Var_a$ and $u \in {}^{\bot}Var_a$ and any perspectives i, j,

i. $(\mathbf{u} \cdot i) = j$ iff $(\bot_j = \bot_i \wedge \mathbf{p}_1(\top_j) = \mathbf{u} \wedge \forall n(n > 1 \supset \mathbf{p}_n(\top_j) = \mathbf{p}_{n-1}(\top_i)))$

ii. $(u \cdot i) = j$ iff $(\top_j = \top_i \wedge \mathbf{p}_1(\bot_j) = u \wedge \forall n(n > 1 \supset \mathbf{p}_n(\bot_j) = \mathbf{p}_{n-1}(\bot_i)))$

This definition explicates the intuition that adding an object to a stack pushes all other objects on that stack down one notch. However, intuitively, adding a new dref of a certain type (say, a new topic time) demotes in prominence only older dref's of the same type (i.e., old topic times). It has no bearing on the prominence rank of dref's of other types (topical things, topical kinds, etc).

The following axioms formalize these intuitions — AX3–4 for the top stack (i.e., topical dref's) and AX5–6 for the bottom stack (background dref's) — in terms of the projection function $\mathbf{p}_a$, which outputs the result of retaining just the coordinates of type a from the input.

AX3 $(\mathbf{u}_a \cdot i) = j \supset \mathbf{p}_{1,a}(\top_j) = \mathbf{u} \wedge \forall n(n > 1 \supset \mathbf{p}_{n,a}(\top_j) = \mathbf{p}_{n-1,a}(\top_i))$

AX4 $(\mathbf{u}_a \cdot i) = j \supset \forall b \in \Theta(b \neq a \supset \mathbf{p}_b(\top_j) = \mathbf{p}_b(\top_i))$

AX5 $(u_a \cdot i) = j \supset \mathbf{p}_{1,a}(\bot_j) = u \wedge \forall n(n > 1 \supset \mathbf{p}_{n,a}(\bot_j) = \mathbf{p}_{n-1,a}(\bot_i))$

AX6 $(u_a \cdot i) = j \supset \forall b \in \Theta(b \neq a \supset \mathbf{p}_b(\bot_j) = \mathbf{p}_b(\bot_i))$

The next definition extends the system of DRT-style abbreviations for type-logical expressions from Muskens (1996), with a formal theory of centering inspired by Dekker (1994). Clause (i) imports and generalizes Dekker's (1994) theory of prominence-guided pronouns. Clause (ii) closely follows Muskens (1995). Clause (iii) is new. It deals with *anchored meanings* — boxes $\mathcal{P}_{[a]}[t_{sa}]$ or properties $\mathcal{R}_{a[a]}[t_{sa}]$ — a form of predication where the argument concept t is rigidly anchored to the input perspective. This operation is illustrated in (13) below. It will play an important role in type-driven bridging (see esp. sections 2.3 and 6.2).

DEFINITION 2 (Terms, conditions, anchored meanings, and boxes)

i.	t°	:=	$\lambda i\, t$	, if $t \in Con_a \cup {}^\bot Var_a \cup {}^\top Var_a$
		:=	$\lambda i\, ti$	, if $t \in Con_{sa} \cup {}^\bot Var_{sa}$
		:=	$\lambda i\, \mathbf{p}_{n+1,a}(\top_i)$	, if $t = \mathbf{d}a_n \in {}^\top Dem_{sa}$
		:=	$\lambda i\, \mathbf{p}_{n+1,a}(\bot_i)$	, if $t = da_n \in {}^\bot Dem_{sa}$
ii.	$R\langle t_1, \ldots, t_n\rangle$	:=	$\lambda i\, R(t_1{}^\circ i, \ldots, t_n{}^\circ i)$	
iii.	$\mathcal{P}_{[a]}[t_{sa}]$	:=	$\lambda ij\, (\mathcal{P}(ti))ij$	
	$\mathcal{R}_{a[a]}[t_{sa}]$	:=	$\lambda y\, \lambda ij\, (\mathcal{R}(ti)(y))ij$	
iv.	$[\,\mid C_1, \ldots, C_m]$	:=	$\lambda ij\, (i = j \wedge C_1 i \wedge \ldots C_m i)$	
	$[v_1 \ldots v_n \mid C_1, \ldots, C_m]$	:=	$\lambda ij\, \exists v_1 \ldots v_n((v_1 \cdot \ldots (v_n \cdot i)) = j \wedge C_1 i \wedge \ldots C_m i)$	
	$(D\, ;\, D')$	:=	$\lambda ij\, \exists h(Dih \wedge D'hj)$	

Finally, clause (iv) again closely follows Muskens (1995). However, there are two important differences. First, the order of the variables in the universe of a box is significant. It reflects the order in which dref's are stacked and hence their prominence rank. Secondly, variables are not dref's themselves but only tools for stacking dref's. Therefore, it is valid to use alphabetic variance to replace variables of the same type that add dref's to the same stack (as in Dekker 1994).

To represent anaphoric links, we will need identity = and Carlson's (1977) relation of *realization*. We denote the latter by $\sqsubseteq$ and use it to relate states / stages, things and kinds. We identify *atomic things* by the predicate **1** and denote *atomic realization*, of a kind by an atom, by $\sqsubseteq_{\mathbf{1}}$. Temporal (and spatial) anaphora involves *temporal* (or *spatial*) *inclusion* and *temporal precedence*, denoted by $\subseteq$ and $<$. These relations are to be interpreted in the familiar way (e.g., Kamp & Reyle 1993, Muskens 1995, Bittner 1999). Finally, we will need two operations from Bittner (1999): *temporal intersection* ($\subseteq$-meet for times), denoted by $\cap$, and *event chain*, of the form $\langle e, e'\rangle$. The exact semantics of these logical constants does not matter to the central concern of this paper — surface composition as type-driven bridging — so I shall not spell it out beyond the following extension of definition 2.

DEFINITION 3 (Logical operations and relations)

i. $(t_1 \cap t_2)^\circ \;:=\; \lambda i\,(t_1{}^\circ i \cap t_2{}^\circ i)$

$\langle t_1, t_2\rangle^\circ \;:=\; \lambda i\,\langle t_1{}^\circ i, t_2{}^\circ i\rangle$

ii. $(t_1\,\mathbf{R}\,t_2) \;:=\; \lambda i\,(t_1{}^\circ i\,\mathbf{R}\,t_2{}^\circ i)$ for $\mathbf{R} \in \{=, \sqsubseteq, \subseteq, <\}$

$(t_1 \sqsubseteq_{\mathbf{1}} t_2) \;:=\; \lambda i\,(\mathbf{1}(t_1{}^\circ i) \wedge t_1{}^\circ i \sqsubseteq t_2{}^\circ i)$

We now have all we need to represent type-driven bridging, for example, in the the verb 'buy-PST' and VP 'buy-PST [a house]'. The ideas sketched in (3) and (2) can now be formalized as in (12) and (13), with free $\mathbf{a} := \mathbf{v}_{0,\,\theta}$ representing the agent. At this point the bridging principles responsible for the transition indicated by '$\leadsto$' are still to be explicated (in section 2.3).[6] But we can already represent the output of type-driven bridging, and simplify it, as indicated in (12) and (13).

(12) *Type-driven bridging in the lexicon* ('buy-PST')

$(pst \cap \mathbf{d}\tau)^{\circ} \angle [e\ y |\ buy\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$

$\rightsquigarrow [\mathbf{t}|\ \mathbf{t} = \mathbf{d}\tau, \mathbf{d}\tau \subseteq (pst \cap \mathbf{d}\tau)]\ ;\ [e\ y |\ buy\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$

≡ (definitions 2 and 3; lattice-theoretic equivalence $t \subseteq (t' \cap t) \leftrightarrow t \subseteq t'$)

$\lambda ij\ \exists h(\exists \mathbf{t}((\mathbf{t} \cdot i) = h \wedge \mathbf{t} = \mathbf{p}_{1,\tau}(\top_i) \wedge \mathbf{p}_{1,\tau}(\top_i) \subseteq pst) \wedge$

$\exists e\ y((e \cdot (y \cdot h)) = j \wedge buy(\mathbf{a}, y, e) \wedge \mathbf{p}_{1,\varepsilon}(\bot_h) < e \wedge e \subseteq \mathbf{p}_{1,\tau}(\top_h)))$

≡ (eliminate h, given $(\mathbf{t} \cdot i) = h$ and AX1–2; collect the quantifiers)

$\lambda ij\ \exists e\ y\ \mathbf{t}((e \cdot (y \cdot (\mathbf{t} \cdot i))) = j \wedge \mathbf{t} = \mathbf{p}_{1,\tau}(\top_i) \wedge \mathbf{p}_{1,\tau}(\top_i) \subseteq pst$

$\wedge\ buy(\mathbf{a}, y, e) \wedge \mathbf{p}_{1,\varepsilon}(\bot_{\mathbf{t}\cdot i}) < e \wedge e \subseteq \mathbf{p}_{1,\tau}(\top_{\mathbf{t}\cdot i}))$

≡ (reduce $\mathbf{p}_{1,\varepsilon}(\bot_{\mathbf{t}\cdot i})$ by AX4, $\mathbf{p}_{1,\tau}(\top_{\mathbf{t}\cdot i})$ by AX3; rearrange)

$\lambda ij\ \exists e\ y\ \mathbf{t}((e \cdot (y \cdot (\mathbf{t} \cdot i))) = j$

$\wedge\ buy(\mathbf{a}, y, e) \wedge \mathbf{p}_{1,\varepsilon}(\bot_i) < e \wedge e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{p}_{1,\tau}(\top_i) \wedge \mathbf{p}_{1,\tau}(\top_i) \subseteq pst)$

≡ (definitions 2 and 3 again)

$[e\ y\ \mathbf{t}|\ buy\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{d}\tau, \mathbf{d}\tau \subseteq pst]$

(13) *Type-driven bridging in the syntax* ('buy-PST [a house]')

$[e\ y\ \mathbf{t}|\ buy\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{d}\tau, \mathbf{d}\tau \subseteq pst] \angle \lambda y[\ |\ house\langle y\rangle]$

$\rightsquigarrow [e\ y\ \mathbf{t}|\ buy\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{d}\tau, \mathbf{d}\tau \subseteq pst]\ ;\ \lambda y[\ |\ house\langle y\rangle][d\theta^{\circ}]$

≡ (definitions 2 and 3)

$\lambda ij\ \exists h(\exists e\ y\ \mathbf{t}((e \cdot (y \cdot (\mathbf{t} \cdot i))) = h$

$\wedge\ buy(\mathbf{a}, y, e) \wedge \mathbf{p}_{1,\varepsilon}(\bot_i) < e \wedge e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{p}_{1,\tau}(\top_i) \wedge \mathbf{p}_{1,\tau}(\top_i) \subseteq pst)$

$\wedge\ (h = j \wedge house(\mathbf{p}_{1,\theta}(\bot_h))))$

≡ (eliminate h; collect ∃'s; reduce $\mathbf{p}_{1,\theta}(\bot_{e\cdot(y\cdot(\mathbf{t}\cdot i))})$ by AX5–6; rearrange)

$\lambda ij\ \exists e\ y\ \mathbf{t}((e \cdot (y \cdot (\mathbf{t} \cdot i))) = j \wedge buy(\mathbf{a}, y, e) \wedge house(y)$

$\wedge\ \mathbf{p}_{1,\varepsilon}(\bot_i) < e \wedge e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{p}_{1,\tau}(\top_i) \wedge \mathbf{p}_{1,\tau}(\top_i) \subseteq pst)$

≡ (definitions 2 and 3 again)

$[e\ y\ \mathbf{t}|\ buy\langle \mathbf{a}, y, e\rangle, house\langle y\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{d}\tau, \mathbf{d}\tau \subseteq pst]$

In both cases the Logic of Change with Centering articulates the idea that type-driven bridging combines mismatched sisters by completing top-level anaphoric links. This can be done from either end — that is, either by introducing a suitable antecedent dref (as in (12)) and by filling in a top-level demonstrative (as in (13)).

These illustrations give some initial idea how surface composition by type-driven bridging might be represented in our Logic of Change with Centering. I now turn to spelling out the principles of the Bridging Theory, which derive these representations in a systematic manner.

2.2. *Bridgeable Basic Meanings*

The central claim of the Bridging Theory is that surface composition across the typological spectrum can be factored out into two invariant ingredients — namely, bridgeable basic meanings and type-driven bridges.

In the example section 3 this universal claim will be illustrated by drawing a semantic parallel between English transitives and so-called 'noun incorporation' of Greenlandic Eskimo. This term, coined by Rischel (1971), is inaccurate because the Eskimo construction involves neither verbs nor verbal stems but rather verb-forming derivational affixes — such as *-liu*(*r*) 'make' in (11) or *-si* 'get' in (14).

(14) Angisuu-mik illu-si-vu-nga.
big-SG.MOD [[house-get]-IND[1]]-1S

This is correctly reported by Kleinschmidt (1851), from whom I also adopt the term 'modalis' — descriptively more accurate than Rischel's 'instrumental' — for the case of external modifiers. The closest English equivalent is (15).

(15) I got a big house.
I [get-PST [a [big house-SG]]]

For this structurally diverse but semantically convergent pair, I propose the following basic meanings. Of these, the bridgeable meanings are shared by English and Eskimo up to tense.

T_0 BASIC TRANSLATIONS (for (14)–(15))

Verbs ($\mathbf{a} := \mathbf{v}_{0,\,\theta}$)		*Type*
get	$\rightsquigarrow \lambda y[e \mid get\langle \mathbf{a}, y, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\theta]$
get^y	$\rightsquigarrow [e\ y \mid get\langle \mathbf{a}, y, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\ ]$
Bridgeable non-verbs		
-PST	$\rightsquigarrow (pst \cap \mathbf{d}\tau_n)^\circ$	$s\tau$
I, 1S	$\rightsquigarrow (me)^\circ$	$s\theta$
-SG	$\rightsquigarrow \lambda y[\ \mid \mathbf{1}\langle y\rangle]$	$[\theta]$
house-	$\rightsquigarrow \lambda y[k \mid y \sqsubseteq k, house\langle k\rangle]$	$[\theta]$
big	$\rightsquigarrow \lambda y[\ \mid big\langle y, d\kappa_n\rangle]$	$[\theta]$
Other items ($a \in \Theta$)		
a	$\rightsquigarrow \lambda P_{[\theta]}\, P$	$[\theta][\theta]$
-MOD	$\rightsquigarrow \lambda P_{[a]}\, P$	$[a][a]$
-IND	$\rightsquigarrow \lambda J_{[\ ]}\, J$	$[\ ][\ ]$

For non-verbs, the meaning assignment in T_0 does not depart too far from type-driven Montagovian theories (e.g., Bittner 1994, van Geenhoven 1998). Past tense denotes the concept of the topical past. This explicates the parallel with pronouns discovered by Partee (1973). Nominal terms are interpreted as usual, minus the Montagovian lift. The common noun stem 'house-' introduces a kind-level dref and denotes the number-neutral property of being a (singular or plural) thing that realizes this kind. That the bare nominal stem leaves the number unspecified is shown most clearly by noun incorporation — e.g., *illu-si-vu-nga* in (14) can mean 'I got a house' or 'I got some houses' (as noted by Rischel 1971). I assume that this underspecification is resolved by the number inflection in Eskimo and English alike (i.e., '-SG' in (14) and (15)). Finally, the fact that modifiers such as 'big' are interpreted relative to a contextually salient comparison class is captured by means of anaphoric reference to a previously mentioned kind ($d\kappa_n$).

Up to this point, the proposed innovations may be controversial but they are not particularly surprising. What is genuinely new is the meaning assignment to verbs. Recall that the Bridging Theory views basic meanings as only rough approximations to be fitted into the local context by type-driven bridging — that is how universality is reconciled with surface faithfulness. Specifically, to explain convergent temporal anaphora, I make two crucial assumptions.

First, all verbs locate their eventualities in relation to the current topic time ($\mathbf{d}\tau$). This will get us the near convergence on temporal anaphora, with and without tense — for example, Eskimo (14) ≅ English (15) and English (6) ≅ Alamblak (7). Tense is not crucial to temporal anaphora because it is just a reminder about the location of the current topic time. Secondly, to explain (near) convergence across discourse and lexicon — English (4) ≡ Alamblak (5), English (6) ≅ Alamblak (7), etc — I assume that verbs can be interpreted as updates, just like clauses. That is, the arguments of a verb can be filled in already in the lexicon.

More precisely, depending on lexical centering, the internal theme argument is either existentially closed (adapting Carlson 1977, van Geenhoven 1998) or bound by a λ-operator (adapting Kratzer 1993).[7] Accordingly, the verb denotes either a box or a dynamic property of the theme (e.g., 'get^y' and 'get' in T_0). In either case the external argument is uniformly represented by the variable $\mathbf{v}_{0,\ \theta}$ — dedicated to this purpose and abbreviated as **a** (for 'agent or other external argument').

Finally, the residue of non-bridgeable items — which varies from language to language — mostly consists of assorted identity maps (e.g., 'a', 'MOD', 'IND'). These are too high in type to participate in type-driven bridging directly. But in case of bridging ambiguities, these items can play the useful role of selecting input of a particular type and filtering out undesirable alternatives — e.g., 'a' and 'MOD' select properties while 'IND' selects boxes (see (19c) and (28) below).

2.3. *Universal Principles of Type-Driven Bridging*

Small as it is, the sample of bridgeable meanings in T_0 already represents the three varieties of bridgeable types — namely, boxes, dynamic concepts, and dynamic properties. These are the only types of meanings that can be combined by type-driven bridging. All type-driven bridges complete some top-level anaphoric link between mismatched sisters. The bridge operator applies *first* to the dynamically dependent sister and *then* to its context-setting sister (see e.g., (18)), in accordance with the universal context-setting order $\angle$, and the following BRIDGING rule: [8]

($\angle$) CONTEXT-SETTING ORDER (for sisters)

Discourse:	text	$\angle$	sentence		
Syntax:	TOP-dependent	$\angle$	head (H)	$\angle$	other dependent
Lexicon:	TOP-affix	$\angle$	stem	$\angle$	other affix

T_1 BRIDGING

If ω is a bridge, $A \rightsquigarrow \alpha$, $B \rightsquigarrow \beta$ and $A \angle B$, then $[A, B] \rightsquigarrow \omega(\beta)(\alpha)$, provided that this is a well-formed term.

Prior to BRIDGING, dynamic concepts may be assimilated to properties by means of *sa*-LIFT. This adapts and extends the identity lift (*ident*) of Partee (1986).

T_2 *sa*-LIFT

If $A \rightsquigarrow \alpha \in WE_{sa}$, then $A \rightsquigarrow {}^{\subseteq}(\alpha)$,

where ${}^{\subseteq} := \lambda u_{sa}\, \lambda v_a\, [\,|\, v \subseteq u]$ if $a \in \{\tau, \rho\}$

$:= \lambda u_{sa}\, \lambda v_a\, [\,|\, v = u]$ otherwise.

Therefore, the three varieties of bridgeable types do not give rise to three × three = nine varieties of bridgeable type mismatch, but only to six. All six are bridged by top-level anaphora mediated by one of two presuppositional sequencing operators, either $^{?};$ or $^{¿};$. Both of these operators reduce to ordinary sequencing ; if their presuppositions are met (modulo one refinement to be discussed in section 5).[9]

(?) A *topic-comment* sequence ($J\,^{?}; K$) requires all topical dref's in *J* to be linked to demonstratives in *K*. (ABOUTNESS PRESUPPOSITION)

(¿) A *base-elaboration* sequence ($J\,^{¿}; K$) requires all background demonstratives in *K* to be linked to dref's in *J*. (GROUNDING PRESUPPOSITION)

The operator $^{?};$ (read: 'what about it?') forms a *topic-comment* sequence ($J\,^{?}; K$). This carries an ABOUTNESS PRESUPPOSITION — the comment *K* is required to be about the topic *J* in the sense that any topical dref introduced in *J* must be addressed by a demonstrative in *K*. The dual operator $^{¿};$ ('and moreover') forms a *base-elaboration* sequence ($J\,^{¿}; K$). This comes with a GROUNDING PRESUPPOSITION to the effect that what is elaborated must be present in the base. Formally, any peripheral demonstrative in the elaboration *K* must be linked to a dref in the base *J*.

The six bridgeable mismatches amount to three basic bridging tasks, each of which requires either a *short bridge* (unmarked) or a *long bridge* (marked by '!'). In all cases type-driven bridging completes some top-level anaphoric link.

(16) *Restrictor* ∠ *Matrix property*

$\langle\exists\rangle!:\ s\tau \ \angle [a] \ \rightsquigarrow [a]$

$\langle\exists\rangle:\ [a] \ \angle [a] \ \rightsquigarrow [\,]$

Base ∠ *Elaborating property*

$\langle ¿ \rangle!:\ [b] \ \angle \ [a] \ \rightsquigarrow [b]$

$\langle ¿ \rangle:\ [\,] \ \angle \ [a] \ \rightsquigarrow [\,]$

Topic ∠ *Comment box*

$\langle ? \rangle!:\ [a] \ \angle [\,] \ \rightsquigarrow [\,]$

$\langle ? \rangle:\ [\,] \ \angle [\,] \ \rightsquigarrow [\,]$

Starting from the bottom of (16), the first basic task is to connect a box to a context-setting constituent of some type ([ ] or [*a*]). In that case, type-driven bridging interprets the context-setting constituent as a topic and the box, as a comment. Accordingly, it fills in what's missing for a topic-comment sequence.

$$\mathrm{B}_1 \quad \langle ? \rangle \quad := \quad \lambda K_{[\,]}\, \lambda J_{[\,]}\, (J^{\,?};\, K)$$

$$\langle ? \rangle !_a \quad := \quad \lambda K_{[\,]}\, \lambda P_{[a]}\, (([\mathbf{v}_a|\ ];\, P[\mathbf{d}a^\circ])^{\,?};\, K)$$

Going up counterclockwise, the second basic task is to link a property to a context-setting constituent whose type ([ ] or [*b*]) is to be preserved. Here, the system assumes that the property is meant to elaborate the most central background dref, of the right type, contributed by the context-setting constituent. Accordingly, it fills in what's missing for a base-elaboration sequence. (Notation: $P_{[a]}[v_b \mid da^\circ]$ is Pv or $P[da^\circ]$, whichever is well-formed.)

$$\mathrm{B}_2 \quad \langle ¿ \rangle_a \quad := \quad \lambda P_{[a]}\, \lambda J_{[\,]}\, (J^{\,¿};\, P[da^\circ])$$

$$\langle ¿ \rangle !_{ab} \quad := \quad \lambda P_{[a]}\, \lambda Q_{[b]}\, \lambda v_b\, (Qv^{\,¿};\, P[v \mid da^\circ])$$

Finally, the third basic task is to link a property to a context-setting constituent whose type ([*a*] or $s\tau$) is *not* preserved. In that case, the system views the context-setting constituent as the domain-restrictor for existential quantification, and the property to be linked, as the matrix.

$$\mathrm{B}_3 \quad \langle \exists \rangle_a \quad := \quad \lambda P_{[a]}\, \lambda Q_{[a]}\, ([v_a|\ ]\,;\, \lambda u_a(Qu\,;\, Pu)[da^\circ])$$

$$\langle \exists \rangle !_a \quad := \quad \lambda P_{[a]}\, \lambda v_{s\tau}\, \lambda u_a\, ([\mathbf{v}_\tau|\ \mathbf{d}\tau = \mathbf{v}_\tau,\, \mathbf{v}_\tau \subseteq v]^{\,?};\, Pu)$$

The short existential bridge $\langle \exists \rangle_a$ is like the operator *A* of Partee (1986), but extended to all semantic domains (as in Bittner 1998, 1999). The long bridge $\langle \exists \rangle !$ further extends existential closure to interpret tenses and other temporal frames as topic time restrictors for verbal properties (e.g. unsaturated 'get-' in (18) below).

This dynamic type-driven system is rounded off by three static rules adapted from Montagovian type-driven theories (e.g., Rooth 1985, Muskens 1996, Bittner 1998). ABSTRACTION binds the subject variable $\mathbf{a} := \mathbf{v}_{0,\,\theta}$. PREDICATION applies the resulting predicate to the subject NP or clitic (recall clause (iii) of definition 2).

T_3 ABSTRACTION [10]

If B $\rightsquigarrow$ β, **a** occurs free in β, and B is sister to an **a**-subject, then B $\rightsquigarrow \lambda\mathbf{a}\beta$.

T_4 PREDICATION

If A $\rightsquigarrow$ α, B $\rightsquigarrow$ β, and A and B are sisters, then [A, B] $\rightsquigarrow$ β[α],

provided that this is a well-formed term.

T_5 APPLICATION

If A $\rightsquigarrow$ α, B $\rightsquigarrow$ β, and A and B are sisters, then [A, B] $\rightsquigarrow$ β(α),

provided that this is a well-formed term.

Finally, APPLICATION (as opposed to BRIDGING) mostly involves non-bridgeable identity maps (e.g., ‘$\text{a}_{[\theta][\theta]}$ $\text{house}_{[\theta]}$’), as we will see in the examples that follow.

3. INITIAL SAMPLE OF SURFACE COMPOSITION AS BRIDGING

The following three examples of surface-compositional analyses illustrate the various principles of the Bridging Theory as well as the relation to competing approaches in Montagovian frameworks. These examples also provide initial support for our theory of centering, including the six-sorted ontology in Table 1.

In sections 3.1 and 3.2 we offer bridging analyses of English (15) and Eskimo (14), as competing alternatives to PTQ and van Geenhoven (1998). In section 3.3 we interpret a kind-level pseudocleft — ‘What John is was unusual in 1945’ — inspired by, but outside the scope of, Partee (1986). In our account ‘be’ is not vacuous. It establishes crucial temporal links via kind- and stage-level anaphora.

3.1. *Modified Indefinite Object in English*

We begin with an overview of the bottom line results to be derived for the English sentence (15). Recall the basic meaning assignment from section 2.2:

T_0	BASIC TRANSLATIONS (for English (15))			*Type*
•	get	$\rightsquigarrow$	$\lambda y[e \mid get\langle \mathbf{a}, y, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\theta]$
	get^y	$\rightsquigarrow$	$[e\ y \mid get\langle \mathbf{a}, y, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\ ]$
•	-PST	$\rightsquigarrow$	$(pst \cap \mathbf{d}\tau_n)^\circ$	$s\tau$
	I, 1S	$\rightsquigarrow$	me°	$s\theta$
	-SG	$\rightsquigarrow$	$\lambda y[\ \mid \mathbf{1}\langle y\rangle]$	$[\theta]$
	house-	$\rightsquigarrow$	$\lambda y[k \mid y \sqsubseteq k, house\langle k\rangle]$	$[\theta]$
	big	$\rightsquigarrow$	$\lambda y[\ \mid big\langle y, d\kappa_n\rangle]$	$[\theta]$
•	a	$\rightsquigarrow$	$\lambda P_{[\theta]}\, P$	$[\theta][\theta]$

Composing these meanings by the principles of the Bridging Theory, we predict no truth-conditional ambiguity, but a four-way centering ambiguity, as follows.

(17) a. I $[\text{get}_{\langle\exists\rangle!}\text{-PST}\ [\text{a}\ [\text{big}_{\langle \text{¿}\rangle!}\ \text{house-SG}_{\langle \text{¿}\rangle!}]]_{\langle\exists\rangle}]_{\mathbf{a}}$ $\rightsquigarrow$

$[k\ e\ \mathbf{t}\ y \mid y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle, big\langle y, k\rangle, get\langle me, y, e\rangle, d\varepsilon < e,$

$e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst, \mathbf{t} = \mathbf{d}\tau]$

b. I $[\text{get}^{y}_{\langle ?\rangle!}\text{-PST}_{\subseteq}\ [\text{a}\ [\text{big}_{\langle \text{¿}\rangle!}\ \text{house-SG}_{\langle \text{¿}\rangle!}]]_{\langle \text{¿}\rangle}]_{\mathbf{a}}$ $\rightsquigarrow$

$[k\ e\ y\ \mathbf{t} \mid y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle, big\langle y, k\rangle, get\langle me, y, e\rangle, d\varepsilon < e,$

$e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst, \mathbf{t} \subseteq \mathbf{d}\tau]$

c. $\text{I}_{\subseteq}\ [\text{get}_{\langle\exists\rangle!}\text{-PST}\ [\text{a}\ [\text{big}_{\langle \text{¿}\rangle!}\ \text{house-SG}_{\langle \text{¿}\rangle!}]]_{\langle\exists\rangle}]_{\mathbf{a},\,\langle\exists\rangle}$ $\rightsquigarrow$

$[k\ e\ \mathbf{t}\ y\ x \mid x = me, y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle, big\langle y, k\rangle, get\langle me, y, e\rangle, \ldots, \mathbf{t} = \mathbf{d}\tau]$

d. $\text{I}_{\subseteq}\ [\text{get}^{y}_{\langle ?\rangle!}\text{-PST}_{\subseteq}\ [\text{a}\ [\text{big}_{\langle \text{¿}\rangle!}\ \text{house-SG}_{\langle \text{¿}\rangle!}]]_{\langle \text{¿}\rangle}]_{\mathbf{a},\,\langle\exists\rangle}$ $\rightsquigarrow$

$[k\ e\ y\ \mathbf{t}\ x \mid x = me, y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle, big\langle y, k\rangle, get\langle me, y, e\rangle, \ldots, \mathbf{t} \subseteq \mathbf{d}\tau]$

For each reading, the type-driven bridging analysis is indicated in the surface structure. I assume that only the subject 'I' is a TOP-dependent, setting up the local context for the head (VP). For all other dependents, the head sets up the context.

These results are compatible with the intuition that (15) is not ambiguous because the predicted centering ambiguity is difficult to detect. Crucially, for *top-level* anaphora — to the primary center — there is full agreement on the bottom stack for each type (κ, ε, θ) and near agreement on the top stack (up to '$\mathbf{t} = \mathbf{d}\tau$' vs. '$\mathbf{t} \subseteq \mathbf{d}\tau$'). But anaphora in all semantic domains is top-level either by default, if mediated by lexical anaphors, or by necessity, if mediated by type-driven bridging. Therefore, it is difficult to construct a context where this centering ambiguity would show up. (Difficult but not impossible — see section 5 on Èdó SVCs.)

Turning now to the details, we first derive (17a). On this reading the verbal stem is lexically unsaturated (see 'get' in T_0). The past tense — a TOP-affix — sets up the local context. Via existential bridging, tense locates the anaphoric temporal frame around the verbal event in the past and aligns it with the old topic time ($\mathbf{d}\tau$).

(18) get$_{\langle\exists\rangle!}$-PST $\rightsquigarrow_{\text{BRIDGING}}$

$$\langle\exists\rangle!_\theta(\lambda y[e|\ get\langle\mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])((pst \cap \mathbf{d}\tau)^\circ)$$

$$\equiv\ \lambda y([\mathbf{t}|\ \mathbf{d}\tau = \mathbf{t}, \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]^{?}; [e|\ get\langle\mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])$$

$$\equiv\ \lambda y[e\ \mathbf{t}|\ get\langle\mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst, \mathbf{t} = \mathbf{d}\tau]$$

Within the object NP, the nominal stem 'house-' sets up the local context in the lexicon for the number affix '-SG' and then, in the syntax, the nominal head 'house-SG' sets up the local context for the modifier 'big'. Both mismatched configurations call for base-elaboration bridging, by ⟨¿⟩!, as in (19a, b). In (19b) the grounding presupposition of ¿; forces a local anaphoric link — to wit, from the kind-level demonstrative *d*κ representing the comparison class in the elaborating property ('big') to the kind-level dref *k* in the base ('house-SG').

(19) a. house-SG$_{\langle ¿\rangle !}$ $\leadsto_{\text{Bridging}}$

$\langle ¿\rangle !_{\theta\theta}(\lambda y[\ |\ \mathbf{1}\langle y\rangle])(\lambda y[k|\ y \sqsubseteq k,\ house\langle k\rangle])$

$\equiv\ \lambda y([k|\ y \sqsubseteq k,\ house\langle k\rangle]\ ^{¿};\ \lambda y[\ |\ \mathbf{1}\langle y\rangle][y\ |\ d\theta°])$

$\equiv\ \lambda y([k|\ y \sqsubseteq k,\ house\langle k\rangle]\ ^{¿};\ [\ |\ \mathbf{1}\langle y\rangle])$

$\equiv\ \lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle]$

b. big$_{\langle ¿\rangle !}$ house-SG $\leadsto_{\text{Bridging}}$

$\langle ¿\rangle !_{\theta\theta}(\lambda y[\ |\ big\langle y,\ d\kappa\rangle])(\lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle])$

$\equiv\ \lambda y([k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle]\ ^{¿};\ \lambda y[\ |\ big\langle y,\ d\kappa\rangle][y\ |\ d\theta°])$

$\equiv\ \lambda y([k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle]\ ^{¿};\ [\ |\ big\langle y,\ d\kappa\rangle])$

$\equiv\ \lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle]$

c. a [big house-SG] $\leadsto_{\text{Application}}$

$(\lambda P_{[\theta]}\, P)(\lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle])$

$\equiv\ \lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle]$

Both in (19a) and in (19b) the alternative of existential bridging, by $\langle\exists\rangle$, is filtered out by the type-checking article ‘a’, which requires a property (see (19c)).

Next, within the VP, the head verb sets up the local context for the object NP.

(20) a. get-PST [a big house-SG]$_{\langle\exists\rangle}$ $\leadsto_{\text{Bridging}}$

$\langle\exists\rangle_{\theta}(\lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle])$

$(\lambda y[e\ \mathbf{t}|\ get\langle \mathbf{a},\ y,\ e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} = \mathbf{d}\tau])$

$\equiv\ [y|\ ]\ ;\ \lambda y([e\ \mathbf{t}|\ get\langle \mathbf{a},\ y,\ e\rangle,\ldots]\ ;\ [k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle])[d\theta°]$

$\equiv\ [k\ e\ \mathbf{t}\ y|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle,\ get\langle \mathbf{a},\ y,\ e\rangle,$

$d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} = \mathbf{d}\tau]$

b. I [get-PST a big house-SG]$_{\mathbf{a}}$ $\leadsto_{\text{Abstr., Pred.}}$

$\lambda \mathbf{a}[k\ e\ \mathbf{t}\ y|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle,\ get\langle \mathbf{a},\ y,\ e\rangle,\ldots][me°]$

$\equiv\ [k\ e\ \mathbf{t}\ y|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y,\ k\rangle,\ get\langle me,\ y,\ e\rangle,$

$d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} = \mathbf{d}\tau]$

If the type mismatch is resolved by existential bridging, as in (20a), then we can successfully complete the derivation by quantifying in the subject, as in (20b).

There is an alternative resolution by base-elaboration bridging, as in (21a). This derivation would lead to a crazy reading (‘I am a big house that **a** bought’) but, fortunately, it is ruled out because the agent variable **a** fails to get bound.

(21) * *Unbound* **a** := $\mathbf{v}_{0,\,\theta}$

a. get-PST [a big house-SG]$_{\langle ¿\rangle !}$ $\rightsquigarrow_{\text{BRIDGING}}$

$\langle ¿\rangle !_{\theta\theta}(\lambda y[k|\ y \sqsubseteq_1 k,\ house\langle k\rangle,\ big\langle y, k\rangle])$

$(\lambda y[e\ \mathbf{t}|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} = \mathbf{d}\tau])$

$\equiv\ \lambda y[k\ e\ \mathbf{t}|\ y \sqsubseteq_1 k,\ house\langle k\rangle,\ big\langle y, k\rangle,\ get\langle \mathbf{a}, y, e\rangle, \ldots]$

b. I [get-PST a big house-SG] $\rightsquigarrow_{\text{PREDICATION.}}$

$[k\ e\ \mathbf{t}|\ me \sqsubseteq_1 k,\ house\langle k\rangle,\ big\langle me, k\rangle,\ get\langle \mathbf{a}, me, e\rangle, \ldots]$

Next, we derive (17b). The key difference is that the verb is lexically saturated (see ‘get^{y}’ in T_0). To combine this with tense — still a TOP-affix setting up the context — the latter concept of a temporal frame must first be lifted to the related subinterval property, as in (22a). The subinterval property provides a suitable topic for the saturated verb, shifting the topic time to a subinterval ($\mathbf{t} \subseteq \mathbf{d}\tau$), as in (22b).

(22) a. -PST$_{\subseteq}$ $\rightsquigarrow_{\text{BASIC}}$

$(pst \cap \mathbf{d}\tau_1)^{\circ}$ $\rightsquigarrow_{sa\text{-LIFT}}$

$\lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1]$

b. [get^{y}-]$_{\langle ?\rangle !}$-PST$_{\subseteq}$ $\rightsquigarrow_{\text{BRIDGING}}$

$\langle ?\rangle !_{\tau}([e\ y|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau])(\lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1])$

$\equiv\ ([\mathbf{t}|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1][\mathbf{d}\tau^{\circ}])^{?};\ [e\ y|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau]$

$\equiv\ [\mathbf{t}|\ \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]^{?};\ [e\ y|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau]$

$\equiv\ [e\ y\ \mathbf{t}|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

Again, just as in (20), the verb sets up the context for the indefinite object. But this time the nominal property can only be linked by base-elaboration bridging, as in (23a) — that is, it elaborates the thing-level dref introduced by the saturated verb. Finally, we quantify in the subject (see (23b)), just as before.

(23) a. get^{y}-PST [a big house]$_{\langle ¿\rangle}$ $\rightsquigarrow_{\text{BRIDGING}}$

$\langle ¿\rangle_{\theta}(\lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle])$

$([e\ y\ \mathbf{t}|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} \subseteq \mathbf{d}\tau])$

$\equiv\ [e\ y\ \mathbf{t}|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

$^{¿};\ \lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle][d\theta°]$

$\equiv\ [e\ y\ \mathbf{t}|\ get\langle \mathbf{a}, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

$^{¿};\ [k|\ d\theta \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle d\theta, k\rangle]$

$\equiv\ [k\ e\ y\ \mathbf{t}|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle,\ get\langle \mathbf{a}, y, e\rangle,$

$d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

b. I [buy-PST a house]$_{\mathbf{a}}$ $\rightsquigarrow_{\text{ABSTR., PRED.}}$

$\lambda\mathbf{a}[k\ e\ y\ \mathbf{t}|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle,\ get\langle \mathbf{a}, y, e\rangle, \ldots][me°]$

$\equiv\ [k\ e\ y\ \mathbf{t}|\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle,\ get\langle \mathbf{a}, y, e\rangle,$

$d\varepsilon < e,\ e \subseteq \mathbf{t},\ \mathbf{t} \subseteq pst,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

The remaining two readings, (17c) and (17d), are parallel to (17a) and (17b). However, the referential subject ‘I’ undergoes *sa*-LIFT before it combines with the VP predicate derived by ABSTRACTION. So we get two properties to be combined into a box (the type required for indicative S). This is accomplished by $\langle\exists\rangle_{\theta}$, which respects the context-setting order (TOP-dep$_{\text{NP}}$ $\angle$ head$_{\text{VP}}$) as indicated in (17c, d).

3.2. *Incorporated Noun with External Modifier in Eskimo*

By hypothesis, bridgeable basic meanings are crosslinguistically stable — up to tense and the like. In particular, they generalize across intuitively equivalent items in English (15) and Eskimo (14), in spite of the dramatic differences in the morphology and syntax (word ~ affix, adjective ~ noun, etc).

T_0 BASIC TRANSLATIONS (for Eskimo (14)) *Type*

• -get	$\leadsto \lambda y[e \mid get\langle \mathbf{a}, y, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\theta]$	
-get^y	$\leadsto [e\ y \mid get\langle \mathbf{a}, y, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\ ]$	
• I, -1S	$\leadsto me^\circ$	$s\theta$	
-SG	$\leadsto \lambda y[\ \mid \mathbf{1}\langle y\rangle]$	$[\theta]$	
house-	$\leadsto \lambda y[k \mid y \sqsubseteq k, house\langle k\rangle]$	$[\theta]$	
big-	$\leadsto \lambda y[\ \mid big\langle y, d\kappa_n\rangle]$	$[\theta]$	
• -MOD	$\leadsto \lambda P_{[a]}\, P$	$[a][a]$	$(a \in \Theta)$
-IND	$\leadsto \lambda J_{[\ ]}\, J$	$[\ ][\ ]$	

These differences bear on surface composition by type-driven bridging only in so far as they affect the bracketing or the context-setting order. For instance, the context-setting order of the verbal element and its nominal theme is reversed — from $[\ldots]_{\text{V}} \angle [\ldots]_{\text{NP}}$ in English (15) to $[\ldots]_{\text{N.stem}} \angle [\ldots]_{\text{V.affix}}$ in Eskimo (14). Therefore, the verbal affix in Eskimo (14) must be lexically unsaturated ('-get' in T_0) — the saturated verb meaning leads to fatal presupposition failure, as we will see in (27). So centering in Eskimo (14) is only two-ways ambiguous, not four.

(24) a. $[[\text{big-SG}_{\langle ¿\rangle !}]\text{-MOD}]_{\langle ¿\rangle}\ [[\text{house-get}_{\langle \exists\rangle}\text{-IND}]_{\mathbf{a}}\text{-1s}]$ $\leadsto$

$[e\ k\ y \mid y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle,\ get\langle me, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau]$

b. $[[\text{big-SG}_{\langle ¿\rangle !}]\text{-MOD}]_{\langle ¿\rangle}\ [[\text{house-get}_{\langle \exists\rangle}\text{-IND}]_{\mathbf{a}}\text{-1s}_{\subseteq, \langle \exists\rangle}]$ $\leadsto$

$[e\ k\ y\ x \mid x = me,\ y \sqsubseteq_{\mathbf{1}} k,\ house\langle k\rangle,\ big\langle y, k\rangle,\ get\langle me, y, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau]$

Also, since there is no tense, the relation of the topic time (**d**τ) to the speech time is not specified. This is actually less of a difference than might seem at first, because in Eskimo this information can be reasonably inferred from the indicative mood. If the speaker asserts the actual existence of such-and-such an event in the topic time then he must be talking about the past for how could he know otherwise.

What is remarkable is that surface composition by type-driven bridging is also very similar, in spite of the radical differences in the surface structures of the two languages. Abstracting away from tense, the composition of Eskimo (24a) and (24b) involves the same basic bridging tasks — two base-elaboration bridges and either one or two existential bridges — as (17a) and (17c) in English. Since there are no new principles involved, we only show the highlights of (24a).

First, because of the shift in the context-setting order — from $[\ldots]_{V} \angle [\ldots]_{NP}$ in English (15) to $[\ldots]_{N.stem} \angle [\ldots]_{V.affix}$ in Eskimo (14) — the existential closure that in English links the object NP to the inflected but still unsaturated verb (as in (20a)) in Eskimo instead links the unsaturated verbal affix to the nominal stem (see (25)).

(25) house-get$_{\langle\exists\rangle}$ $\rightsquigarrow_{\text{BRIDGING}}$

$$\langle\exists\rangle_{\theta}(\lambda y[e|\ \mathit{get}\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])(\lambda y[k|\ y \sqsubseteq k, \mathit{house}\langle k\rangle])$$

$$\equiv\ [y|\ ]\ ;\ \lambda y([k|\ y \sqsubseteq k, \mathit{house}\langle k\rangle]\ ;\ [e|\ \mathit{get}\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])[d\theta^{\circ}]$$

$$\equiv\ [y|\ ]\ ;\ ([k|\ d\theta \sqsubseteq k, \mathit{house}\langle k\rangle]\ ;\ [e|\ \mathit{get}\langle \mathbf{a}, d\theta, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])$$

$$\equiv\ [e\ k\ y|\ y \sqsubseteq k, \mathit{house}\langle k\rangle, \mathit{get}\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$$

This correctly predicts that the incorporated noun is unspecified for number and restricted to narrow scope. The alternative of base-elaboration bridging, which might allow for wide scope, is ruled out by presupposition failure.

(26) * GROUNDING PRESUPPOSITION of ¿;

house-get$_{\langle ¿\rangle !}$ $\rightsquigarrow_{\text{BRIDGING}}$

$$\langle ¿\rangle !_{\theta\theta}(\lambda y[e|\ \mathit{get}\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])(\lambda y[k|\ y \sqsubseteq k, \mathit{house}\langle k\rangle])$$

$$\equiv\ \lambda y([k|\ y \sqsubseteq k, \mathit{house}\langle k\rangle]\ ¿;\ \lambda y[e|\ \mathit{get}\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau][y\ |\ d\theta^{\circ}])$$

$$\equiv\ \lambda y([k|\ y \sqsubseteq k, \mathit{house}\langle k\rangle]\ ¿;\ [e|\ \mathit{get}\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])$$

That is, more precisely, the grounding presupposition of ¿; requires that *all* background demonstratives in the elaboration be linked to antecedent drefs in the base. But (26) fails to meet this presupposition because $d\varepsilon$ has no local antecedent. This presupposition failure cannot be rescued by accommodation because accommodation — to wit, type-driven bridging — has already taken place. And there is no 'second-order accommodation' — i.e., accommodation triggered by a presuppositional element such as ¿; that itself was introduced by accommodation.

So surface faithful existential closure is enough to ensure narrow scope — no need for semantic incorporation of van Geenhoven (1998).[11] For us, that operation would amount to lexical saturation of the verbal affix. The mismatch would then be N.$stem_{[\theta]} \angle$ V.$affix_{[\,]}$, which can only be resolved by topic-comment bridging:

(27) * ABOUTNESS PRESUPPOSITION of ?;

house-get$^{y}_{\langle ?\rangle !}$ $\rightsquigarrow_{\text{BRIDGING}}$

$$\langle ?\rangle !_{\theta}([e\ y|\ get\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])(\lambda y[k|\ y \sqsubseteq k, house\langle k\rangle])$$

$$\equiv ([\mathbf{x}|]\ ;\ \lambda y[k|\ y \sqsubseteq k, house\langle k\rangle][\mathbf{d}\theta^{\circ}])\ {}^{?};\ [e\ y|\ get\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$$

$$\equiv [k\ \mathbf{x}|\ \mathbf{x} \sqsubseteq k, house\langle k\rangle]\ {}^{?};\ [e\ y|\ get\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$$

As shown in (27), that would introduce ?; along with a topical dref for a thing that satisfies the nominal property and that the saturated verb should then say more about. But in (27) the aboutness presupposition of ?; fails to be met because the verb does not contain any topical demonstrative of the right type (i.e., no $\mathbf{d}\theta$).

So only (25) survives. This is elaborated by the external modifier, as in (28).

(28) [big-SG$_{\langle ¿\rangle !}$-MOD]$_{\langle ¿\rangle}$ [[house-get-IND]$_{\mathbf{a}}$-1S] $\rightsquigarrow_{\text{BRIDGING}}$

$$\langle ¿\rangle_{\theta}(\lambda y([\ |\ big\langle y, d\kappa\rangle]\ {}^{¿};\ [\ |\ \mathbf{1}\langle y\rangle]))$$

$$([e\ k\ y|\ y \sqsubseteq k, house\langle k\rangle, buy\langle me, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])$$

$$\equiv [e\ k\ y|\ y \sqsubseteq_{\mathbf{1}} k, house\langle k\rangle, big\langle y, k\rangle, buy\langle me, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$$

This elaborates the primary background dref for a thing (*y*), adding the information that it is a big specimen of the currently central kind (*k*) and also that it is an atom.

Because of the different bracketing, the bridges in the two languages are built in different order, but the top-level anaphoric links that are formed are the same, so the Eskimo and English derivations converge on nearly equivalent final outputs. This semantic convergence is one of the endless manifestations of a fundamental phenomenon noted in the introduction which we will see again in different guises. First in section 4, in the guise of convergent temporal anaphora in English and Alamblak, and then again, in the more complex guise of English (10) and Eskimo (11), in section 6, where the general issues involved will be addressed in depth.

Another general pattern that emerges is that surface composition by type-driven bridging is deterministic in the following sense. Surviving derivations agree on the truth conditions as well as the potential for top-level anaphora — i.e., the primary centers of all types on the topical and background tier. Alternative derivations that might lead to other readings are quickly filtered out for semantic improprieties — fatal presupposition failure (as in (26)–(27)), failure to bind the subject variable **a** (e.g., (21)), or unresolvable type mismatch (e.g., ⟨∃⟩ under 'a', recall (19)).

3.3. *Kind-Level Pseudocleft in English*

The kind-level pseudocleft (29) might naturally follow, e.g., 'Jets are a recent invention', and would be true if John is a jet pilot and the utterance time is 2001.

(29) What John is was unusual in 1945.

It would then convey that jet pilots were unusual in 1945, even if John wasn't even born yet at that time. Intuitively, there is a close relation to the famous example of Partee (1986) — 'What John is is unusual' — but Partee's tenseless analysis, which treats 'be' as a vacuous marker of predication, is difficult to extend to (29).

In contrast, it is straightforward to analyze (29) in the Bridging Theory. All we need are the following basic meanings (where **tm** maps states / stages to times).

T_0 BASIC TRANSLATIONS (for (29))

Verbs ($\mathbf{b} \in \{\mathbf{a}, \mathbf{d}\kappa_n\}$):			*Type*
be	$\rightsquigarrow$	$[s\ \mathbf{t}\mid s \sqsubseteq \mathbf{b}, s \sqsubseteq \mathbf{b}', \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{d}\tau]$	[ ]
Bridgeable non-verbs:			
John, 1945	$\rightsquigarrow$	$john°, 1945°$	$s\theta$, $s\tau$
-PST, -PRS	$\rightsquigarrow$	$(pst \cap \mathbf{d}\tau_n)°, (now \cap \mathbf{d}\tau_n)°$	$s\tau$
in	$\rightsquigarrow$	$\lambda s[t\mid s \subseteq t]$	$[\sigma]$
unusual	$\rightsquigarrow$	$\lambda s[\ \mid s \sqsubseteq \mathbf{d}\kappa_n, unusual\langle \mathbf{d}\kappa_n, \mathbf{tm}\langle s\rangle\rangle]$	$[\sigma]$
what	$\rightsquigarrow$	$\lambda k[\ \mid \mathbf{R}\langle k, \mathbf{d}\kappa_n\rangle]$	$[\kappa]$

This basic meaning assignment articulates the intuition that the stative verb 'be' introduces a dref for a state / stage, locates it in relation to the topic time, and further identifies it as a stage of the subject and / or of a currently topical kind. The non-subject dependents of 'be' can then be linked to these two hooks by type-driven top-level anaphora. With that in mind, 'what' is interpreted as a kind-level property of being suitably related to a topical kind, and 'unusual', as a stage-level property of realizing a topical kind that is unusual at the time of that stage.

The subject of (29) can then be composed as in (30), where the fronted 'what' is a TOP-dependent setting up the context for the head, i.e., the residual S.

(30) what$_{if}$ [John [be$_{\langle ?\rangle !}$-PRS$_{\subseteq}$]$_{\mathbf{a}}$]$_{\langle ?\rangle !}$ $\rightsquigarrow$

$([\mathbf{k}\mid\ ]\ ;\ \lambda k[\ \mid \mathbf{R}\langle k, \mathbf{d}\kappa_1\rangle][\mathbf{d}\kappa°])\ ^?;\ (\lambda\mathbf{a}(([\mathbf{t}'\mid\ ]\ ;\ \lambda t[\ \mid t \subseteq now \cap \mathbf{d}\tau_1][\mathbf{d}\tau°])$
$^?;\ [s\ \mathbf{t}\mid s \sqsubseteq \mathbf{a}, s \sqsubseteq \mathbf{d}\kappa, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{d}\tau])[john°])$

$\equiv\ [s\ \mathbf{t}\ \mathbf{t}'\ \mathbf{k}\mid s \sqsubseteq john, s \sqsubseteq \mathbf{k}, \mathbf{R}\langle \mathbf{k}, \mathbf{d}\kappa\rangle, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{t}' \subseteq now \cap \mathbf{d}\tau]$

$\equiv\ [s\ \mathbf{t}\ \mathbf{t}'\ \mathbf{k}\mid s \sqsubseteq john, s \sqsubseteq \mathbf{k}, \mathbf{R}\langle \mathbf{k}, \mathbf{d}\kappa\rangle, now \subseteq s, now = \mathbf{t} = \mathbf{t}' \subseteq \mathbf{d}\tau]$

That is, the subject of (29) introduces a topical kind (**k**) that is suitably related to the last mentioned topical kind ($\mathbf{d}\kappa$). In the context of 'Jets are a recent invention' this shifts the primary kind-level topic from jets to jet pilots. The new topical kind (i.e., jet pilots) is instantiated by a stage of John's (*s*) that holds at the time of utterance (*now*) as well as the just mentioned topic time ($\mathbf{d}\tau$, extended present). The final reduction in (30) follows given that the utterance time is an instant. [12]

The VP of (29) is analyzed in (31). It retrieves the new kind-level topic ($\mathbf{d}\kappa$) and adds a comment that this topical kind also had another stage ($s' \sqsubseteq \mathbf{d}\kappa$) when it was unusual. That stage is temporally located in 1945. It also overlaps with the past portion of the topic time we were talking about two topical τ-drefs back (i.e., skip **t** and **t′** in (30) and go back to the extended present retrieved in (31) by $\mathbf{d}\tau_2$).

(31) $[\text{be}_{\langle ?\rangle !}\text{-PST}_{\subseteq}\ \text{unusual}_{\langle ¿\rangle}]\ [\text{in } 1945_{\subseteq,\ \langle ¿\rangle !}]_{\langle ¿\rangle}$ $\rightsquigarrow$

$$((([\mathbf{t}'''|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_3][\mathbf{d}\tau^\circ])\ ^{?};\ [s'\,\mathbf{t}''|\ s' \sqsubseteq \mathbf{d}\kappa,\ \mathbf{t}'' \subseteq s',\ \mathbf{t}'' \subseteq \mathbf{d}\tau])$$

$$^{¿};\ \lambda s[\ |\ s \sqsubseteq \mathbf{d}\kappa,\ unusual\langle \mathbf{d}\kappa,\ \mathbf{tm}\langle s\rangle][d\sigma^\circ])$$

$$^{¿};\ \lambda s([t|\ s \subseteq t]\ ^{¿};\ \lambda t[\ |\ t \subseteq 1945][s\ |\ d\tau^\circ])[d\sigma^\circ]$$

$$\equiv\ [t\ s'\ \mathbf{t}''\ \mathbf{t}'''|\ s' \sqsubseteq \mathbf{d}\kappa,\ unusual\langle \mathbf{d}\kappa,\ \mathbf{tm}\langle s'\rangle\rangle,\ \mathbf{t}'' \subseteq s' \subseteq t \subseteq 1945,$$

$$\mathbf{t}'' \subseteq \mathbf{t}''' \subseteq pst \cap \mathbf{d}\tau_2]$$

Formally, the subject and the VP of (29) are interpreted by type-driven bridging as a topic-comment sequence, as in (32).

(32) $[\text{what John be-PRS}]_{if}\ [\text{be-PST unusual in } 1945]_{\langle ?\rangle}$ $\rightsquigarrow$

$$[s\ \mathbf{t}\ \mathbf{t}'\ \mathbf{k}|\ s \sqsubseteq john,\ s \sqsubseteq \mathbf{k},\ \mathbf{R}\langle \mathbf{k}, \mathbf{d}\kappa\rangle,\ now \subseteq s,\ now = \mathbf{t} = \mathbf{t}' \subseteq \mathbf{d}\tau]$$

$$^{?};\ [t\ s'\ \mathbf{t}''\ \mathbf{t}'''|\ s' \sqsubseteq \mathbf{d}\kappa,\ unusual\langle \mathbf{d}\kappa,\ \mathbf{tm}\langle s'\rangle\rangle,\ \ldots,\ \mathbf{t}'' \subseteq \mathbf{t}''' \subseteq pst \cap \mathbf{d}\tau_2]$$

$$\equiv\ [t\ s'\ \mathbf{t}''\ \mathbf{t}'''\ s\ \mathbf{t}\ \mathbf{t}'\ \mathbf{k}|\ s \sqsubseteq john,\ s \sqsubseteq \mathbf{k},\ \mathbf{R}\langle \mathbf{k}, \mathbf{d}\kappa\rangle,\ now \subseteq s,$$

$$s' \sqsubseteq \mathbf{k},\ unusual\langle \mathbf{k},\ \mathbf{tm}\langle s'\rangle\rangle,\ \mathbf{t}'' \subseteq s' \subseteq t \subseteq 1945,\ \mathbf{t}'' \subseteq \mathbf{t}''' \subseteq pst,$$

$$now = \mathbf{t} = \mathbf{t}' \subseteq \mathbf{d}\tau,\ \mathbf{t}'' \subseteq \mathbf{t}''' \subseteq \mathbf{d}\tau]$$

In this sequence the aboutness presupposition of ?; is clearly met for the topical kind-level dref, **k**, which is directly referred to by **d**κ in the comment. I assume that aboutness is also met, albeit less directly, for the two topic times, **t** and **t**′. These are addressed in the comment via anaphoric reference to a larger topic time (the extended present, $\mathbf{d}\tau_2$), in which both **t** and **t**′ are included.

This semantic representation of (29) reflects the intuition that, if the utterance time is in 2001, then John may be too young to have any stage in 1945 and jet pilots need no longer be unusual (as indicated in (33)). But they could still be unusual after 1945 since *s*′ need not be the maximal stage with this property.

(33) ||||||||||||||||||||||||||||| **d**τ (extended present)|||||||||||||||||||||||||||||
____||||||||||||1945||||||||||||||||||||||| ______________ •*now*___________________
|--$s'_{\text{jet.pilots: unusual}}$--| |--$s_{\text{John: jet.pilot}}$--|

By this point, all the principles of the Bridging Theory have been illustrated at least once. We have seen a range of natural language phenomena, from simple to more challenging, that are amenable to surface-composition in terms of type-driven bridging. The surface structure is interpreted as is, without adding traces or other inaudibilia, not even the invisible indices that Montagovian theories would require.

I now turn to three reasons which lead me to believe that some version of this dynamic type-driven system is more faithful to natural language semantics than static Montagovian theories. The evidence is drawn from a typologically diverse sample of languages — English, Alamblak, Èdó, and West Greenlandic Eskimo. Each phenomenon to be discussed concerns a fundamental issue on which the Bridging Theory takes a distinctive stand — dynamics at all levels (section 4), the nature of the structural determinism of subclausal composition (section 5), and the relation between universality and surface faithfulness (section 6).

4. Dynamics at All Levels: Convergent Temporal Anaphora

4.1. *General Issues*

A central tenet of the Bridging Theory is that dynamic anaphora plays a crucial role not only in discourse but also in subclausal composition. This distinctive feature of the framework receives empirical support from the fact that dynamic phenomena in natural languages generalize all the way down to the lexicon.

In particular, the Bridging Theory offers a level-neutral account of temporal anaphora which explains, for example, how English discourses (such as (4) and (6)) converge on the same meaning, or the same range of meanings, as lexical List SVCs of Alamblak (see (5) and (7)).

(4) He was sick. He died.

(5) Dbëhna-noh-më-r. ≡ (4)
be.sick-die-PST-3SM

(6) I climbed a tree. I looked for insects.

(7) Mɨyt ritm muh-hambray-an-m. ≅ (6)
tree insects climb-seek-1S-3P

As it stands, the DRT theory of temporal anaphora in English discourse — most fully developed in Kamp & Reyle (1993) — ignores centering and therefore has a massive problem of anaphora resolution.[13] This problem is addressed in the type-logical reconstruction of DRT by Muskens (1995) by means of a special store for events (*R*, for 'reference point'). But this only captures the basic pattern — an eventive verb *normally* moves the event-based narrative time forward one notch (Kamp 1979) — not the well-known fact that this is a defeasible default (witness the ambiguity of (6) ≅ (7)). What is worse, this *ad hoc* device loses the core insight of Partee (1973) — faithfully articulated by Kamp & Reyle (1993) — that there is a general parallel between temporal anaphora and anaphora in other domains.

Moreover, English-based theories fail to generalize to lexical List SVCs of Alamblak because they crucially rely on parochial details of English structures — such as tense. But in Alamblak tense only enters after the key anaphoric links have been established (as in (5)) or is missing altogether (as in (7)). Nevertheless, English and Alamblak converge on the same dynamics of narrative time.

The Bridging Theory offers a general solution to these problems. Crucially, the key anaphoric links are established by the basic meanings of verbs, unaided by tenses. Verbs both introduce the key dref's for events, states and topic times and relate them to central dref's of these types retrieved by anaphoric reference to 'the last-mentioned topic time' ($\mathbf{d}\tau$), or 'the event mentioned just before last' ($d\varepsilon_1$), etc.

T_0 BASIC TRANSLATIONS (for bridgeable items in (4)–(7))

Verbs ($\mathbf{a} := \mathbf{v}_{0,\,\theta}$):			*Type*
be	$\leadsto$	$[s\ \mathbf{t}\mid s \sqsubseteq \mathbf{a},\ \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{d}\tau]$	[ ]
be.sick	$\leadsto$	$[s\ \mathbf{t}\mid s \sqsubseteq \mathbf{a},\ sick\langle s\rangle,\ \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{d}\tau]$	[ ]
die	$\leadsto$	$[e\mid die\langle \mathbf{a}, e\rangle,\ d\varepsilon_n < e,\ e \subseteq \mathbf{d}\tau]$	[ ]
climb^y	$\leadsto$	$[e\ y\mid climb\langle \mathbf{a}, y, e\rangle,\ d\varepsilon_n < e,\ e \subseteq \mathbf{d}\tau]$	[ ]
seek^k	$\leadsto$	$[e\ k\mid seek\langle \mathbf{a}, k, e\rangle,\ d\varepsilon_n < e,\ e \subseteq \mathbf{d}\tau]$	[ ]
Bridgeable non-verbs:			
1S, 3S	$\leadsto$	$me\,^\circ,\ \mathbf{d}\theta_n{}^\circ$	$s\theta$
-PST	$\leadsto$	$(pst \cap \mathbf{d}\tau_n)^\circ$	$s\tau$
sick	$\leadsto$	$\lambda s[\ \mid sick\langle s\rangle]$	$[\sigma]$
tree	$\leadsto$	$\lambda y[k\mid y \sqsubseteq_{\mathbf{1}} k,\ tree\langle k\rangle]$	$[\theta]$
insects	$\leadsto$	$\lambda k[\ \mid insects\langle k\rangle]$	$[\kappa]$

Moreover, verbal meanings are stable across typologically diverse languages. Therefore, the (near) equivalences (4) ≡ (5) and (6) ≅ (7) can be derived from the fact that English and Alamblak agree on the relevant aspects of verbal meanings. That is, more precisely, the stative verb 'be' (or 'be.sick') says that there is a (sick) stage (*s*) of the subject (**a**) that overlaps with the last mentioned topic time ($\mathbf{d}\tau$) at a new topic time (**t**). The intransitive eventive verb 'die' says that there is an event (*e*) of the subject (**a**) dying within the last mentioned topic time ($\mathbf{d}\tau$) after a previously mentioned reference event ($d\varepsilon_n$). And the transitive verbs 'climb^y' and 'seek^k' say something similar about a climb of some thing and a search for a kind.

On this view the Reichenbachian reference times and events instantiate, in the domain of temporal anaphora, the general phenomenon of centering, which is crucial for anaphora resolution in all semantic domains (recall sections 2–3). The default dynamics of narrative time (e.g. in (4) ≡ (5)) is just an instance of the well-known fact that by default all anaphors target the last-mentioned dref of the right type. And temporal ambiguities (e.g. in (6) ≅ (7)) arise because the top-level default may be defeated in favor of a less central but perhaps more plausible dref.

4.2. *Convergence, with Tense, on Top-Level Default*

For the convergent pair (4) ≡ (5) the details of this account can be spelled out as follows. Given the basic meanings from section 4.1 and compositional rules of the Bridging Theory the surface composition of the first sentence of Alamblak (4) proceeds as in (34)–(36) (à la section 3.3).

(34) $\text{be}_{\langle ?\rangle !}\text{-PST}_{\subseteq}$ $\leadsto_{sa\text{-LIFT, BRIDGING}}$

$$([\mathbf{t}'|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1][\mathbf{d}\tau^\circ])^{?}; [s\ \mathbf{t}|\ s \sqsubseteq \mathbf{a}, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{d}\tau]$$

$$\equiv [s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{a}, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$$

(35) be-PST sick$_{\langle ¿\rangle}$ $\rightsquigarrow_{\text{BRIDGING}}$

$[s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{a}, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]\ ^{¿};\ \lambda s[\ |\ sick\langle s\rangle][d\sigma°]$

$\equiv\ [s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{a}, sick\langle s\rangle, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

(36) he [be-PST sick]$_{\mathbf{a}}$ $\rightsquigarrow$ ABSTR., PRED.

$\lambda\mathbf{a}[s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{a}, sick\langle s\rangle, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau][\mathbf{d}\theta°]$

$\equiv\ [s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{d}\theta, sick\langle s\rangle, \mathbf{t} \subseteq s, \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

In (34) the verb combines with the tense inflection via a long topic-comment bridge ⟨?⟩!. The effect is that the topic time of the verbal stem is located in the topical past. In (35) the stage-level property of being sick elaborates, via the short base-elaboration bridge ⟨¿⟩, the stage-level dref introduced by the verbal stem 'be-'. And finally, in (36) the subject NP is quantified into the external argument slot.

The composition of the second sentence, shown in (37) and (38), is similar:

(37) die$_{\langle ?\rangle !}$-PST$_{\subseteq}$ $\rightsquigarrow_{sa\text{-LIFT, BRIDGING}}$

$([\mathbf{t}''|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1][\mathbf{d}\tau°])\ ^{?};\ [e|\ die\langle \mathbf{a}, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]$

$\equiv\ [e\ \mathbf{t}''|\ die\langle \mathbf{a}, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}'' \subseteq pst \cap \mathbf{d}\tau]$

(38) he [die-PST]$_{\mathbf{a}}$ $\rightsquigarrow$ ABSTR., PRED.

$\lambda\mathbf{a}[e\ \mathbf{t}''|\ die\langle \mathbf{a}, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}'' \subseteq pst \cap \mathbf{d}\tau][\mathbf{d}\theta°]$

$\equiv\ [e\ \mathbf{t}''|\ die\langle \mathbf{d}\theta, e\rangle, d\varepsilon < e, e \subseteq \mathbf{t}'' \subseteq pst \cap \mathbf{d}\tau]$

Finally, the two sentences are combined by topic-comment bridging, as in (39). The aboutness presupposition is met directly for the primary topic time (**t**) and, for the secondary topic time (**t′**), via an anaphoric subinterval link (recall (32)). In effect, the verb phrase 'be-PST sick' sets up the topic time for the verbal stem 'die-'. That is how the topic time framing the death event is anaphorically linked to the time of the sick state.

(39) [he be-PST sick] [he die-PST]$_{\langle ?\rangle}$ $\leadsto_{\text{BRIDGING}}$

$[s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{d}\theta,\ sick\langle s\rangle,\ \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

$^{?};\ [e\ \mathbf{t}''|\ die\langle \mathbf{d}\theta, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t}'' \subseteq pst \cap \mathbf{d}\tau]$

$\equiv\ [e\ \mathbf{t}''\ s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{d}\theta,\ sick\langle s\rangle,\ die\langle \mathbf{d}\theta, e\rangle,$

$d\varepsilon < e,\ e \subseteq \mathbf{t}'' \subseteq \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

In the lexical List SVC (5) of Alamblak the same topic-comment bridge establishes the same anaphoric link between the topic time introduced by the bare verbal stem 'be.sick-' and the anaphoric reference to the last-mentioned topic time in the incorporated verb '-die' (see (40)).

(40) be.sick-die$_{\langle ?\rangle}$- $\leadsto_{\text{BRIDGING}}$

$[s\ \mathbf{t}|\ s \sqsubseteq \mathbf{a},\ sick\langle s\rangle,\ \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{d}\tau]\ ^{?};\ [e|\ die\langle \mathbf{a}, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau]$

$\equiv\ [e\ s\ \mathbf{t}|\ s \sqsubseteq \mathbf{a},\ sick\langle s\rangle,\ die\langle \mathbf{a}, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

(41) [be.sick-die]$_{\langle ?\rangle !}$ -PST$_{\subseteq}$ $\leadsto_{sa\text{-LIFT, BRIDGING}}$

$([\mathbf{t}'|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1][\mathbf{d}\tau^\circ])$

$^{?};\ [e\ s\ \mathbf{t}|\ s \sqsubseteq \mathbf{a},\ sick\langle s\rangle,\ die\langle \mathbf{a}, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{d}\tau]$

$\equiv\ [e\ s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{a},\ sick\langle s\rangle,\ die\langle \mathbf{a}, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

(42) [be.sick-die-PST]$_{\mathbf{a}}$-3SM $\leadsto_{\text{ABSTR., PRED.}}$

$\lambda \mathbf{a}[e\ s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{a},\ sick\langle s\rangle,\ die\langle \mathbf{a}, e\rangle,\ \ldots][\mathbf{d}\theta^\circ]$

$\equiv\ [e\ s\ \mathbf{t}\ \mathbf{t}'|\ s \sqsubseteq \mathbf{d}\theta,\ sick\langle s\rangle,\ die\langle \mathbf{d}\theta, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{t} \subseteq s,\ \mathbf{t} \subseteq \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

Likewise, the long topic-comment bridge ⟨?⟩! in effect locates the sickness and the death in the topical past. In the lexical List SVC of Alamblak this is accomplished in one fell swoop in (41), where the whole List SVC is inflected for tense. The effect is the same as the verb-by-verb inflection in English (34) and (37). Finally, in (42) the subject clitic is quantified into the verbal predicate in the usual manner.

Thus the equivalence of the English discourse (4) and lexical List SVC (5) of Alamblak follows because the two languages agree on the bridgeable meanings as well as the top-level anaphoric links to be built by type-driven bridging.

4.3. *Convergence, without Tense, on Temporal Ambiguity*

Essentially the same story explains the near equivalence of English (6) and Alamblak (7), including the temporal ambiguity. The details are as follows: [14]

(43) a. I [climb$^{y}_{\langle ?\rangle !}$-PST$_{\subseteq}$ [a tree]$_{\langle ¿\rangle}$]$_{\mathbf{a}}$

$\lambda\mathbf{a}((([\mathbf{t}|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1][\mathbf{d}\tau^{\circ}])\ ^{?};$

$[e\ y|\ climb\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau])\ ^{¿};\ \lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle][d\theta^{\circ}])[me^{\circ}]$

$\equiv\ [k\ e\ y\ \mathbf{t}|\ climb\langle me, y, e\rangle, y \sqsubseteq_1 k,\ tree\langle k\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]$

b. I [look$^{k}_{\langle ?\rangle !}$-PST$_{\subseteq}$ [for insects]$_{\langle ¿\rangle}$]$_{\mathbf{a}}$

$\lambda\mathbf{a}((([\mathbf{t}|\ ]\ ;\ \lambda t[\ |\ t \subseteq pst \cap \mathbf{d}\tau_1][\mathbf{d}\tau^{\circ}])\ ^{?};$

$[e\ k|\ seek\langle \mathbf{a}, k, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau])\ ^{¿};\ \lambda k[\ |\ insects\langle k\rangle][d\kappa^{\circ}])[me^{\circ}]$

$\equiv\ [e\ k\ \mathbf{t}|\ seek\langle me, k, e\rangle, insects\langle k\rangle, d\varepsilon_n < e, e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]$

c. [I climb^{y}-PST a tree] [I look^{k}-PST for insects]$_{\langle ?\rangle}$

$[k\ e\ y\ \mathbf{t}|\ climb\langle me, y, e\rangle, y \sqsubseteq_1 k,\ tree\langle k\rangle, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]$

$^{?};\ [e'\ k'\ \mathbf{t}'|\ seek\langle me, k', e'\rangle, insects\langle k'\rangle, d\varepsilon_n < e', e' \subseteq \mathbf{t}', \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

(44) a. [[climb^{y}-seek$^{k}_{\langle ?\rangle}$]$_{\mathbf{a}}$-1S]-3P

$\lambda\mathbf{a}([e\ y|\ climb\langle \mathbf{a}, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]\ ^{?};$

$[e'\ k'|\ seek\langle \mathbf{a}, k', e'\rangle, d\varepsilon_n < e', e' \subseteq \mathbf{d}\tau])[me^{\circ}]$

b. tree$_{\langle ¿\rangle}$ [insects$_{\langle ¿\rangle}$ climb^{y}-seek^{k}-1S-3P]

$(([e\ y|\ climb\langle me, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]\ ;[e'\ k'|\ seek\langle me, k', e'\rangle,$

$d\varepsilon_n < e', e' \subseteq \mathbf{d}\tau])\ ^{¿};\ \lambda k[\ |\ insects\langle k\rangle][d\kappa^{\circ}])\ ^{¿};\ \lambda y[k|\ y \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle][d\theta^{\circ}]$

$\equiv\ ([e\ y|\ climb\langle me, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]\ ;[e'\ k'|\ seek\langle me, k', e'\rangle,$

$insects\langle k'\rangle, d\varepsilon_n < e', e' \subseteq \mathbf{d}\tau])\ ;\ [k|\ d\theta \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle]$

The key points are analogous to the story we just told in section 4.2. That is, the near equivalence arises because English and Alamblak agree on two crucial points. First of all, they agree on the bridgeable meanings up to tense. And they also agree on the top-level anaphoric links to be completed by type-driven bridges — one topic-comment bridge and two base-elaboration bridges. The elaborating bridges link the property of being a tree to the topmost thing on the bottom stack (introduced by the transparent verb ‘climb^y’) and the property of being a kind of insects, to the topmost kind (introduced by the opaque verb ‘seek^k’).

One point of disagreement are the extra tenses of English, which add the information that the topic time is in the past. As already explained in section 2.2, *de facto* this is not much of a disagreement because in Alamblak, as in Eskimo, this information can be reasonably inferred from the indicative mood (unmarked in Alamblak). If the speaker asserts the actual existence of some events in the topic time, then he must be talking about the past for how could he know otherwise. This reasoning correctly predicts that in all languages in the absence of tense events introduced by indicative eventive clauses are normally understood to lie in the past.

Apart from tense, the disagreement is limited to issues that do not affect prominence-guided anaphora — for example, whether the short topic-comment bridge should apply already in the lexicon, as in Alamblak, interpreting ‘-seek^k’ as a comment about ‘climb^y–’, or first to full clauses at the level of discourse, as in English.[15] In either case we get a temporal ordering ambiguity because topic-comment sequencing does not impose any constraints on background anaphora.

Therefore, there are two plausible ways to resolve the anaphoric reference event for ‘-seek^k’, represented by a background event-level demonstrative $d\varepsilon_n$. The top-level default, $d\varepsilon_0$ (abbreviated as $d\varepsilon$), retrieves the last-mentioned event, which at this point is the climb. This yields a reading where the search follows the climb (‘$e < e'$’ in the reduced bottom line) in English (45) and Alamblak (46) alike.

(45) $[k\ e\ y\ \mathbf{t}|\ climb\langle me, y, e\rangle, \ldots, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]$

$^{?}; [e'\ k'\ \mathbf{t}'|\ seek\langle me, k', e'\rangle, \ldots, d\varepsilon < e', e' \subseteq \mathbf{t}', \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

$\equiv\ [e'\ k'\ \mathbf{t}'\ k\ e\ y\ \mathbf{t}|\ climb\langle me, y, e\rangle, y \sqsubseteq_1 k,\ tree\langle k\rangle, seek\langle me, k', e'\rangle,$

$insects\langle k'\rangle, d\varepsilon < e < e', e \subseteq \mathbf{t}, e' \subseteq \mathbf{t}' \subseteq \mathbf{t}, \mathbf{t} \subseteq \mathbf{d}\tau, \mathbf{t} \subseteq pst]$

(46) $([e\ y|\ climb\langle me, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]\ ; [e'\ k'|\ seek\langle me, k', e'\rangle, \ldots,$

$d\varepsilon < e', e' \subseteq \mathbf{d}\tau])\ ; [k|\ d\theta \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle]$

$\equiv\ [k\ e'\ k'\ e\ y|\ climb\langle me, y, e\rangle, y \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle, seek\langle me, k', e'\rangle,$

$insects\langle k'\rangle, d\varepsilon < e < e', e \subseteq \mathbf{d}\tau, e' \subseteq \mathbf{d}\tau]$

Alternatively, the anaphoric reference event for ‘seek^{k}’ can be represented as $d\varepsilon_1$ — this anaphor is lexical so it need not be top-level. We then skip the topmost event and retrieve the last event introduced before that. In effect, in English (47) as well as Alamblak (48) the search is ordered after the same reference event as the climb ($d\varepsilon < e$, $d\varepsilon < e'$). So on this reading the climb and the search may overlap.

(47) $[k\ e\ y\ \mathbf{t}|\ climb\langle me, y, e\rangle, \ldots, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]$

$^{?}; [e'\ k'\ \mathbf{t}'|\ seek\langle me, k', e'\rangle, \ldots, d\varepsilon_1 < e', e' \subseteq \mathbf{t}', \mathbf{t}' \subseteq pst \cap \mathbf{d}\tau]$

$\equiv\ [e'\ k'\ \mathbf{t}'\ k\ e\ y\ \mathbf{t}|\ climb\langle me, y, e\rangle, y \sqsubseteq_1 k,\ tree\langle k\rangle, seek\langle me, k', e'\rangle,$

$insects\langle k'\rangle, d\varepsilon < e, d\varepsilon < e', e \subseteq \mathbf{t}, e' \subseteq \mathbf{t}' \subseteq \mathbf{t}, \mathbf{t} \subseteq \mathbf{d}\tau, \mathbf{t} \subseteq pst]$

(48) $([e\ y|\ climb\langle me, y, e\rangle, d\varepsilon < e, e \subseteq \mathbf{d}\tau]\ ; [e'\ k'|\ seek\langle me, k, e'\rangle, \ldots,$

$d\varepsilon_1 < e', e' \subseteq \mathbf{d}\tau])\ ; [k\ |\ d\theta \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle]$

$\equiv\ [k\ e'\ k'\ e\ y|\ climb\langle me, y, e\rangle, y \sqsubseteq_{\mathbf{1}} k, tree\langle k\rangle, seek\langle me, k', e'\rangle,$

$insects\langle k'\rangle, d\varepsilon < e, d\varepsilon < e', e \subseteq \mathbf{d}\tau, e' \subseteq \mathbf{d}\tau]$

Thus, by factoring out surface composition into invariant bridgeable meanings and type-driven bridges, we get a theory of convergent temporal anaphora that is general enough to span English discourse as well as Alamblak lexicon.

5. Deterministic Type-Driven Bridging: Two Types of SVCs in Èdó

5.1. *General Issues*

In spite of its global dynamism, the Bridging Theory still recognizes a fundamental dichotomy between defeasible defaults in discourse and structural determinism at the subclausal level. It also offers a natural explanation. Structural determinism is due to type-driven bridging, and it is only at the lower levels that there is enough diversity of types to support this mechanism. In addition, the theory predicts the exact impact of variation in the structure on type-driven bridging, including some semantic consequences that would baffle static compositional theories.

A case in point is the mystery of List SVCs vs. Plan SVCs in Edó, exemplified by the minimal pair of (8) and (9). As noted in the introduction, the mere presence or absence of an object pronoun triggers a whole cluster of semantic consequences — in relation to planning, as well as dynamic anaphora to topic times and background events.

(8) Òzó dé LGB nó!dè tìé órè érè nà.
Ozo $[_{if}$ buy.PST LGB yesterday] $[_{H}$ read.PST it today]
'Ozo bought LGB yesterday. He read it today.' (possibly by accident)

(9) Òzó dé LGB (* nó!dè) tìé érè nà.
Ozo $[_{H}$ buy.PST LGB (* yesterday)]$[_{ff}$ read.PST today]
'Ozo [bought LGB (*yesterday) and read it] today.' (as planned)

Now, how on Earth can an object pronoun, of all things, have any bearing on planning, or on dynamic anaphora in semantic domains other than its own?! It is not clear how any static compositional theory could provide a sensible answer to this question. In contrast, the Bridging Theory does. Here it is.

First of all, since the Bridging Theory takes the overt surface structure at face value, it can plausibly say that the object pronoun directly bears on the *type* of the second part of the SVC. This must be a box if the object pronoun is present, as in the List SVC (8), but it could be a property of the theme argument — i.e., 'is a thing read by the subject **a**' — if the pronoun is missing, as in the Plan SVC (9).

By hypothesis (section 2.2), the theme-oriented property reading of a transitive verb is just one option, alternating with a saturated reading where the theme is existentially closed. However, I assume that the property reading can be forced by whatever mechanism licenses verbs with missing objects in languages without '*pro* drop', such as Èdó. For instance, the structural analysis of Èdó SVCs assumed here, developed by Bittner (2000) in the trace-less HPSG framework of Bouma *et al* (*in press*), could be naturally constrained to enforce this. And once we have this type contrast, then type-driven bridging is on the roll and can derive the full cluster of semantic consequences. The following sections 5.2 through 5.4 spell out the details, assuming by now familiar basic meanings. [16]

5.2. *Bridge-Induced Presuppositions about Planning*

The first semantic difference to be explained has to do with presuppositions about planning. For example, in the List SVC (49) — which is equivalent to discourse, just as in Alamblak — the two actions, of buying and reading, could be accidental.

(49) Òzó dé LGB tìé órè.
Ozo [$_{if}$ buy.PST LGB] [$_{H}$ read.PST it]
'Ozo bought LGB. He read it.' (possibly by accident)

(50) Òzó dé LGB tìé
Ozo [$_{H}$ buy.PST LGB] [$_{ff}$ read.PST]
'Ozo [bought LGB and read it].' (as planned)

Not so in the Plan SVC (50). This presupposes a multi-phase action plan, by a particular agent (here Ozo) focused on a particular theme (Chomsky's *Lectures on Government and Binding*), and it describes the successful execution of that plan.

In terms of type-driven bridging, the analysis of the List SVC (49) can be anticipated based on section 4. We have two boxes, so the basic bridging task is the same as in the Alamblak List SVC (44a). In Èdó (49) this task is similarly accomplished by the short topic-comment bridge ⟨?⟩, as in (51).

(51) LIST SVC (49) (via ⟨?⟩)

Ozo $[[_{if}\text{buy}_{\langle\exists\rangle!}$-PST LGB$_{\subseteq,\langle\exists\rangle}]\ [_{H}\,\text{read}_{\langle\exists\rangle!}$-PST it$]_{\langle ?\rangle}]_{\mathbf{a}}$ $\rightsquigarrow$

$[e\ \mathbf{t}\ y |\ buy\langle ozo, y, e\rangle, y = lgb, d\varepsilon < e, e \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t} \subseteq pst]$

$^{?}; [e'\ \mathbf{t}' |\ read\langle ozo, d\theta, e'\rangle, d\varepsilon < e', e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}' \subseteq pst]$

$\equiv\ [e'\ \mathbf{t}'\ e\ \mathbf{t}\ y |\ buy\langle ozo, y, e\rangle, y = lgb, read\langle ozo, y, e'\rangle,$

$d\varepsilon < e < e', e \subseteq \mathbf{d}\tau, e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t} = \mathbf{t}' \subseteq pst]$

This derives the usual equivalence with the corresponding discourse. Therefore, there is no planning presupposition, any more than in discourse, and we have the same ordering options for the two events as we would in discourse (section 4.3).

In contrast, the bridging task in the Plan SVC (50) is different, because the second part, by hypothesis, is a property. More precisely, it is the property of being read by the agent and this property is to be linked to a context-setting box — namely, the first part of the SVC. For type-driven bridging, this can only be an incomplete base-elaboration sequence. As a matter of fact, we have recently seen examples of this basic bridging task, e.g., in Alamblak (44b), where the property of being a tree, or a kind of insect, was also linked to a context-setting box by base-elaboration bridging. In Èdó (52), just as in those other cases, the property of being read is linked to the topmost background dref, of the right type, introduced by the context-setting box — here, to LGB, the topmost thing-level dref.

(52) PLAN SVC (50) (via ⟨¿⟩)

Ozo [[$_H$ buy$_{\langle\exists\rangle!}$-PST LGB$_{\subseteq,\langle\exists\rangle}$] [$_{ff}$ read$_{\langle\exists\rangle!}$-PST]$_{\langle ¿\rangle}$]$_\mathbf{a}$ $\leadsto$

$[e\ \mathbf{t}\ y|\ buy\langle ozo, y, e\rangle, y = lgb, d\varepsilon < e, e \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t} \subseteq pst]$

$¿;\ [e'\ \mathbf{t}'|\ read\langle ozo, d\theta, e'\rangle, d\varepsilon < e', e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}' \subseteq pst]$

$\equiv\ [\langle e, e'\rangle\ e'\ \mathbf{t}'\ e\ \mathbf{t}\ y|\ buy\langle ozo, y, e\rangle, y = lgb, read\langle ozo, y, e'\rangle,$

$d\varepsilon < e < e', e \subseteq \mathbf{d}\tau, e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t} = \mathbf{t}' \subseteq pst]$

That is, the first half of the Plan SVC (50) says that there is something, to wit LGB, that Ozo bought, and the second half elaborates that this thing was also read by Ozo. Here the anaphoric reference event for the second verb, 'read', can only be the top-level default, $d\varepsilon$ — nothing else will pass the grounding presupposition of base-elaboration sequencing. Therefore, there is no temporal ordering ambiguity in Plan SVCs — the second event necessarily follows the first (Baker fw). [17]

Up to this point, the interpretation of the Plan SVC (50) of Èdó is analogous to base-elaboration in Alamblak (44). But there is one new circumstance, which base-elaboration bridging registers and responds to in a predictable way. In (50) the elaborating sequencing operator 'and moreover' (¿;) connects two boxes which both add an event to the bottom stack (e and e'). Elaborating sequencing responds by further introducing the chain of these two events ($\langle e, e'\rangle$), as indicated in the bottom line of (52).[18] I suggest that it is the formation of this action chain which introduces the presupposition about planning — for an acceptable action chain, both of the actions as well as their order must have been planned, by a particular agent focused on a particular theme.

Event chaining also takes place under very similar circumstances of type-mismatch resolution in English resultatives (e.g., 'shoot dead') and equivalent Resultative SVCs, according to the analysis developed in a dynamic type-driven framework by Bittner (1999). That analysis could be transposed into the Bridging

Theory as a yet another instance of base-elaboration bridging. Resultatives, of course, do not presuppose an action plan. This difference can be plausibly attributed to aspect — the second event in a resultative event chain is an externally caused *change of state*, not an *action* that can be planned.[19] Only the chaining of two or more actions gives rise to a presupposition about an underlying action plan.

5.3. *Type-Driven Anaphora to the Central Event*

The different event structures derived by topic-comment bridging in List SVCs and base-elaboration bridging in Plan SVCs have implications for event modification. These, too, are predictable by type-driven bridging — given the standard Davidsonian assumption that event modifiers denote properties of events.

Since event modifiers preserve the type of the modified constituent, they are a yet another job for base-elaboration bridging — this time, without any further event chain formation because event modifiers do not add any new events to the bottom stack. Base-elaboration bridging explains the structural determinism of event anaphora by assorted modifiers — manner (e.g., 'quickly'), spatial location (e.g., 'in Benin'), temporal duration (e.g., 'for two hours'), etc. At each point in the structure the event modifier can only be linked to the current central event — so the 'scope' of an event modifier is fully determined by its structural position.

For example, in the List SVC (53) the event modifier must be bracketed with the first VP (Bittner 2000). Therefore, it can only be linked to the first event (54).

(53)	Òzó	gi<u>é</u>!gi<u>é</u>	d<u>é</u>	LGB	tìé	<u>ó</u>rè
	Ozo $[_{if}$	**quickly**$_{\langle ¿\rangle}$	[buy.PST	LGB]]	$[_{H}$ read.PST	it]$_{\langle ?\rangle}$

(54) $([e\ \mathbf{t}\ y|\ buy\langle ozo, y, e\rangle, \ldots]^{¿}; [\ |\ quick\langle d\varepsilon\rangle])^{?}; [e'\ \mathbf{t}'|\ read\langle ozo, d\theta, e'\rangle, \ldots]$

$\equiv\ [e'\ \mathbf{t}'\ e\ \mathbf{t}\ y|\ buy\langle ozo, y, e\rangle, y = lgb, quick\langle e\rangle, read\langle ozo, y, e'\rangle,$

$d\varepsilon < e < e', e \subseteq \mathbf{d}\tau, e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t} = \mathbf{t}' \subseteq pst]$

In the superficially similar Plan SVC (55) the event modifier can only be linked to the entire action chain, as in (56). This is because it combines with the whole Plan SVC so the action chain, added by ¿;, is the current central event. [20]

(55) Ò̀zó giẹ́!giẹ́ dẹ́ LGB tìé

Ò̀zó [**quickly**$_{\langle ¿\rangle}$ [[$_{H}$ buy.PST LGB] [$_{ff}$ read.PST]$_{\langle ¿\rangle}$]

(56) ([*e* **t** *y*| *buy*⟨*ozo, y, e*⟩, …] ¿; [*e*′**t′**| *read*⟨*ozo, d*θ*, e*′⟩,…]) ¿; [| *quick*⟨*d*ε⟩]

≡ [⟨*e, e*′⟩ *e*′**t′** *e* **t** *y*| *buy*⟨*ozo, y, e*⟩, …, *read*⟨*ozo, y, e*′⟩,…] ¿; [| *quick*⟨*d*ε⟩]

≡ [⟨*e, e*′⟩ *e*′**t′** *e* **t** *y*| *buy*⟨*ozo, y, e*⟩, …, *read*⟨*ozo, y, e*′⟩, *quick*⟨⟨*e, e*′⟩⟩,…]

This example is particularly interesting because there are also two lower ranked events — namely, in the order of prominence, the second action (introduced by ‘read’) and the first action (introduced by ‘buy’). Therefore, the competing DMG analysis of Dekker (1993) — intuitively similar but without centering — would predict an ambiguity. In fact, there is none, as the Bridging Theory predicts.

Finally, even though neither of the component actions is accessible to top-level event anaphora in (56), the Plan SVC (57) shows that each action in turn is accessible at the point in the structure where that action is the current central event.

(57) Ò̀zó dé LGB vbè È̀dó tìé vbé úzọ́lá èvá

Ozo [$_{H}$ [buy.PST LGB][**in Benin**$_{\subseteq,\ \langle ¿\rangle!}$]$_{\langle ¿\rangle}$][$_{ff}$read.PST [**in** [**wk two**]$_{\langle ¿\rangle!}$]$_{\langle ¿\rangle!}$]$_{\langle ¿\rangle}$

(58) ([*e* **t** *y*| *buy*⟨*ozo, y, e*⟩, …] ¿; ([*r*| *d*ε ⊆ *r*] ¿; [| *d*ρ ⊆ *benin*]))

¿; ([*e*′**t′**| *read*⟨*ozo, d*θ*, e*′⟩,…] ¿; ([*t*| *d*ε ⊆ *t*] ¿; [| *two.weeks*⟨*d*τ⟩]))

≡ [⟨*e, e*′⟩ *t e*′**t′** *r e* **t** *y*| *buy*⟨*ozo, y, e*⟩, *y = lgb, e ⊆ r ⊆ benin,*

read⟨*ozo, y, e*′⟩, *e*′ ⊆ *t, two.weeks*⟨*t*⟩, …]

Specifically, in (58) the first action is accessed by the first event modifier (‘in Benin’) and the second action, by the second event modifier (‘in two weeks’).

5.4. *Type-Driven Centering on Old vs. New Topic Time*

Since type-driven bridging also mediates anaphora to topic times — by temporal frames denoted by tenses and frame adverbials such as 'yesterday' — that, too, is predicted to be deterministic. In particular, the Bridging Theory predicts an important difference tied to the type of the verbal constituent in the scope of the temporal frame. If that constituent is a box then we get topic-comment bridging, which introduces a new topic time. But if the verbal constituent is a property then we get existential bridging, which reintroduces the old topic time ($\mathbf{d}\tau$). That is, in that case the temporal frame is just a reminder about the old topic time.

This explains why the List SVC (8) is acceptable — just like discourse — whereas the Plan SVC (9), with the same two temporal frames, is rejected as a contradiction. In the List SVC the second temporal frame, 'today', sets up the context for a box, 'read-PST it'. Therefore, 'today' is able to introduce a new topic time — via the topic-comment bridge ⟨?⟩! — and thus avoid the conflict with the old topic time, which was introduced by 'yesterday' (as in (59)).

(59) Ozo $[_{if}$[buy-PST LGB]$_{\langle ?\rangle !}$ **yesterday**$_{\subseteq}$] $[_{H}$[read-PST it]$_{\langle ?\rangle !}$ **today**$_{\subseteq}]_{\langle ?\rangle}$ $\rightsquigarrow$

$[e\ \mathbf{t}'\ y\ \mathbf{t}|\ \mathit{buy}\langle ozo, y, e\rangle, y = lgb, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{t}' \subseteq \mathit{yesterday} \cap \mathbf{d}\tau]$

$^{?}; ([\mathbf{t}''|\ \mathbf{t}'' \subseteq \mathit{today} \cap \mathbf{d}\tau_2]\ ^{?}; [e'\ \mathbf{t}'''|\ \ldots, e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}''' \subseteq \mathit{pst}])$

$\equiv\ [e'\ \mathbf{t}'''\ \mathbf{t}''\ e\ \mathbf{t}'\ y\ \mathbf{t}|\ \mathit{buy}\langle ozo, y, e\rangle, y = lgb, \mathit{read}\langle ozo, y, e'\rangle, d\varepsilon < e < e',$

$e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{t}' \subseteq \mathit{yesterday} \cap \mathbf{d}\tau, e' \subseteq \mathbf{t}'', \mathbf{t}'' = \mathbf{t}''' \subseteq \mathit{pst} \cap \mathit{today} \cap \mathbf{d}\tau]$

But in the Plan SVC (9) the conflict is unavoidable. Here the second VP must be a property so the second frame, 'today', must be interpreted via existential bridging (60). The consequences are disastrous: the last topic time (**t**), introduced by 'yesterday', is reintroduced and simultaneously supposed to serve as a reminder that the topic time is today. No wonder speakers reject this as a contradiction!

(60) * Ozo [$_{H}$ [buy-PST LGB]$_{\langle ?\rangle !}$ **yesterday**$_{\subseteq}$] [$_{ff}$ [read-PST]$_{\langle \exists\rangle !}$ **today**]$_{\langle ¿\rangle}$ ⇝

$[e\ \mathbf{t}'\ y\ \mathbf{t}|\ buy\langle ozo, y, e\rangle, y = lgb, d\varepsilon < e, e \subseteq \mathbf{t}, \mathbf{t} = \mathbf{t}' \subseteq yesterday \cap \mathbf{d}\tau]$

$^{¿}$; $([\mathbf{t}''|\ \mathbf{d}\tau = \mathbf{t}'' \subseteq today \cap \mathbf{d}\tau_2]\ ^{?}; [e'\ \mathbf{t}'''|\ \ldots, e' \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}''' \subseteq pst])$

$\equiv\ [\langle e, e'\rangle\ e'\ \mathbf{t}'''\ \mathbf{t}''\ e\ \mathbf{t}'\ y\ \mathbf{t}|\ buy\langle ozo, y, e\rangle, y = lgb, read\langle ozo, y, e'\rangle, \ldots,$

$e \subseteq \mathbf{t}, \mathbf{t} \subseteq yesterday \cap \mathbf{d}\tau, e' \subseteq \mathbf{t}, \mathbf{t} \subseteq pst \cap today \cap \mathbf{d}\tau, \mathbf{t} = \mathbf{t}' = \mathbf{t}''\ldots]$

So Èdó SVCs present no mystery after all, if we adopt the Bridging Theory of surface composition. This theory not only offers a general explanation why subclausal composition is deterministic, but also predicts in detail which features of the structure will determine which elements of meaning. In particular, deterministic type-driven bridging correctly predicts that the mere presence or absence of an object pronoun can set off a chain reaction whose semantic consequences range from bridge-induced presuppositions about planning to top-level anaphora, in various semantic domains, that type-driven bridging also mediates.

6. Universality and Surface Faithfulness

6.1. *General Issues*

The last but perhaps most important argument in favor of the Bridging Theory concerns the relation between two ideals for semantic composition — universality and faithfulness to overt surface structures. I mentioned in the introduction that, as far as I can see, compositional theories that place the primary burden on static mechanisms such as function application and static variable binding must choose between these ideals. Either universality or surface faithfulness must be given up because languages disagree about the bracketing and, more generally, because of the ubiquitous phenomenon of semantic convergence across structural diversity.

We have already seen some examples of such convergence, across Eskimo noun incorporation and English transitive clauses in section 3, and then again, in section 4, across English discourse and Alamblak lexical SVCs. My point here is that this is not just a peculiarity of a few constructions that we might hope to deal with by means of construction-specific rules. What we need is a general solution because semantic convergence across structural diversity is a fundamental problem that confronts us every single time we compare intuitive equivalents drawn from typologically distant languages. That is, the two seemingly isolated instances we have already analyzed are just glimpses of a kaleidoscopic puzzle that confronts us yet again, e.g., in the more complex guise of English (10) and Eskimo (11).

(10) [In [that room]] [I [quickly [[make-PST [a [new anorak]]] [for my child]]]].

(11)

(11)	Ini	taanna	sukkasuu-mik	qiturna-n-nik
	[room	that]	[[quickly-MOD	[child-1S-SG.MOD

anura-liu-us-si-vviga-a-ra	nutaa-mik.
[[[[[anorak-make]-for]-APASS]-in]-IND[2]]-1S.3S]]	new-SG.MOD]

In the latter convergent pair consider, for example, the modifier ‘new’. What sort of story could we tell that would generalize across both languages? The classical Montagovian story is that ‘new’ is a second order functor that takes property arguments — for example, it maps the property of being an anorak to the property of being a new anorak. This works fine for English (10), but in Eskimo (11) we encounter a snag. The Eskimo equivalent of the English noun ‘anorak’, which we would like to feed to the equivalent of ‘new’ as an argument, is incorporated into the equivalent of ‘make’. So if we take the surface structure at face value, then we cannot tell the Montagovian story about Eskimo. That is, we can maintain surface faithfulness but without universality.

Alternatively, we could maintain the claim that the Montagovian story is universal by assimilating Eskimo structures to English at the level that feeds into semantic composition. That route has in fact been taken, with varying details and varying degrees of disregard for the hard realities of Eskimo morphology, by all compositional analyses so far — including Sadock (1986), Bittner (1994, 1998) and van Geenhoven (1998, *in press*). [21] But if you take the route of assimilating Eskimo structures to English then you better forget surface faithfulness. And you end up with the bizarre claim that, if truth be told, only English structures are interpretable. Eskimo structures must first be turned into English to be interpreted!

Of course, this is only one example of a static compositional analysis, and there are many alternatives one could pursue. But the problems that this example illustrates are deeply rooted, I think, in the static conception of compositionality so, in general, I do not see how universality can be reconciled with surface faithfulness under the static approach. In contrast, the conflict, and even the tension, between these two ideals disappears if we switch to the dynamic approach, where surface composition proceeds primarily by type-driven bridging.

For example, nothing new needs to be added to explain the semantic convergence of English (10) and Eskimo (11). The basic outline of the account that derived the simple instances of semantic convergence in sections 3 and 4 immediately generalizes to this more complex manifestation as well. In particular, going back to the modifier 'new', we now do have a story to tell that generalizes across both languages, with due respect for their structural differences. Crucially, the relation of this modifier to the noun 'anorak' is rethought as a top-level anaphoric link — parallel to the relation between 'big' and 'house' in section 3.

That is, in both languages the nominal root 'anorak-' sets up a dref for a kind. More precisely, it denotes the number-neutral property of being a thing that realizes some kind of anorak. The information that this thing is an atom comes from the singular number, which morphologically combines either with 'anorak-' (English) or with 'new' (Eskimo). In both languages, the modifier 'new' elaborates the kind-level dref introduced by the noun, adding the information that the particular anorak made in this event is a new specimen of that kind at the current topic time. In English the past tense adds the further information that the topic time is in the past, while in Eskimo this is just a reasonable inference from the indicative mood.

More generally, we predict semantic convergence across structural diversity if there is agreement on two crucial issues. First, the bridgeable basic meanings are essentially the same — up to tense and mood, which serve as reminders about the current topic time and topical possibility.[22] And secondly, there is agreement about the top-level anaphoric links to be completed by type-driven bridging. The requisite bridges can be built at any level — lexicon, syntax or discourse — and in any order as long as type-driven top-level anaphora is not affected.

6.2. *Semantic Convergence across Structural Diversity*

For the convergent pair of English (10) and Eskimo (11), I propose the following factorization into largely shared basic meanings and universal type-driven bridges.

T_0 BASIC TRANSLATIONS (for (10)–(11)) [23]

• make	$\rightsquigarrow$	$\lambda s[e \mid make\langle \mathbf{a}, s, e\rangle, d\varepsilon_n < e, e \subseteq \mathbf{d}\tau]$	$[\sigma]$
• -PST	$\rightsquigarrow$	$(pst \cap \mathbf{d}\tau_n)^\circ$	$s\tau$
I, my, 1S	$\rightsquigarrow$	$(me)^\circ$	$s\theta$
3s, that	$\rightsquigarrow$	$(\mathbf{d}\rho_n)^\circ$	$s\rho$
-SG	$\rightsquigarrow$	$\lambda s[\ \mid \mathbf{1}\langle s\rangle]$	$[\sigma]$
new, anorak	$\rightsquigarrow$	$\lambda s[\ \mid new\langle s, d\kappa_n, \mathbf{d}\tau\rangle], \lambda s[k \mid s \sqsubseteq k, anorak\langle k\rangle]$	$[\sigma]$
child, -APASS	$\rightsquigarrow$	$\lambda y[\ \mid child.of\langle y, \mathbf{a}\rangle], \lambda y[\ \mid \mathbf{a} \neq y]$	$[\theta]$
in^r, -[$_{\mathbf{d}\rho}$], for^y	$\rightsquigarrow$	$\lambda e[r \mid e \subseteq r], \lambda e[\ \mid e \subseteq \mathbf{d}\rho], \lambda e[y \mid for\langle e, y\rangle]$	$[\varepsilon]$
in, room	$\rightsquigarrow$	$\lambda r[\ \mid r \subseteq r], \lambda r[\ \mid room\langle r\rangle]$	$[\rho]$
• IND, MOD, a	$\rightsquigarrow$	$\lambda J_{[\,]}\, J, \lambda P_{[a]}\, P$	

(61) ISOLATING TENSE-BASED LANGUAGE WITH 'RIGID' ORDER (English (10))

<u>Lexicon</u> (ignoring '-PST', key bridges by ⟨¿⟩!, ⟨¿⟩!)

[make-$[_{\mathbf{d}\rho}]_{\langle\text{¿}\rangle!}]_{\langle\exists\rangle!}$-PST $\rightsquigarrow$

$\lambda s([\mathbf{t}|\ \mathbf{d}\tau = \mathbf{t} \subseteq pst \cap \mathbf{d}\tau]^{?}; ([e|\ make\langle \mathbf{a}, s, e\rangle \ldots e \subseteq \mathbf{d}\tau]^{\text{¿}}; [\ |\ d\varepsilon \subseteq \mathbf{d}\rho]))$

$\equiv\ \lambda s[e\ \mathbf{t}|\ e \subseteq \mathbf{d}\rho,\ make\langle \mathbf{a}, s, e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau,\ \mathbf{d}\tau = \mathbf{t} \subseteq pst]$

anorak-SG$_{\langle\text{¿}\rangle!}$ $\rightsquigarrow$

$\lambda s([k|\ s \sqsubseteq k,\ anorak\langle k\rangle]^{\text{¿}}; [\ |\ \mathbf{1}\langle s\rangle])$

$\equiv\ \lambda s[k|\ s \sqsubseteq_{\mathbf{1}} k,\ anorak\langle k\rangle]$

<u>Syntax</u> (key bridges by ⟨¿⟩!, ⟨∃⟩, ⟨¿⟩!, ⟨¿⟩, ⟨¿⟩, ⟨¿⟩!, ⟨¿⟩!, ⟨?⟩!)

make$_{\mathbf{d}\rho}$-PST [a [new$_{\langle\text{¿}\rangle!}$ anorak-SG]]$_{\langle\exists\rangle}$ $\rightsquigarrow$

$[s|\ ]\ ; ([e\ \mathbf{t}|\ e \subseteq \mathbf{d}\rho,\ make\langle \mathbf{a}, d\sigma, e\rangle, \ldots]\ ;$

$\lambda s([k|\ s \sqsubseteq_{\mathbf{1}} k,\ anorak\langle k\rangle]^{\text{¿}}; [\ |\ new\langle s, d\kappa, \mathbf{d}\tau\rangle])[d\sigma^{\circ}])$

$\equiv\ [k\ e\ \mathbf{t}\ s|\ e \subseteq \mathbf{d}\rho,\ make\langle \mathbf{a}, s, e\rangle,\ s \sqsubseteq_{\mathbf{1}} k,\ anorak\langle k\rangle,\ new\langle s, k, \mathbf{t}\rangle,$

$d\varepsilon < e,\ e \subseteq \mathbf{d}\tau,\ \mathbf{d}\tau = \mathbf{t} \subseteq pst]$

quickly$_{\langle\text{¿}\rangle}$ [[make$_{\mathbf{d}\rho}$-PST a new anorak] [for^{y} [my child$_{\mathbf{a}}$]$_{\langle\text{¿}\rangle!}$]$_{\langle\text{¿}\rangle}$] $\rightsquigarrow$

$([k\ e\ \mathbf{t}\ s|\ldots]^{\text{¿}}; ([y|\ for\langle d\varepsilon, y\rangle]^{\text{¿}}; [\ |\ child.of\langle d\theta, me\rangle]))^{\text{¿}}; [\ |\ quick\langle d\varepsilon\rangle]$

$\equiv\ [y\ k\ e\ \mathbf{t}\ s|\ e \subseteq \mathbf{d}\rho,\ make\langle \mathbf{a}, s, e\rangle,\ s \sqsubseteq_{\mathbf{1}} k,\ anorak\langle k\rangle,\ new\langle s, k, \mathbf{t}\rangle,$

$for\langle e, y\rangle,\ child.of\langle y, me\rangle,\ quick\langle e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau,\ \mathbf{d}\tau = \mathbf{t} \subseteq pst]$

[in [that$_{\subseteq,\langle\text{¿}\rangle!}$ room]$_{\langle\text{¿}\rangle!}$]$_{if}$ [I [quickly make$_{\mathbf{d}\rho}$-PST … for my child]$_{\mathbf{a}}$]$_{\langle ?\rangle!}$ $\rightsquigarrow$

$([\mathbf{r}|\ ];\ \lambda r([\ |\ r \subseteq r]^{\text{¿}}; ([\ |\ room\langle r\rangle]^{\text{¿}}; [\ |\ r \subseteq \mathbf{d}\rho_1]))[\mathbf{d}\rho^{\circ}])$

$^{?}; (\lambda \mathbf{a}[y\ k\ e\ \mathbf{t}\ s|\ e \subseteq \mathbf{d}\rho,\ make\langle \mathbf{a}, s, e\rangle, \ldots][me^{\circ}])$

$\equiv\ [y\ k\ e\ \mathbf{t}\ s\ \mathbf{r}|\ room\langle \mathbf{r}\rangle,\ e \subseteq \mathbf{r} \subseteq \mathbf{d}\rho,$

$make\langle me, s, e\rangle,\ s \sqsubseteq_{\mathbf{1}} k,\ anorak\langle k\rangle,\ new\langle s, k, \mathbf{t}\rangle,\ for\langle e, y\rangle,$

$child.of\langle y, me\rangle,\ quick\langle e\rangle,\ d\varepsilon < e,\ e \subseteq \mathbf{d}\tau,\ \mathbf{d}\tau = \mathbf{t} \subseteq pst]$

(62) POLYSYNTHETIC MOOD-BASED LANGUAGE WITH 'FREE' ORDER (Eskimo (11))

Lexicon (ignoring '-APASS', key bridges by ⟨∃⟩, ⟨¿⟩, ⟨¿⟩, ⟨¿⟩, ⟨¿⟩!)

[[[[[[anorak-make$_{⟨∃⟩}$]-for$^{y}_{⟨¿⟩}$]-APASS$_{⟨¿⟩}$]-in$^{r}_{⟨¿⟩}$]-IND^{2}]$_{\mathbf{a}}$-1S]-3S$_{⊆,⟨¿⟩}$ ⤳

(*λ***a**(((([*s*|]; ([*k*| *d*σ ⊑ *k*, *anorak*⟨*k*⟩]; [*e*| *make*⟨**a**, *d*σ, *e*⟩, …, *e* ⊆ **d**τ]))

¿; [*y*| *for*⟨*d*ε, *y*⟩]) ¿; [| *d*θ ≠ **a**]) ¿; [*r*| *d*ε ⊆ *r*])[*me*°]) ¿; [| *d*ρ ⊆ **d**ρ]

≡ [*r y e k s*| *e* ⊆ *r* ⊆ **d**ρ, *make*⟨*me*, *s*, *e*⟩, *s* ⊑ *k*, *anorak*⟨*k*⟩, *for*⟨*e*, *y*⟩,

y ≠ *me*, *d*ε < *e*, *e* ⊆ **d**τ]

[new-SG$_{⟨¿⟩!}$]-MOD ⤳

λs([| *new*⟨*s*, *d*κ, **d**τ⟩] ¿; [| **1**⟨*s*⟩])

≡ *λs*[| *new*⟨*s*, *d*κ, **d**τ⟩, **1**⟨*s*⟩]

Syntax (key bridges by ⟨¿⟩, ⟨¿⟩, ⟨¿⟩, ⟨¿⟩!, ⟨?⟩!)

[room that$_{⊆,⟨¿⟩!}$] [[quickly-MOD$_{⟨¿⟩}$ [child-1S-SG.MOD$_{⟨¿⟩}$

anorak-make-for-APASS-in-IND^{2}-1S-3S]] new-SG.MOD$_{⟨¿⟩}$]$_{⟨?⟩!}$ ⤳

([**r**|] ; *λr*([| *room*⟨*r*⟩] ¿; [| *r* ⊆ **d**ρ$_{1}$])[**d**ρ°])

?; (((([*r y e k s*| *e* ⊆ *r* ⊆ **d**ρ, *make*⟨*me*, *s*, *e*⟩, *s* ⊑ *k*, *anorak*⟨*k*⟩,

for⟨*e*, *y*⟩, *y* ≠ *me*, *d*ε < *e*, *e* ⊆ **d**τ] ¿; [| *child.of*⟨*d*θ, *me*⟩])

¿; [| *quick*⟨*d*ε⟩]) ¿; [| *new*⟨*d*σ, *d*κ, **d**τ⟩, **1**⟨*d*σ⟩])

≡ [*r y e k s* **r**| *room*⟨**r**⟩, *e* ⊆ *r* ⊆ **r** ⊆ **d**ρ,

make⟨*me*, *s*, *e*⟩, *s* ⊑$_{\mathbf{1}}$ *k*, *anorak*⟨*k*⟩, *new*⟨*s*, *k*, **d**τ⟩, *for*⟨*e*, *y*⟩,

child.of⟨*y*, *me*⟩, *quick*⟨*e*⟩, *d*ε < *e*, *e* ⊆ **d**τ]

It will be seen that there is close agreement on the bridgeable meanings up to tense, mood, and some other grammatical morphemes (e.g., '-APASS'). For simplicity, the number inflection is not factored out for 'child' and 'room', since English and Eskimo agree on these points. I assume that in both languages the topological placement of the locative phrase in the initial field — and hence its status as a context-setting TOP-dependent — is licensed by the head verb (see

Kathol 2000, Bouma *et al* in press). The basic meaning of the verb is adjusted accordingly. In Eskimo (62) the requisite meaning adjustment is made by the locative object agreement (-3s $\leadsto$ **d**ρ). In English (61) the corresponding lexical operation (represented by -[$_{\mathbf{d}\rho}$]) does not affect the form of the verb, but only its meaning and the topological field assignment to the affected locative dependent.

The two languages also agree on the ten top-level anaphoric links to be completed by type-driven bridges — namely, one short existential bridge, eight base-elaboration bridges, and one long topic-comment bridge. The existential bridge, ⟨∃⟩, restricts and closes off the theme argument of the verb. Most of the base-elaboration bridges link a property of some type to the current central dref of that type on the bottom stack set up by the context-setting sister. Finally, the topic-comment bridge, ⟨?⟩!, sets up the locative phrase — a TOP-dependent, in the initial field — as a topic for the rest of the clause. The two languages disagree on the order in which these bridges are to be built, and also on the division of labor between the lexicon and syntax. But these disagreements are compatible with semantic convergence because they do not affect type-driven top-level anaphora.

By factoring out surface composition into crosslinguistically stable bridgeable meanings and universal type-driven bridges, we reconcile a strong claim that semantics is universal with the ideal strict surface composition. The surface order — be it ‘rigid’ or ‘free’ — is respected. So is the traditional view — still current in lexicalist frameworks such as HPSG — that syntax has no access to the internal structure of morphologically complex words. What matters for semantic composition is not morphological structure, but rather the resulting potential for top-level anaphora — *i.e.*, the *stack structure* in the final output of lexical composition. Therefore, there is no need to decorate structures with invisible indices, traces, or other inaudibilia. However, some lexical ambiguities or zero derivations are still required, to capture centering ambiguities in the lexicon.

7. Conclusion

I have presented a new conception of subclausal composition, where the primary burden is on type-driven bridging which completes top-level anaphoric links between mismatched constituents. And I have given three reasons to believe that this dynamic Bridging Theory is more faithful to natural language semantics than the classical static approach.

First, the Bridging Theory explains how dynamic phenomena, such as temporal anaphora, generalize across all levels and across the typological spectrum. Second, it explains the shift from defeasible defaults in discourse to structural determinism at subclausal levels, in terms of the type diversity needed to support type-driven bridging. Deterministic type-driven bridging also makes detailed predictions about the exact impact of syntactic structure on top-level anaphora in various domains and other presuppositional phenomena which it mediates. And last but not least, the Bridging Theory combines a strong claim that semantics is universal — bridgeable basic meanings are mostly universal and type-driven bridges, all universal — with the ideal of strict surface composition.

Viewed from the perspective of formal languages, the conception of semantic composition as type-driven bridging must seem bizarre. So let me end by pointing out a different perspective, from which it appears more natural. According to the Bridging Theory, natural language semantics is closely parallel to natural language phonology. Basic meanings are like phonemes — approximate building blocks to be fitted into the local context by universal mechanisms that automatically fill in missing information. This is done by type-driven bridging in semantics and by articulatory assimilation in phonology. So even though the classical parallel with formal languages is lost, the Bridging Theory succeeds in capturing not only the semantic kinship of typologically distant languages — such as English, Alamblak, Èdó and Eskimo — but also the fundamental kinship of natural language semantics to other components of natural language grammar.

REFERENCES

Abraham, W. and S. de Meij, eds. (1986), *Topic, Focus, and Configurationality*, John Benjamins, Amsterdam.

Asher, N. and A. Lascarides (1998), 'Bridging', *Journal of Semantics* **15**, 83–113.

Baker, M. and O. T. Stewart (1999), 'On Double-Headedness and the Anatomy of the Clause', unpublished MS, Rutgers, http://ling.rutgers.edu/people/faculty/ours/baker.html

Barwise, J. (1987), 'Noun Phrases, Generalized Quantifiers and Anaphora', in P. Gärdenfors (ed.) *Generalized Quantifiers*, Reidel, Dordrecht, pp. 1–29.

Bittner, M. (1994) *Case, Scope, and Binding*, Kluwer, Dordrecht.

Bittner, M. (1998) 'Cross-Linguistic Semantics for Questions', *Linguistics and Philosophy* **21**, 1–82.

Bittner, M. (1999), 'Concealed Causatives', *Natural Language Semantics* **7**, 1–78.

Bittner, M. (2000), 'Headedness and Linearization in Serial Verbs of Èdó', unpublished MS, Rutgers & Uni-Bielefeld, http://www.rci.rutgers.edu/~mbittner/Pages/DynamicXLS.html

Bouma, G. *et al* (*in press*), 'Satisfying Constraints on Extraction and Adjunction', to appear in *Natural Language and Linguistic Theory*, http://www-csli.stanford.edu/~sag/sag.html

Bruce, L. (1988), 'Serialization: From Syntax to Lexicon', *Studies in Language* **12**, 19–49.

Carlson, G. (1977), *Reference to Kinds in English*, Ph. D. dissertation, University of Massachusetts at Amherst.

Clark, H. (1977) 'Bridging', in P. N. Johnson-Laird and P. C. Wason (eds.) *Thinking: Readings in Cognitive Science*, Cambridge University Press, Cambridge, 411–420.

Dekker, P. (1993), 'Existential Disclosure,' *Linguistics and Philosophy* **16**, 561–587.

Dekker, P. (1994), 'Predicate Logic with Anaphora', in M. Harvey and L. Santelmann (eds.) *Proceedings from SALT* IV, DMLL, Cornell University, Ithaca, pp. 79–95.

Geenhoven, V. van (1998), *Semantic Incorporation and Indefinite Descriptions*, CSLI, Stanford.

Geenhoven, V. van (in press), ‘"Raised Possessors" and Noun Incorporation in West Greenlandic’. To appear in *Natural Language & Linguistic Theory*.

Groenendijk, J. and M. Stokhof (1990) ‘Dynamic Montague Grammar,’ in L. Kálmán et al (eds.) *Papers from the 2nd Symposium on Logic and Language*. Akadémiai Kiadó, Budapest, 3–48.

Grosz, B., A. Joshi and S. Weinstein (1995), ‘Centering: A Framework for Modeling the Local Coherence of a Discourse’, *Computational Linguistics* **21**, 203–225.

Heim, I. (1982), *The Semantics of Definite and Indefinite Noun Phrases*, Ph. D. dissertation, University of Massachusetts at Amherst.

Jäger, G. (1997), ‘The Stage / Individual Contrast Revisited’, in B. Agbayani and S. W. Tang (eds.) *Proceedings of WCCFL 15*, CSLI, Stanford, pp. 225–239.

Kamp, H. (1979), ‘Events, Instants and Temporal Reference’, in R. Bäuerle *et al* (eds.) *Semantics from Different Points of View*, Springer, Berlin, pp. 376–417.

Kamp, H. (1981), ‘A Theory of Truth and Semantic Representation’, in J. Groenendijk *et al* (eds.) *Formal Methods in the Study of Language*, Mathematical Centre, Amsterdam, pp. 277–322.

Kamp, H. and U. Reyle (1993), *From Discourse to Logic*, Kluwer, Dordrecht.

Kathol, A. (2000), *Linear Syntax,* Oxford University Press, Oxford.

Kratzer, A. (1993), ‘On External Arguments’, in E. Benedicto and J. Runner (eds.), *UMOP* 17: *Functional Projections*, GLSA, University of Massachusetts at Amherst, pp. 103–130.

Kleinschmidt, S. (1851) *Grammatik der grönländischen sprache*, von Reimer, Berlin.

Muskens, R. (1995), ‘Tense and the Logic of Change’, in U. Egli *et al* (eds.) *Lexical Knowledge in the Organization of Language*, Benjamins, Amsterdam, pp. 147–183.

Muskens, R. (1996), ‘Combining Montague Semantics and Discourse Representation’, *Linguistics and Philosophy* **19**, 143–186.

Partee, B. (1973), ‘Some Structural Analogies between Tenses and Pronouns in English’, *Journal of Philosophy* **70**, 601–609.

Partee, B. (1986), 'Ambiguous Pseudoclefts with Unambiguous *Be*', in S. Berman *et al* (eds.) *Proceedings from NELS* 16, GLSA, University of Massachusetts at Amherst, pp. 354–366.

Rischel, J. (1971) 'Some Characteristics of Noun Phrases in West Greenlandic', *Acta Linguistica Hafniensia* **12**, 213–245.

Rooth, M. (1985), *Association with Focus*, Ph. D. dissertation, University of Massachusetts at Amherst.

Rooth, M. (1987), 'Noun Phrase Interpretation in Montague Grammar, File Change Semantics and Situation Semantics', in P. Gärdenfors (ed.) *Generalized Quantifiers*, Reidel, Dordrecht, pp. 237–268.

Sadock, J. M. (1986), 'Autolexical Syntax: A Proposal for the Treatment of Noun Incorporation and Similar Phenomena', *Natural Language & Linguistic Theory* **3**, 379–439.

Stewart, O. T. (1998), *The Serial Verb Construction Parameter*, Ph. D. dissertation, McGill University, Montreal.

Stone, M. (1997) 'The Anaphoric Parallel between Modality and Tense', *IRCS Report* 97–06, University of Philadelphia.

Walker, M., A. Joshi and E. Prince, eds. (1998), *Centering Theory in Discourse*, Clarendon Press, Oxford.

FOOTNOTES

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1 Based, e.g., on Abraham & de Meij (1986), Kathol (2000), and Bittner (2000), I assume five topological fields, linearly ordered as follows: initial field (*if*) < initial boundary (*ib*) < middle field (*mf*) < final boundary (*fb*) < final field (*ff*). Note that not every sentence-initial constituent is in the initial field, since this topological field need not be instantiated. In what follows dependents in the initial field are identified by the subscript *if* where this is relevant for type-driven bridging.

2 This is part of the evidence for my claim that verbs can be saturated already in the lexicon.

3 The examples in the paper are drawn from the following sources: *Alamblak*: Bruce (1988). *Èdó*: Stewart (1998), Baker & Stewart (1999), Baker (field work). *Greenlandic Eskimo*: Bittner (field work). The glosses are abbreviated as follows. *Tense* & *Mood*: PST = past, PRS = present, IND^1 = intransitive indicative, IND^2 = transitive indicative. *Case-related*: MOD = modalis, APASS = antipassive. *Agreement*: 1 = 1st person, 3 = 3rd person, P(L) = plural, S(G) = singular, M = masculine. *Heads & Topology*: H = head, $[\ ]_{if}$ = initial field dependent, $[\ ]_{ff}$ = final field dependent.

4 My *List SVCs* and *Plan SVCs* correspond to what Stewart (1998) calls *Covert Coordination* and *Consequential SVCs*. I find his labels misleading since List SVCs do *not* obey the Coordinate Structure Constraint, and in Plan SVCs the second event is *not* a consequence of the first.

5 In Bittner (2000) this structural analysis is fleshed out in HPSG. It is based on the evidence presented in Stewart (1998) and Baker & Stewart (1999), including the examples in section 5.

6 Note that neither '$\angle$' (for 'is the context-setting sister for') nor '$\rightsquigarrow$' (for 'translates into') is an expression of our Logic of Change with Centering. The mixed notation '$\alpha \angle \beta \rightsquigarrow \gamma$' is a shorthand for 'given a mismatched configuration where the context-setting sister translates into α and the dynamically dependent sister, into β, the output of type-driven bridging is γ'.

7 Unlike Kratzer (1993), I assume that the external argument is represented in the lexical meaning of the verb. I do not know any other analysis of this argument that works for all verbs. Kratzer's use of an unanalyzed relation 'agent' is just a name for the problem, not a solution.

8 In the rules the notation [A, B] denotes a constituent whose immediate daughters are A and B. The daughters may occur in any order. I assume that only binary branching is possible.

[9] The refinement concerns sequences of the form ([…*e*…|…] ¿; […*e*′…|…]), where *e* and *e*′ are topmost event dref's introduced in the two boxes. In this case ¿; further adds the event chain ⟨*e*, *e*′⟩ — that is, the sequence reduces to ([…*e*…|…] ; *λe*([…*e*′…|…] ; [*e*″| *e*″ = ⟨*e*, *d*ε⟩])(*d*ε°]), which we will abbreviate as [⟨*e*, *e*′⟩ *e*′…*e*…|…]. See Bittner (1999) and section 5 below for crosslinguistic evidence and further discussion.

[10] I assume a syntactic framework such as HPSG, where '**a**-subjects' and constituents with free occurrences of **a** can be identified by means of suitable features.

[11] The idea that the existential force of incorporated nouns in Eskimo is due to type-mismatch resolution by Partee's *A* (static counterpart of $\langle\exists\rangle_\theta$) was first proposed by Bittner (1994). That proposal was articulated in a static framework so surface faithfulness could not be maintained. Therefore, it failed to ensure narrow scope, as pointed out by van Geenhoven (1998). The present reconstruction of the same basic idea in a dynamic framework does not have this problem.

[12] See Kamp & Reyle (1993).

[13] That is not to say that centering as conceived here offers a full solution, but it is a big help.

[14] I assume that non-bridgeable items are interpreted as identity maps, as in section 3.

[15] The hypothesis that Alamblak List SVCs are interpreted as topic-comment sequences receives support from the fact that speakers reject (i) because 'stars are observable from the ground' but accept (ii) in a context 'where the observation of stars would be of interest' (Bruce 1988:29).

(i) # Mɨyt guñm muh-hëti-an-m.

tree stars [climb-see$_{\langle ?\rangle}$]-1S-3P

⤳ ([*e y*| *climb*⟨*me*, *y*, *e*⟩, *d*ε < *e*, *e* ⊆ **d**τ] $^?$; [*e*′ *k s*| *s* ⊑ *k*, *see*⟨*me*, *s*, *e*′⟩, …])…

(ii) Mɨyt guñm muh-hɨti-marña-an-m

tree stars [[climb-see$_{\langle ?\rangle}$]-well$_{\langle ¿\rangle}$]-1S-3P

⤳ (([*e y*| *climb*⟨*me*, *y*, *e*⟩, …] $^?$; [*e*′ *k s*| *s* ⊑ *k*, *see*⟨*me*, *s*, *e*′⟩, …]) ¿; [| *do.well*⟨*me*, *d*ε⟩])…

≡ ([*e y*| *climb*⟨*me*, *y*, *e*⟩, …] $^?$; [*e*′ *k s*| *s* ⊑ *k*, *see*⟨*me*, *s*, *e*′⟩, *do.well*⟨*e*′⟩, …]) …

Similar reactions might be elicited from English speakers for canonical topic-comment structures like the odd # ‘Domestic animals sleep’ vs. acceptable ‘Domestic animals sleep indoors’. Although the aboutness presupposition is met in all cases, the strange topic-comment sequences fail to meet the presupposition of *contrast* — the comment should distinguish the topic from focal alternatives (Jäger 1997). I thank Nicholas Asher for helpful discussion of this point.

[16] In this section I ignore centering ambiguities and assign property readings to all verbs. This is only crucial for the second verb in Plan SVCs — without the object — as the reader can verify.

[17] The second action of the plan must follow the first but other events may intervene — e.g., (50) could be followed by ‘But he did the dishes before he started reading’ (Baker’s fieldwork).

[18] Recall ftn. 9. More challenging Plan SVCs, with opaque verbs followed by transparent verbs (as in (i)), are amenable to essentially the same analysis, thanks to kind-level anaphora (see (ii)).

(i) Òzó miẹ́n ìyán dẹ́ lé.

Ozo [[[$_{\mathrm{H}}$ seek.PST yams$_{\langle\exists\rangle}$] [$_{ff}$buy.PST]$_{\langle\text{¿}\rangle}$] [$_{ff}$ cook.PST]$_{\langle\text{¿}\rangle}$]]$_{\mathbf{a}}$

‘Ozo looked for yams, bought some, cooked them and ate them.’ (all as planned)

(ii) $([e_1\ \mathbf{t}_1\ k|\ seek\langle ozo, k, e_1\rangle, yams\langle k\rangle, d\varepsilon < e_1, e_1 \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}_1 \subseteq pst]$

$\text{¿}; [e_2\ y\ \mathbf{t}_2|\ y \sqsubseteq d\kappa, buy\langle ozo, y, e_2\rangle, d\varepsilon < e_2, e_2 \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}_2 \subseteq pst])$

$\text{¿}; [e_3\ \mathbf{t}_3|\ cook\langle ozo, d\theta, e_3\rangle, d\varepsilon < e_3, e_3 \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}_3 \subseteq pst]$

$\equiv ([\langle\langle e_1, e_2\rangle, e_3\rangle\ e_3\ \mathbf{t}_3\ \langle e_1, e_2\rangle\ e_2\ y\ \mathbf{t}_2\ e_1\ \mathbf{t}_1\ k|\ seek\langle ozo, k, e_1\rangle, yams\langle k\rangle, y \sqsubseteq k, buy\langle ozo, y, e_2\rangle,$

$cook\langle ozo, y, e_3\rangle, d\varepsilon < e_1 < e_2 < e_3, e_1 \subseteq \mathbf{d}\tau, e_2 \subseteq \mathbf{d}\tau, e_3 \subseteq \mathbf{d}\tau, \mathbf{d}\tau = \mathbf{t}_1 = \mathbf{t}_2 = \mathbf{t}_3 \subseteq pst]$

[19] Transposing Bittner (1999), I propose that *action* predicates introduce just an event, whereas *change of state* predicates introduce a state / stage along with an associated event of becoming. This difference in the potential for top-level anaphora bears on bridge-induced presuppositions about planning. It also guides base-elaboration bridging in other respects, e.g., the causal relation is filled in only if the base introduces an event and the elaborating property is stage-level.

[20] Without event chaining, top-level event anaphora would target the last event, as in the Alamblak List SVC (ii) in ftn. 15.

[21] Sadock (1986) does not spell out the compositional rules, but that is hardly necessary since his compositional structures for Eskimo look exactly like English.

[22] The present extensional system cannot draw this parallel, so I have been misrepresenting mood as an identity map on updates. On the anaphoric parallel with tense, see Stone (1997).

[23] The theme of 'make' is analyzed here as a stage, and 'anorak', 'new', and '-SG', as stage-level properties. All that is crucial is that the theme of 'make' be of a *different* type than the implicit argument of 'for'. Otherwise, this argument would cover up the theme of 'make' in Eskimo (11), and thereby block top-level anaphora by the external modifier 'new-SG.MOD'. A similar problem arises in Alamblak in ftn. 15, where the theme of 'see' is analyzed as a stage for the same reason. Such noncanonical use (misuse?) of stages can hopefully be eliminated in future work.