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Aspectual universals of temporal anaphora

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Abstract: It has long been recognized that temporal anaphora in French and English depends on the aspectual distinction between *events* and *states.* For example, temporal location as well as temporal update depends on the aspectual type. This paper presents a general theory of aspect-based temporal anaphora, which extends from languages with grammatical tenses (like French and English) to tenseless languages (e.g. Kalaallisut). This theory also extends to additional aspect-dependent phenomena and to non-atomic aspectual types, *processes* and *habits*, which license anaphora to proper atomic parts (cf. nominal *pluralities* and *kinds*).

1 INTRODUCTION

Since Kamp 1979 and Partee 1984 it has been recognized that temporal anaphora in French and English depends on the aspectual distinction between *events* and *states*. For instance, aspect affects temporal location: events occur within the time that is currently under discussion in discourse (*point of reference* of Reichenbach 1947; *topic time* of Klein 1994), whereas states hold at that time. Aspect also affects the update of the topic time. If the updating verb refers to an event the new topic time is the duration of the result state of this event (Webber 1988), whereas if it refers to a state the new topic time is the duration of that state.

This paper extends these generalizations along three dimensions. The resulting theory of aspect-based temporality extends from languages with grammatical tenses, such as French and English, to grammatically tenseless languages, represented here by Kalaallisut (Shaer 2003, Bittner 2003, 2005, 2007). Secondly, in addition to temporal location and update, the theory extends to new aspect-sensitive phenomena, such as temporal defaults and reality presuppositions. And thirdly, it extends to non-atomic aspectual types, *processes* and *habits*, which like their nominal counterparts, *pluralities* and *kinds*, support discourse anaphora to proper atomic parts.

I focus here on evidence from English and Kalaallisut and on theory-neutral empirical generalizations. The paper is organized as follows. In section 2 I present some initial evidence from Kalaallisut that temporal anaphora can rely on aspect instead of tense. Nevertheless, I claim, Kalaallisut agrees with English on crosslinguistic generalizations about temporality based on aspectual types. Since Kalaallisut and English represent two typological extremes, I conjecture that these crosslinguistic generalizations constitute *aspectual universals* of temporal anaphora. An initial formulation, for atomic events and states, is presented in section 3.

Sections 4 and 5 extend these generalizations to non-atomic aspectual types—temporally distributed processes and temporally as well as modally distributed habits. Both types support anaphora to proper parts—to wit, eventive stages and instantiating episodes, respectively. The final section 6 is the conclusion.

2 ASPECT-BASED TEMPORALITY

Jespersen 1933 begins his discussion of the grammatical tense system in English with the following admonition:

> "It is important to keep the two concepts *time* and *tense* strictly apart. The former is common to all mankind and is independent of language; the latter varies from language to language and is the linguistic expression of time-relations, so far as these are indicated in verb forms."

Indeed, it has since been shown that some languages have no grammatical tense marking at all, and yet still convey temporal reference as precisely as English (see esp. Bohnemeyer 2002 on Yukatek Maya, Bittner 2003, 2005, 2007 on Kalaallisut).

In Kalaallisut[1] verbs inflect for mood and agreement, instead of tense. The mood system distinguishes matrix and dependent clauses. Matrix moods relate the current perspective point—by default, the speech event—to the currently topical modality. The *indicative* mood (1) identifies the speech event as a report of a fact; the *negative* mood (2), as a report of a non-fact; and the *interrogative* mood (3), as an act of asking a question. The topical modality for these epistemic moods is the speech reality. In contrast, the future-oriented moods concern the speaker's desires rather than beliefs. Thus, the *imperative* mood (4) identifies the speech event as a request that the topical modality the speaker desires be realized by the addressee during the result state of this speech act, while the *optative* mood (5) marks the speech event as an expression of a wish. In each case, the subject agreement identifies the currently topical individual ($\top$), and the object agreement, the topmost individual in the background ($\bot$).

(1) *Juunap* *asavaanga*.
Juuna-p *asa*-pa-*anga*.
Juuna-sg.ERG love-IND.TV-3s.1s
Juuna$_{\top}$ loves me$_{\bot}$.

[1] Kalaallisut has a great deal of fusion. For clarity, line 1 is in the modern orthography, minus the allophones (*e*, *o*, *f*) of *i*, *u*, *v*; line 2 is the morphological analysis; line 3 are the morpheme-by-morpheme glosses; line 4 is a free English translation. Verbal inflections are explained in the text. Nouns inflect for possessor agreement, number, and case (ABL = ablative, DAT = dative, EQU = equalis, ERG = ergative, LOC = locative, MOD = modalis, VIA = vialis). Uninflected bases are of four categories: transitive verbs (tv), intransitive verbs (iv), relational nouns (rn), or common nouns (cn).

(2) *Juunap* *asanngilaanga*.
Juuna-p *asa-nngit*-la-*anga*
Juuna-sg.ERG love-not-NEG-3s.1s
Juuna$_{\top}$ doesn't love me$_{\perp}$.

(3) *Juuna*, *asavinga*?
Juuna *asa*-pi-*nga*.
Juuna love-QUE-2s.1s
Juuna$_{\top}$, do you$_{\top}$ love me$_{\perp}$?

(4) *Juuna*, *sinilluarit*!
Juuna *sinig-lluar-Ø-t*.
Juuna be.asleep-well-IMP-2s
Juuna$_{\top}$, sleep well!

(5) *Juuna* *sinilli*.
Juuna *sinig*-li-*Ø*.
Juuna be.asleep-OPT-3s
Let Juuna$_{\top}$ sleep.

The dependent moods classify the background circumstances of the matrix situation as *factual* (6a, b), *hypothetical* (7a, b), *habitual* (8a, b), *elaborating* (9a, b), or *non-factual* (10). In addition, dependent mood inflections encode the centering status of the dependent subject, which can be either topical—i.e. anaphoric to the matrix subject—or backgrounded.

(6) a. *Ole* *angirlarami* *ulapilirpuq*
Ole *angirlar*-ga-*Ni* *ulapig-lir-pu-q*
Ole come.home-FCT$_{\top}$-3s$_{\top}$ be.busy-begin-IND.IV-3s
When/because Ole$_{\top}$ came home, he$_{\top}$ got busy.

b. *Ataata* *angirlarmat* *Ole* *ulapilirpuq*.
ataata *angirlar*-mm-*at* *Ole* *ulapig-lir-pu-q*
dad come.home-FCT$_{\perp}$-3s$_{\perp}$ Ole be.busy-begin-IND.IV-3s
When/because Dad$_{\perp}$ came home, Ole$_{\top}$ got busy.

(7) a. *Ole* *angirlaruni* *ulapikkumaarpuq*.
Ole *angirlar*-gu-*Ni* *ulapig-jumaar-pu-q*
Ole come.home-HYP$_{\top}$-3s$_{\top}$ be.busy-be.likely-IND.IV-3s
When/if Ole$_{\top}$ comes home, he$_{\top}$ is likely to be busy.

b. *Ataata* *angirlarpat* *Ole* *ulapikkumaarpuq*.
ataata *angirlar*-pp-*at* *Ole* *ulapig-jumaar-pu-q*
dad come.home-HYP$_{\perp}$-3s$_{\perp}$ Ole be.busy-be.likely-IND.IV-3s
When/if Dad$_{\perp}$ comes home Ole$_{\top}$ is likely to be busy.

(8) a. *Ole angirlaraangami ulapittarpuq.*
Ole angirlar-gaanga-*Ni ulapig-tar-pu-q*
Ole come.home-HAB$_{\top}$-3s$_{\top}$ be.busy-habit-IND.IV-3s
When Ole$_{\top}$ comes home he$_{\top}$ is busy.

b. *Ataata angirlaraangat Ole ulapittarpuq.*
ataata angirlar-gaang-*at Ole ulapig-tar-pu-q*
dad come.home-HAB$_{\perp}$-3s$_{\perp}$ Ole be.busy-habit-IND.IV-3s
When Dad$_{\perp}$ comes home Ole$_{\top}$ is busy.

(9) a. *Olep uqarvigaanga ulapinnirarluni*
Ole-p uqar-vigi-pa-anga ulapig-nirar-llu-*NI*
Ole-sg.ERG say-to-IND.TV-3s.1s be.busy-say-ELA$_{\top}$-3s$_{\top}$
Ole$_{\top}$ told me$_{\perp}$ he$_{se}$ was busy

b. *Aanip uqarvigaanga Ole ulapittuq*
Aani-p uqar-vigi-pa-anga Ole ulapig-tu-*q*
Ann-sg.ERG say-to-IND.TV-3s.1s Ole be.busy-ELA$_{\perp}$.IV-3s$_{\perp}$
Ann$_{\top}$ told me$_{\perp}$ Ole$_{\perp'}$ was busy.

(10) *Ole itissanani sinippuq.*
Ole itir-ssa-na-*Ni sinig-pu-q*
Ole wake.up-prospect-NON$_{\top}$-3s$_{\top}$ be.asleep-IND.IV-3s
Ole$_{\top}$ is fast asleep. (lit. without prospect of waking up)

Unlike the other dependents, topic-elaborating verbs (*-llu* 'ELA$_{\top}$') do not evoke situations of their own. Instead they are anaphorically linked to the verb they elaborate, forming an anaphoric chain which evokes and further specifies the same situation. Thus, in (9a) the initial matrix verb reports an event where the topical individual (Ole) speaks. This reported speech event is the antecedent for the following topic-elaboration, which further specifies it as an event of claiming to be busy. The indicative mood on the matrix verb marks this reported speech event as a fact—i.e. according to the speaker of (9a), it is a real speech event, which has actually happened.

In Kalaallisut topic-elaborating dependents can either follow the head verb, as in (9a), or precede it, as in (11). That is, they can enter into anaphoric verbal chains as either antecedents or anaphors.

(11) *Nuannaarluni angirlarnirarpaa.*
nuannaar-llu-*Ni angirlar-nirar-pa-a*
be.happy-ELA$_{\top}$-3s$_{\top}$ come.home-say-IND.TV-3s.3s
A. He$_{\top}$ reported him$_{\perp}$ to have come home happy.
B. He$_{\top}$ happily reported him$_{\perp}$ to have come home.

Common semantic relations between topic-elaboration and its head include identity, as in (9a), and concurrent state–event, as in (11), among others. In general, the modal and temporal location of the head-situation is determined directly, by the morphological marking on the head, while the location of the dependent situation is determined indirectly, via its semantic relation to the head.

Instead of tense, temporal anaphora in Kalaallisut relies on aspectual typing of verbal roots and suffixes. This lexical system distinguishes three types of episodes: atomic *states*, which hold at the currently topical period (see (12a, b)); atomic *events*, which fall within the topical period (see (13a, b)); and *processes*—chains of stages (events) such that the designated stage falls within the topical period (see (14a, b)). The designated stage depends on the discourse relation (Lascarides & Asher 1993)—e.g. a causal relation favors stage one (process begins during the result time of the home coming), while a non-causal relation might favor a later stage (process already in progress).

(12) a. *Ataata angirlarmat, sinippunga.*
ataata angirlar-mm-at sinig-*pu-nga*
Dad come.home-FCT$_{\perp}$-3s$_{\perp}$ be.asleep-IND.IV-1s
When Dad came home, I was asleep.

b. *Ataata angirlarmat, anisimavunga.*
ataata angirlar-mm-at *ani*-sima-*pu-nga*
Dad come.home-FCT$_{\perp}$-3s$_{\perp}$ go.out-prf-IND.IV-1s
When Dad came home, I was out.

(13) a. *Ataata angirlarmat, anivunga.*
ataata angirlar-mm-at ani-*pu-nga*
Dad come.home-FCT$_{\perp}$-3s$_{\perp}$ go.out-IND.IV-1s
When Dad came home, I went out.

b. *Ataata angirlarmat, sinilirpunga.*
ataata angirlar-mm-at *sinig*-lir-*pu-nga*
Dad come.home-FCT$_{\perp}$-3s$_{\perp}$ be.asleep-begin-IND.IV-1s
When Dad came home, I fell asleep.

(14) a. *Ataata angirlarmat, allakkat allappakka.*
ataata angirlar-mm-at *allagaq-t* allag-*pa-kka*
Dad come.home-FCT$_{\perp}$-3s$_{\perp}$ letter-pl write-IND.TV-1s.3p
When Dad came home, I {wrote, was writing} a letter$_{pl}$.

b. *Ataata angirlarmat, tiiliurpunga.*
ataata angirlar-mm-at *tii*-liur-*pu-nga*
Dad come.home-FCT$_{\perp}$-3s$_{\perp}$ tea-make-IND.IV-1s
When Dad came home, I {made, was making} tea.

In (12)–(14) the topic time is set by the initial factive clause, as the period of the result state of the most recent or aforementioned home coming event. Discourse-initially, by default, the topic time is the instant right now. This makes no difference for the temporal location of states. States hold at the topic time, whether this is a period (as in (12a, b)) or an instant (15). But the difference is important for non-stative episodes. Relative to a topical instant, events and processes are not located directly, but via related result states. Thus, discourse initially an event is located so that its result state holds right now (16), and a process so that the result state of the designated stage—normally, stage one—holds (17).

(15) *Ataata sinippuq*.
ataata sinig-*pu-q*
Dad be.asleep-IND.IV-3s
Dad is asleep.

(16) *Ataata anivuq*.
ataata ani-*pu-q*
Dad go.out-IND.IV-3s
Dad has gone out.

(17) *Ataata tiiliurpuq*.
ataata *tii*-liur-*pu-q*
Dad tea-make-IND.IV-3s
Dad {is making, ?has made} tea.

Habits are understood to be current at the topic time, like states and processes. However, unlike either of these episodic types, a habit need not be instantiated at the topic time, as the following minimal pairs attest:

(18) {*Niaqunguvunga*, *Niaqungusarpunga*.}
{*niaquq*-ngu-*pu-nga*, *niaquq-ngu*-tar-*pu-nga*}
{head-have.aching-IND.IV-1s, head-have.aching-habit-IND.IV-1s}
{I have a headache, I have headaches}

(19) *Ole* {*skakkirpuq*, *skakkirtarpuq*.}
Ole {*skakki*-r-*pu-q* *skakki-r*-tar-*pu-q*}
Ole {chess-do-IND.IV-3s, chess-do-habit-IND.IV-3s}
Ole {is playing chess, plays chess}

Moreover, habits, unlike episodes, can be temporally located not only in relation to topical periods and instants, but also kinds of time. For each instance of the topical kind of time, the episode instantiating the habit is located in accordance with its aspectual type (see (8a, b) above, and (20a), (21a) below).

Kalaallisut sharply distinguishes episodes from habits. Habitual predicates are marked as such, usually by means of the habitual mood or a habitual suffix such as *-tar* 'habit'. A habitual suffix is required in certain unambiguously habitual contexts. These include the topic-elaborating complement of the habitual base *iliqquri-* 'be in the habit of',

(20) *Juunap* *iliqqurilirsimavaa*
Juuna-p iliqquq-gi-*lir-sima-pa-a*
Juuna-sg.ERG habit.of-rn\tv-begin-prf-IND.TV-3s.3s
Juuna$_{\top}$ has formed the habit of

a. *sapaatikkut* *isirtarluni*.
sapaat-kkut *isir*-tar-*llu-Ni*
Sunday-sg.VIA come.in-habit-ELA$_{\top}$-3s$_{\top}$
[dropping in on Sundays]$_{\perp}$.

b. *sapaatikkut* {**isiqattaarluni*, **isirluni*}
sapaat-kkut {*isir*-qattaar-*llu-Ni* isir-*llu-Ni*}
Sunday-sg.VIA {enter-keep.v.ing- ELA$_{\top}$-3s$_{\top}$ enter-ELA$_{\top}$-3s$_{\top}$}

as well as environments where the temporal topic is a kind of time, typically set by the habitual mood (e.g. (8a, b)) or a temporal noun in the vialis case:

(21) [Ole$_{\top}$ plays chess.]

a. *Amirlanirtigut* *ajugaasarpuq*.
amirlaniq-tigut *ajugaa*-tar-*pu-q*
most-pl.VIA win-habit-IND.IV-3s
He$_{\top}$ mostly wins.

b. *Amirlanirtigut* {**ajugaaqattaarpuq*, **ajugaavuq*}
amirlaniq-tigut {*ajugaa*-qattaar-*pu-q*, ajugaa-*pu-q*}
most-pl.VIA {win-keep.v.ing-IND.IV-3s, win-IND.IV-3s}

In discourse referential terms, (20b) is ruled out because an elaborating episode cannot be anaphorically linked to a habit (function from worlds and times to instantiating episodes). Similarly, (21b) is out because an episode cannot be located in relation to a kind of time (function from worlds and episodes to instantiating times). In both cases even a process (chain of events), formed e.g. by *-qattaar*, is still an episode, and so is ruled out just like atomic episodes. Only a true habit (*-tar* or equivalent) will do.

In spite of their different grammars, Kalaallisut and English agree on certain aspectual generalizations about temporal anaphora. In what follows I gradually elucidate these crosslinguistic generalizations and show that they form a coherent and comprehensive temporal system. This crosslinguistic system presupposes the above aspectual classification into atomic *states* and *events*, and non-atomic *processes* and *habits*. These aspectual classes, based on temporal anaphora, have nominal counterparts, based on nominal

anaphora—to wit, atomic *inanimates* and *animates*, and non-atomic *pluralities* and *kinds*. Thus, aspectual universals of temporal anaphora appear to instantiate more general anaphoric patterns.

3 ANAPHORA WITH ATOMIC EPISODES

3.1 *Topical periods and reality*

We begin with some well-known generalizations about temporal anaphora with atomic events and states. The generalizations about temporal *location* (**L**) in relation to the period that is currently under discussion—the *topical period* (in the terminology of Klein 1994)—were first proposed by Kamp 1979 and Kamp and Rohrer 1983 for French. Partee 1984 proposes similar generalizations for English, citing unpublished work by Hinrichs 1981. Concerning the *update* (**U**) of the topical period, I follow Partee 1984 on update by state-verbs, and Webber 1988 on update by event-verbs.

L. Location relative to topical period (to be continued)

In the topical modality $^{\top}p$, • a *state* includes the topical period • an *event* is included in the topical period.

U. Temporal update (to be continued)

If a verb refers to a in $^{\top}p$ and updates the temporal topic to $^{\top}t$, then: • $^{\top}t$ is the time of a in $^{\top}p$, if a is a *state* • $^{\top}t$ is the result time of a in $^{\top}p$, if a is an *event*.

In relation to these patterns, English behaves just like Kalaallisut, as the pairwise equivalent discourses in (22)-(22′) and (23)-(23′) attest. In each discourse the initial topical period is set by a temporal modifier ('today').

The first pair of discourses (22)-(22′) is about (atomic) events. English verbs are grammatically marked for past, present, or future tense. This grammatical marking presupposes a past, present, or future topic time (Stone 1997, Kratzer 1998). Thus in English (22) the past tense on *came* first of all tests that the input topic time precedes the speech event. It then locates its event within this topical past (event-clause of **L**), and updates the topic time to the result time (event-clause of **U**). Next, the past tense on *went* tests that the input topic time is past, locates its event and updates the topic time to the result time. Finally, the adverb *soon* updates the input topic time to a short subperiod, and the past tense on *fell* repeats the anaphoric cycle.

(22) [1]Today when I *came* home, [2]Anne *went* out. [3]John soon *fell* asleep.

(22′) [1]*Ullumi* *angirlarama* [2]*Aani* *anivuq*.
ullu-mi angirlar-*ga-ma* *Aani* ani-*pu-q*
day-sg.LOC come.home-FCT$_{\top}$-1s Aani go.out-IND.IV-3s

[3]*Juuna* *irniinnaq* *sinilirpuq*.
Juuna *irniinnaq* *sinig*-lir-*pu-q*
Juuna soon be.asleep-begin-IND.IV-3s

Kalaallisut (22′) converges on the same event structure by different grammatical means. There is no tense, so the topical subperiod of today need not be past. However, the events of (22′) must all precede the speech event, because the factual moods (IND and FCT) presuppose *current verifiability*, from the modal and temporal perspective of the speech event:

V. Current verifiability (to be continued)

In a speech event $^{\top}e$ in $^{\top}w$, the speaker may report:
• a *state s* as a $^{\top}w$-fact, iff the beginning of *s* precedes $^{\top}e$ in $^{\top}w$
• an *event e* as a $^{\top}w$-fact, iff *e* precedes $^{\top}e$ in $^{\top}w$

In Kalaallisut the topic time can only be updated up to the comment and the matrix verb already belongs to the comment. Thus, in (22′) there are fewer topic times, but the event structure is the same as in English (22).

Following Kamp and Rohrer 1983 and Partee 1984, generalization **L** requires states to hold at the currently topical period. For English and Kalaallisut, this pattern is illustrated in (23)–(23′). Note that combined with the event-clause of **U**, the state-clause of **L** only requires that the matrix states—the result state of Anne's going out and the state of Juuna being asleep—hold during the *result time* of the home coming event. In this case there is no causal relation between the topic-setting event (home coming) and the matrix states. By default, the temporal relation is then strengthened, in both languages, so that the causally independent states hold already at the time of the event itself, not only during its result time.

(23) [1]Today when I came home, [2]Anne *was* out. [3]John *was* asleep.

(23′) [1]*Ullumi* *angirlarama* [2]*Aani* *anisimavuq*.
ullu-mi *angirlar-ga-ma* *Aani* *ani*-sima-*pu-q*
day-sg.LOC come.home-FCT$_{\top}$-1s Aani go.out-prf-IND.IV-3s

[3]*Juuna* *sinippuq*.
Juuna sinig-*pu-q*
Juuna be.asleep-IND.IV-3s

When there is a causal relation, the strengthening is defeated and we find the weaker temporal relation which **U** and **L** strictly require. This, too, holds in English and Kalaallisut alike (see Hinrichs 1981 and (24)–(24′)).

(24) When Simon *arrived* in Uummannaq, he *was* housed in the school.

(24′) *Siimuut Uummannamut pigami*
Siimuut Uummannaq-mut pi-*ga-Ni,*
Simon Uummannaq-sg.DAT get.to-FCT$_{\top}$-3s$_{\top}$

atuarvimmi najugaqarpuq.
atuarvik-mi najur-gaq-qar-*pu-q*
school-sg.LOC live.in-tv\rn-have-IND.IV-3s

In English-based literature the generalizations of **U** and **L** are often presented as mere defaults (e.g. Moens and Steedman 1988, Webber 1988, Lascarides and Asher 1993, Hamm, Kamp and Lambalgen 2006). Examples like (25) and (26) are cited as evidence of defeasibility:

(25) John *got* a ticket. He *was* driv*ing* too fast. [Hamm et al 2006]

(26) When I *came* to this conference, I *bought* my ticket six months in advance. [Dowty p.c.]

However, this evidence is not conclusive because English verbs are underspecified for aspectual type. So it is not clear whether the verb *got* in (25) evokes an atomic event of getting a fine or, perhaps, a process that terminates in such an event. Likewise for *came* in (26). Crucially, aspectually explicit Kalaallisut translations respect **U** and **L**. Thus, for (25) and (26) my consultant volunteered the following well-behaved translations:

(25′) *Johni akiligassinniqarpuq*
Johni akilir-gaq-ssit-*niqar-pu-q*
John pay.for-tv\rn-give-passive-IND.IV-3s

sukkavallaartumik biilirsimagami
sukka-pallaar-tu-mik biili-r-sima-*ga-Ni.*
go.fast-too-iv\cn-sg.MOD car-do-prf-FCT$_{\top}$-3s$_{\top}$

(26′) *Danmarkilialirama*
Danmarki-liar-lir-*ga-ma*
Denmark-go.to-begin-FCT$_{\top}$-1s

qaammatit arvinillit siuqqullugu billitsisivunga.
qaammat-t arvinilli-t siuqqut-llu-gu billitsi-si-*pu-nga.*
month-pl six-pl v.ahead-ELA$_{\top}$-3s$_{\perp}$ ticket-get-IND.IV-1s

In (25′) the result state of stage one of a speeding process includes the current topic time, which in turn includes an event of John getting a fine. The result time of stage one is the temporal frame for the expected stage two—an expectation which the fining event presumably terminates.

Similarly, in (26′) an event of getting a ticket is located within the result time of stage one of a process of going to Denmark—e.g. deciding to go.

In addition, the aspectually more literal translation (26″) has an odd meaning—precisely as **U** and **L** predict. In (26″) the event of getting the ticket can only be located *after* the arrival. Therefore, it cannot be a ticket for this trip; the anaphoric agreement on *siuqqullugu* 'v-ing ahead of it$_{\perp}$' must refer to some other (aforementioned or contextually salient) event.

(26″) *Danmarkimut* *tikikkama*
Danmarki-mut tikit-*ga-ma, …*
Denmark-sg.DAT come-FCT$_{\top}$-1s
When I came to Denmark,

qaammatit *arvinillit* *siuqqullugu* *billitsisivunga.*
qaammat-t *arvinilli-t* *siuqqut-llu-gu* *billitsi*-si-*pu-nga.*
month-pl six-pl v.ahead-ELA$_{\top}$-3s$_{\perp}$ ticket-get-IND.IV-1s
I got a ticket (for some other event) six month ahead (of that event).

In general, aspectually explicit Kalaallisut systematically supports the strong claim that **U** and **L** are not merely defaults, but inviolable generalizations. English is also compatible with this strong claim, once we allow for aspectual underspecification and extend **U** and **L** with further clauses for processes and habits, to be added in Sections 4 and 5.

In addition to temporal location, events and states also contrast in relation to temporal update. In English this contrast has two dimensions, one of which extends to Kalaallisut and is included in **U**. To see this presumably universal contrast compare temporal update by state-predicates with update by event-predicates. In (23)-(23′) the initial event-predicate 'come home' updates the topic time to the result time of this event. In contrast, in (27)-(27′) the state-predicate 'be asleep' updates the topic time to the duration of this state.

(27) [1]Today when John *was* asleep, [2]Anne went out. [3]I stayed at home.

(27′) [1]*Ullumi* *Juuna* *sinittuq* [2]*Aani* *anivuq.*
ullu-mi *Juuna* sinig-*tu-q* *Aani* *ani-pu-q*
day-sg.LOC Juuna be.asleep-ELA$_{\perp}$.IV-3s$_{\perp}$ Aani go.out-IND.IV-3s

[3]*Uanga* *angirlarsimaannarpunga.*
uanga *angirlar-sima-innar-pu-nga*
me come.home-prf-∀-IND.IV-1s

The other dimension concerns the orthogonal issue whether the main verb also participates in temporal update. In English the key, once again, is aspect: matrix event-verbs update topic times whereas matrix state-verbs do not—compare, e.g., the eventive *went out* in (22) versus the stative *was out*

in (23). This aspectual contrast is common but not universal. It is found in languages where temporal update extends to the position of the main verb. In addition to English, this class includes French, but not, e.g., Kalaallisut. In Kalaallisut the topic time can only be updated before the comment, and the matrix verb is already part of the comment. So the matrix verb never updates the topic time, regardless of its aspectual class.

For temporal update by event-verbs, **U** adopts the *result time* proposal of Webber 1988, not the *immediately after* proposal of Partee 1984. One advantage is a natural account of the causal implicatures of English *when* and Kalaallisut 'FCT'. The implicature is strong enough to make sentences like (28) sound odd out of context (as noted by Moens and Steedman 1988). But it is only an implicature, for it can be cancelled if the context favors a purely temporal interpretation—e.g. in (29).

(28) #When the sun set, my car broke down.

(29) I had an awful day. In the morning I cut myself shaving. At noon I missed my plane. And when the sun set, my car broke down. So there I was, stranded in the dark in the middle of nowhere.

The idea that eventive *when*-clauses update topic times to result times also explains the transitivity failure in (30).

(30) When John left, Sue burst into tears.
When Sue burst into tears, her mother got upset.
$\not\models$ When John left, Sue's mother got upset.

Moens and Steedman 1988, who note this puzzle, posit intransitive causal or enablement relations. I propose a simpler account, in terms of reference to result times. Assuming **U** and **L**, the first premise locates the event of Sue bursting into tears during the result time of John's leaving. The second premise locates the event of the mother getting upset during the result time of Sue's outburst. Crucially, this could be after the result time of John's leaving, at which point the mother might in fact have been pleased.

Aspect-dependent verifiability **V** already goes one step beyond the pioneering work of Kamp 1979, Hinrichs 1981, Kamp and Rohrer 1983, Partee 1984, and Webber 1988. As we will see, comparison with Kalaallisut further reveals four more crosslinguistic generalizations about aspect-dependent temporal anaphora—bringing the total up to seven. But first, a word is in order about grammatical tense versus grammatical mood.

3.2 *Tense versus mood*

In relation to temporal reference, grammatical tenses characteristically differ from grammatical moods. English (31) and Polish (32) exemplify two varieties of the characteristic tense-based pattern.

(31) a. [1]Anne *has* gone out. [2]John *is* asleep.
b. [0]Today when I came home, [1]Anne *went* out (*#has* gone out).
[2]John *was* (*#is*) asleep.

(32) a. *Ania* wyszła *Jaś* śpi
Ania PFV.go.out.PST.3sf Jaś IPF.sleep.PRS.3s
Anne has gone out. Jaś is asleep.

b. *Dziś jak przyszłam do domu*,
today when PFV.come.PST.1sf to house
Today when I came home,
to Ania wyszła. *Jaś* spał (#śpi)
then Ania PFV.go.out.PST.3sf Jaś IPF.sleep.PST.3sm (#…PRS)
Anne went out. Jaś was asleep (#is asleep).

Both languages use one tense form to refer to the present time and a different tense form to refer to the past. Moreover, both grammatically constrain the appropriate tense form. Thus, for example, in (31b) as well as (32b) the past tense in the *when*-clause sets a past topic time, which can only be coherently followed by a matrix comment in the past tense.

In contrast, no such temporal constraints are imposed by grammatical moods. The characteristic mood-based pattern is exemplified by the corresponding discourses (33) in Kalaallisut.

(33) [0](*Ullumi angirlarama*)
(*ullu-mi angirlar*-ga-*ma*)
(day-sg.LOC come.home-FCT$_{\top}$-1s)

[1]*Aani anivuq*. [2]*Juuna sinippuq*.
Aani ani-pu-*q*. *Juuna sinig*-pu-*q*.
Aani go.out-IND.IV-3s Juuna be.asleep-IND.IV-3s

In this language the factual grammatical moods—matrix *indicative* (IND) and dependent *factive* (FCT)—presuppose current verifiability in the sense of **V**. Temporally, factual moods refer to the current topic time—by default, the speech time. In Kalaallisut (33) the initial event-clause updates the topic time to the result time of the most recent or previously mentioned home coming event. If this clause is left out, the topic time is the speech time, so Kalaallisut (33) translates into English (31a) and Polish (32a). Otherwise, it translates into English (31b) and Polish (32b). In either case, Kalaallisut (33) is temporally precise. Its temporal reference is context-dependent; it is not vague, ambiguous, or underspecified.

The context-dependent temporal reference of grammatical mood may seem exotic. But in relation to modal reference grammatical tense exhibits similar context-dependence. For instance, compare English (34) (from *Harry Potter*) with its Kalaallisut translation (34′). The English present tense

usually refers to the real world—the default modal topic. But it can also refer to what is expected, as in (34). Not so for the indicative mood in Kalaallisut (34′). This presupposes current verifiability in the strict sense of **V**. So it can only report as a fact the current state of expectation, not the expected but as yet uninstantiated habit.

(34) Wood is explaining the rules of Quidditch to Harry, who has never played yet. [Now, the last member of the team is the Seeker.] That'*s* you.

(34′) *Tassa illit ujaasisussaavutit*
tassa illit ujar-ssi-tuq-ssaq-u-*pu-tit*.
FOC you seek-apass-iv\cn-prospective-be-IND.IV-2s
You_{F} are to be the Seeker.

Is this an issue of greater precision? I think not. Translators readily recover, from either a mood or a tense system, the supposedly 'missing'—temporal or modal—information they need for proper encoding in the other system. So this information must be there; it is just not explicitly highlighted. To account for these observations I propose that grammatical tense and grammatical mood have a great deal in common. The parallels and contrasts are laid out in Table 1, where $^{\top}t$ is the current topic time; $^{\top}w$, the topical modality; and $^{\top}e$, the speech event or other perspective point.

TABLE 1. Non-future tense vs. factual mood

	Temporal reference	*Modal reference*
English {PST, PRS}	presupposed: $^{\top}t$ is {past, now} from the perspective of $^{\top}e$	topical modality
Kalaallisut {IND, FCT}	topic time	presupposed (**V**): fact from the perspective of $^{\top}e$ in $^{\top}w$

In particular, both tenses and moods have temporal as well as modal reference determined by topic-oriented anaphora. For any type, the topic is the most prominent referent of that type. Since there can only be one such referent, topic-oriented anaphora is unambiguous. Topic-oriented anaphora is all there is to the modal reference of tense and the temporal reference of mood. That is why both types of reference are, at once, precise and free.

In contrast, the temporal reference of tense and the modal reference of mood is constrained by perspectival presuppositions. These test whether the input temporal or modal topic is properly related to the current perspective point ($^{\top}e$)—by default, the speech event. At each point in discourse the perspectival presuppositions of grammatical tenses and moods help to identify the current perspective point.

If Table 1 is correct, then languages grammatically mark tense or mood primarily to identify the current perspective point, not to determine

the temporal or modal location. The temporal and modal location is already determined by topic-oriented anaphora, so the perspectival presuppositions of tenses and moods are just icing on the cake (recall the convergence of tense-based (22), (23), (27) with mood-based (22′), (23′), (27′)).

By now, we have some crosslinguistic generalizations about aspect-based reality presuppositions, location relative to topical periods, and the update of these periods. We also have some idea how the current topics are retrieved and tested by grammatical tenses or moods. What is still unclear is how this system gets started—i.e., what determines the initial set of topics?

3.3 *Topical instants and other defaults*

In his classical paper on assertion, Stalnaker 1968 notes that discourse anaphora does not start from an empty context. In Stalnaker's own words:

> "When I speak I presuppose that others know I am speaking…This fact, too, can be exploited in the conversation, as when Daniels says *I am bald*, taking it for granted that his audience can figure out who is being said to be bald. I mention this COMMONPLACE [emphasis added] way that assertions change the context in order to make it clear that the context on which assertion has its ESSENTIAL effect is not defined by what is presupposed before the speaker begins to speak, but will include any information which the speaker assumes his audience can infer from the performance of the speech act."

In Bittner 2007 I formalized Stalnaker's 'commonplace' effect as a *start-up update*, which uses the beginning of a speech act, or of an attitude state, to set up three default topics—modal, perspectival, and temporal, in that order. The default topic time depends on the topical modality and the aspectual type of the perspective point. Normally, we talk about reality from the perspective of a speech event. The default topic time is then the time of that event:

($\top_e$) Start-up update: Speech *event*
i-reality: $^{\top}w_i$ • $^{\top}e_0$: e_0-agent speaks up
| $^{\top}t_0$: e_0-time (instant) in $^{\top}w_i$

These three default topics determine the interpretation of indexical expressions. For instance, if you enter the office of a stranger and he says *I am busy*, then the first person pronoun *I* refers to the agent of this speech act, and the present tense refers to the speech time in the speech reality. There are many other indexical expressions—e.g., *we*, *you, here, in fact, maybe, a week ago, next week, come, go,* etc. As far as I can see, the three default topics in ($\top_e$) suffice to interpret them all.

We can also talk (to ourselves) from the perspective of an attitude state. This gives rise to the following configuration of start-up default topics:

($\top_s$) Start-up update: Attitude *state*
i-reality: $^{\top}w_i$ — $^{\top}s_0$: s_0-exp. believes/wants/… $^{\top}p_0$
| $^{\top}t_0$: s_0-onset time (instant) in w_i

The use of these start-up topics to interpret indexicals can be illustrated by means of Kaplan's famous example of beliefs *de re* and *de se*:

(35) "If I see, reflected in the window the image of a man whose pants appear to be on fire, my behaviour is sensitive to whether I think *His pants are on fire*, or *My pants are on fire*, though the object of thought may be the same." [Kaplan 1990]

Lewis 1979 analyzed the difference in terms of 'self-ascription', but I propose to replace this primitive with the more intuitive notion of self-awareness. In the topical reality ($^{\top}w_i$) at the topic time ($^{\top}t_0$) Kaplan enters a belief state ($^{\top}s_0$) where he forms a certain belief. If the belief is *de se*, *My pants are on fire*, then Kaplan locates himself in a class of worlds where the pants on the experiencer of this belief state—the believer's *me*—are on fire at the time of this belief state—the believer's (*right*) *now*. In contrast, if the belief is *de re*, *His pants are on fire*, then Kaplan locates himself in a class of worlds where the pants on a certain male *res*, whom the experiencer of this belief state is watching and currently believes to be some other person—the believer's *he*—are on fire at the time of this belief state.

In general, whenever we are conscious, we are aware of our own actions and mental states. So a current action or mental state can serve as a perspective point we can use to identify the individual we think of as *me*—the agent of this action or the experiencer of this mental state—the place we think of as (*right*) *here*, the time we think of as (*right*) *now*, and so on. In general, the default topic time depends on the aspectual type of the current perspective point. For events and states, this is spelled out in **D**:

D. Default topics (to be continued)

Given a perspective point $^{\top}a$ in $^{\top}w$, the default topic time is:
• the instant of $^{\top}a$-onset, if $^{\top}a$ is a *state*
• the instant of $^{\top}a$, if $^{\top}a$ is an *event*

Note that start-up topic times are times of *events* (see **D**), whereas updated topic times are times of *states* (see **U**). This aspectual difference has implications for temporal anaphora. As stated in **I**, event-times behave like (*discourse*) *instants*, whereas all other times behave like (*discourse*) *periods*:

I. (Discourse) instants

A discourse referent for a time is:
• a (*discourse*) *instant*, if it is the time of an event referent
• a (*discourse*) *period*, otherwise

Intuitively, generalization **I** is reminiscent of Kamp 1979. Empirically, discourse instants are identified by their ability to antecede anaphors such as *that instant* or *that moment*. In general, event-verbs support these anaphors, regardless of the physical time the event may take (see (36a, b)). In contrast, state-verbs are unacceptable (see (37)).

(36) a. Humans *arrived* late on the evolutionary scene. At *that moment* they were much like other apes, but they soon began to evolve away from our common ancestor.
b. John *fell* asleep by the fire. At *that moment* the phone rang.

(37) John *was* asleep by the fire. #At *that moment* the phone rang.

The anaphoric diagnostics in (36)-(37) provide initial support for **I**, which identifies discourse instants as event-times, and discourse periods, as all other times. And this distinction, in turn, accounts for the crosslinguistically stable contrast between discourse-initial temporal location—characterized by **L′** and illustrated in (38), and discourse-internal temporal location—characterized by **L** and illustrated in (39).[2]

L′. Location relative to topical instant (to be continued)

In the topical modality $^{\top}p$, • a *state* includes the topical instant, • an *event* has a result state that includes the topical instant.

(38)

Aani	ani-*pu-q*.	*Juuna*	sinig-*pu-q*
Aani	go.out-IND.IV-3s	Juuna	be.asleep-IND.IV-3s
Aani	has gone out.	Juuna	is asleep.

L. Location relative to topical period (to be continued)

In the topical modality $^{\top}p$, • a *state* includes the topical period, • an *event* is included in the topical period.

(39)

Ullu-mi	*angirlar-ga-ma*
day-LOC	come.home-FCT$_{\top}$-1s
Today	when I came home, …

Aani	ani-*pu-q*.	*Juuna*	sinig-*pu-q*.
Aani	go.out-IND.IV-3s	Juuna	be.asleep-IND.IV-3s
Aani	went out.	Juuna	was asleep.

[2] **L′** also holds for other tenseless languages—see e.g. Comrie 1976:82ff on Igbo and Yoruba (Congo-Kordofanian), Chung & Timberlake 1985 on Chamorro (Austronesian), Smith 1997 on Navajo (Athapascan) and Chinese, Bohnemeyer 2002 on Yukatek (Mayan), Ritter & Wiltschko 2004 on Blackfoot (Algonquian) and Halkomelem (Salish).

The picture that has emerged so far suggests that languages disagree on the grammatical means, but agree on the communicative ends of temporal anaphora. These include generalizations about temporal defaults (**D**); current verifiability (**V**); discourse instants and discourse periods (**I**); temporal location relative to topical instants and periods (**L**′ and **L**); and temporal update (**U**). All of these generalizations depend on the aspectual distinction between events and states, which languages also agree on.

So far, following the standard practice in the literature on temporal anaphora, we have only considered events and states. But in actual texts these two aspectual types constantly alternate and anaphorically interact with two distributed types. I dub them *processes* and *habits* because they can antecede anaphors like *this process* and *this habit*. Unlike the atomic aspectual types—states and events—processes and habits have discourse-transparent proper parts. The next two sections show that discourse anaphora treats processes as chains of causally linked events, and habits, as world- and time-dependent episodes. The discourse-transparent parts of a process are the events that constitute its stages. In contrast, the discourse-transparent parts of a habit are the instantiating episodes, which can be of any aspectual type.

4 ANAPHORA WITH PROCESSES

4.1 *Quantification as discourse reference*

Consider the contrast between (40) and (41). In (40) the verb *ask* evokes a single inquiry, whereas in (41) it evokes a whole series. The single inquiry evoked in (40) can antecede the event-anaphor *that instant*, but not the anaphor *this process*, which makes one wonder 'What process?' Also, within the quote, the present tense refers to the time of this particular inquiry, and the stage-anaphor *next* refers to a particular stage in the process evoked by the aforementioned instructions.

(40) [1]When I finished reading the instructions, [2]Jim *asked* me:
[3]"What do I do next?"
a. … At that instant the phone rang.
b. … #This process took a long time.

(41) [1]As we worked our way through the instructions, [2]Jim and Tom *asked* me over and over, by turns, with increasing desperation:
[3]"What do I do next?"
a. … #At that instant the phone rang.
b. … This process left us all exhausted.

In contrast, in (41) the event-anaphor *that instant* is odd, while the process-anaphor is fine: it refers to the whole chain of inquiries. The direct

quote in (41) receives a distributed, inquiry-dependent interpretation. For each inquiry, the present tense refers to the time of that inquiry; the first person pronoun *I* refers to its agent; and the stage-anaphor *next* refers to the current next stage—i.e. carrying out the currently next instruction.

Atelic processes, such as asking questions, have been analyzed as quantification over events (e.g. Dowty 1979, van Geenhoven 2004). Combined with E-type anaphora, this analysis is adequate for simple cases of process anaphora—e.g. *this process* in (41). But process-modifiers such as *by turns* or *with increasing desperation* are problematic for this approach. The difficulty is that they modify neither the individual stages nor their sum, so neither event quantification nor E-type anaphora can capture their meaning. Another problem is the interaction with quotes—e.g. in (41), the stage-dependent interpretation of the present tense, the pronoun *I*, and the stage-anaphor *next*. One cannot quantify into a direct quote, so these interactions are difficult to capture in a quantificational analysis.

All of these problems can be solved if we instead analyze processes as chains of causally linked events, available for discourse reference (see Bittner 2003, 2007). A process verb such as *ask* in (41) then evokes a discourse referent for a process-chain of causally linked events—the discourse-transparent *stages* of the process. Formally, a process-chain is a function from events to events, which sends each non-final stage of the process to the next stage and locates the latter during the result-time of the former. The anaphor *this process* refers to the entire process-chain.

Process-modifiers are predicates of process-chains. For instance, *over and over* holds of a process-chain with more than two stages. The modifier *by turns* correlates a process-chain with a chain of agents—e.g., in (41), with ⟨Jim, Tom, Jim, Tom, …⟩. The successive stages of the process are actions by the successive agents. Similarly, *with increasing desperation* correlates a process-chain with a scale—formally, another chain, e.g., of *kinds* of agents (see Bittner 2003). For each successive stage of the process, the agent instantiates a kind that ranks one notch higher on the desperation scale. Since process-modifiers are predicates, not binders, a process-verb can be elaborated by multiple process-modifiers, as (41) attests.

This analysis receives morphological support from Kalaallisut:

(41′) [1]*Ilitsirsuutit* *malittariniartillutigit*
ilitsirsur-ut-t *malittari-niar-tit-llu-tigit*
instruct-means-pl follow-try-state-ELA$_{\top}$-1p.3p

[2]*Jimmip* *Tummillu* *tulliriiaarlutik*
Jimmi-p *Tummi-p=lu* *tulliq-giiaar-llu-tik*
Jim-sg.ERG Tom-sg.ERG=and next-v.in.many.rn.pairs-ELA$_{\top}$-3p$_{\top}$

apiriqattaarpaannga *ilungirsuraluttuinnarlutik*
apiri-qattaar-*pa-annga* *ilungirsur-galuttuinnar-llu-tik*
ask-keep.v.ing-IND.TV-3p.1s struggle-increasingly-ELA$_{\top}$-3p$_{\top}$

[3]"*Tullianik* *susaanga*?"
tulliq-a-nik *su-ssa-pi-nga?"*
next-3s$_{\perp}$.sg-MOD do.what-prospect-QUE-1s

In Kalaallisut (41′) the main verb (IND) is lexically typed as a process, by the process-forming suffix *-qattaar*, corresponding to *over and over* in the English (41). The English process-modifiers *by turns* and *with increasing desperation* are rendered in Kalaallisut as topic-elaborating verbs (ELA$_{\top}$). As already noted, this dependent mood in Kalaallisut generally forms an anaphoric chain with the main verb, co-specifying the same discourse referent (recall e.g. (9a), (11), (20a), (26′)). In (41′), the elaborated discourse referent is a process—a chain of causally linked events.

In the context of this speech process the direct quote receives a stage-dependent interpretation, in English and Kalaallisut alike. This, too, can be analyzed as discourse reference, to an event-dependent concept distributed over the stages of a speech process (Bittner 2007). On this analysis, each inquiry in (41)–(41′) constitutes a stage of a speech process. For each inquiry, the present tense/interrogative mood refers to the time of this stage of the process; the first person refers to the current speaker; and the stage-anaphor 'next' refers to the currently next stage—temporally located during the result time of the current inquiry—of the process evoked by the aforementioned instructions.

In discourse referential terms, processes are the verbal counterpart of nominal pluralities, modulo some extra temporal structure. Pluralities are sets of atomic individuals (Sharvy 1980, Schwarzschild 1992, a.o), while processes are chains of eventive stages (Bittner 2003, 2007). The set structure of pluralities has well-known implications for nominal anaphora (see e.g. Kamp and Reyle 1993). Similarly, the chain structure of processes has implications for verbal anaphora, as I now turn to show.

4.2 *Stage anaphora*

Unlike atomic episodes, processes have discourse-transparent proper parts. This enables processes to antecede stage-anaphors—e.g. *first*, *next*, *the end*, *begin*, *finish*, *stop*, etc—which are not licensed by atomic episodes, such as the atomic event in (42) or the atomic state in (43): [3]

(42) John *arrived* last night. At that instant the phone rang. *#First* he rang the doorbell. *#Next* he said: 'Hello'

(43) At the end of his life John *had* a beautiful house. *#First* he sat in the living room, admiring every detail. *#Next* he sat in the kitchen.

[3] In (42) the event-anaphor *that instant* forces the event-reading of the underspecified English verb *arrive*. It is therefore crucial to get clear judgements. I thank Barbara Partee, David Dowty, Anita Mittwoch, and Malka Rappaport for judgements and discussion.

In contrast, the process-reading of the verb *build* in English (44), and the aspectually unambiguous process-suffix *-liur* in Kalaallisut (44′), both set up a discourse referent for a process. As a chain of discourse-transparent stages, a process referent has the requisite structure to antecede stage-anaphors—here, *first*, *next*, and *the end* in (44), and the equivalents in (44′).

(44) [1]John *built* a house last year. [2]*First* he got an architect to draw up a plan. [3]*Next* he hired a contractor. [4]At *the end* he was very pleased.

(44′) [1]*Siurna Johni illuliurpuq* [2]*Siullirmik*
siurna Johni illu-liur-*pu-q* siulliq-*mik*
last.year John$_{\top}$ house-make-IND.IV-3s first-sg.MOD

titartaasartuq illumik
titartar-(ss)i-tar-tuq-q illu-mik
draw-apass-habit-iv\cn-sg house-sg.MOD

titartaatippaa. [3]*Tullianik*
titartar-(ss)i-tit-pa-a tulliq-a-*nik*
draw-apass-cause-IND.TV-3s.3s next-3s$_{\perp}$.sg-MOD

illuliurtartuq illuliurtippaa.
illu-liur-tar-tuq-q illu-liur-tit-pa-a
house-make-habit-iv\cn-sg house-make-cause-IND.TV-3s.3s

[3]*Inirnira assut iluaraa*
inir-*niq*-a *assut iluari-pa-a*
finish-v\n-3s$_{\perp}$.sg very like-IND.TV-3s.3s

The stage-structure of a process referent—how many stages, of what kind, etc—depends on the context. For example, after the first sentence of (44)–(44′) the speaker could alternatively continue as in (45)–(45′):

(45) [1]John *built* a house last year. [2]*First* he worked out a budget. [3]*Next* he applied for a loan.

(45′) [1]*Siurna Johni illuliurpuq* [2]*Siullirmik*
siurna Johni illu-liur-*pu-q* siulliq-*mik*
last.year John$_{\top}$ house-make-IND.IV-3s first-sg.MOD

akiligassanik naatsursuivuq.
akilir-gaq-ssaq-nik naatsursur-(ss)i-pu-q
pay.for-tv\rn-prospective-pl.MOD calculate-apass-IND.IV-3s

[3]*Tullianik akiligassaqarnissamik*
tulliq-a-*nik akilir-gaq-ssaq-qar-niq-ssaq-mik*
next-3s$_{\perp}$.sg-MOD pay.for-tv\rn-prospective-have-v\n-prospective-sg.MOD

qinnutiqarpuq.
qinnut-qar-pu-q
request-have-IND.IV-3s

Thus the lexical meaning of a process-verb does not determine the stages of the evoked process. It simply sets up a discourse referent for a process-chain with at least two stages. This is enough to support stage-anaphora—just like any plurality will support proper part anaphora—while leaving the exact number and nature of the discourse-transparent stages up to the discourse context.

4.3 *Temporal anaphora with processes*

The stage-structure of a process also has implications for temporal anaphora, where it gives rise to three-way contrasts with atomic events and states. In general, a process is related to temporal anaphora via a particular stage—hereafter 'stage *n*', where the choice of *n* depends on the discourse relation (recall (14)). For instance, to extend the generalizations **V**, **L′** and **L** to processes, we add the following process-clauses:

V. Current verifiability (to be continued)

In a speech event $^{\top}e$ in $^{\top}w$, the speaker may report:
- a *state s* as a $^{\top}w$-fact, iff the beginning of *s* precedes $^{\top}e$ in $^{\top}w$
- an *event e* as a $^{\top}w$-fact, iff *e* precedes $^{\top}e$ in $^{\top}w$
- a *process ee* as a $^{\top}w$-fact, iff stage 1 of *ee* precedes $^{\top}e$ in $^{\top}w$

L′. Location relative to topical instant (to be continued)

In the topical modality $^{\top}p$,
- a *state* includes the topical instant
- an *event* has a result state that includes the topical instant
- stage *n* of a *process* has a result state that includes the topical instant

L. Location relative to topical period (to be continued)

In the topical modality $^{\top}p$,
- a *state* includes the topical period
- an *event* is included in the topical period
- stage *n* of a *process* is included in the topical period

In Kalaallisut verbs are lexically typed for aspect and any aspectual type can be located relative to any topic time. The three-way contrasts of **V** **L′** and **L** are therefore clearly evident. Discourse-initially, the topic time is a (discourse) instant—to wit, the time of the speech event, by default (recall **D** and **I**). **V** and **L′** then predict the interpretation illustrated in (46), for a state of sleep, an event of waking up, and a process of making tea.

(46) *Ole* {*sinippuq* *itirpuq* *tiiliurpuq*
Ole {sinig-*pu-q,* itir-*pu-q,* *tii*-liur-*pu-q*}
Ole {be.asleep-IND.IV-3s wake.up-IND.IV-3s tea-make-IND.IV-3s}
Ole {is asleep, has woken up, is making tea}

After an updating event-verb, the topic time is a period—to wit, the time of the result state of this event (recall **U** and **I**). **V** and **L** then predict the somewhat different three-way contrast, exemplified in (47).

(47) *Ataataga* *angirlarmat*
ataata-ga *angirlar-mm-at*
dad-1s.sg come.home-$FCT_{\perp}$-$3s_{\perp}$
When my dad came home,

{*sinippunga*, *itirpunga* *tiiliurpunga*}
{sinig-*pu-nga*, itir-*pu-nga*, *tii*-liur-*pu-nga*}
{be.asleep-IND.IV-1s, wake.up-IND.IV-1s, tea-make-IND.IV-1s}
{I was asleep, I woke up, I made/was making tea}

In English these contrasts are obscured by aspectual under-specification and language-specific constraints on admissible combinations of topic times and aspectual types. One of these constraints is that only states (and habits) can normally be located relative to topical instants. Thus, in the discourse-initial environment of (46) the English translations are all stative. In general, Kalaallisut event- and process-verbs are often rendered as stative predicates—e.g. perfect or progressive—in English.

Even so, the process-clause of **L** holds in both languages, as shown by discourses of the type exemplified in (48)–(48′).

(48) [The day after A was murdered a big mob of kayaks set out to finish off his son.]
[1]The leaders of the kayak mob appeared on the horizon, while the boy was still asleep. [2]His mother *shook* him *awake*.

(48′) [1]*Nukappiaraq* *suli* *sinittuq*
nukappiara-q *suli* *sinit-tu-q*
boy-sg still be.asleep-$ELA_{\perp}$.IV-$3s_{\perp}$

qajarpassuit *nuialirput*
qajaq-paa-(r)suaq-t *nui-at-lir-pu-t*
kayak-group-big-pl appear-together-begin-IND.IV-3p

[2]*Arnaata* *itirsarpaa.*
arnaq-a-ta *itir*-sar-*pa-a*
mother-$3s_{\perp}$.sg-ERG wake.up-causal.process-IND.TV-3s.3s

Sentence one sets the topic time to a period when the boy is asleep. The episode of sentence two is located in relation to this topical period. If this

episode were an atomic event of waking up, the discourse would be contradictory. But since shaking awake is a process, **L** locates just the first stage in the topical period, i.e. while the boy is still asleep. The final stage, when the boy is awake, falls outside of this topical period.

Processes also contrast with both states and events in relation to temporal update. As usual, the event-rule applies to stage *n* of the process:

U. Temporal update (to be continued)

If a verb refers to *a* in $^{\top}p$ and updates the temporal topic to $^{\top}t$, then:
- $^{\top}t$ is the time of *a* in $^{\top}p$, if *a* is a *state*
- $^{\top}t$ is the result time of *a* in $^{\top}p$, if *a* is an *event*
- $^{\top}t$ is the result time of stage *n* of *a* in $^{\top}p$, if *a* is a *process*

For Kalaallisut, this three-way contrast is illustrated in (49), for a state of sleep, an event of arrival, and a process of approaching:

(49) *Ataata* {*sinimmat*, *tikimmat* *aggirmat*}
ataata {sinig-*mm-at* tikit-*mm-at,* aggir-*mm-at*}
dad {be.asleep-FCT$_{\perp}$-3s$_{\perp}$, come-FCT$_{\perp}$-3s$_{\perp}$, approach-FCT$_{\perp}$-3s$_{\perp}$}
When Dad {was asleep, arrived, was on the way}

anaanama *sianirvigaanga.*
anaana-ma *sianirvigi-pa-anga.*
mum-1s.sg.ERG give.a.ring-IND.TV-3s.1s
mum gave me a ring.

The process-clause of **U** also holds in English. The following examples illustrate this for an atelic process in (50) and a telic process in (51).

(50) Today when I *talked* with Mum, she said she was tired.

(50′) *Ullumi* *anaana* *uqaluqatigigakku* *qasunirarpuq.*
ullu-mi *anaana* uqalu-*qatigi-ga-kku* *qasu-nirar-pu-q*
day-sg.LOC mum talk-with-FCT$_{\top}$-1s.3s tired-say-IND.IV-3s

(51) When the Smiths *threw a party*, they invited all their friends.

(51′) *Smithikkut* *nalliuttursiuramik*
Smith-kku-t *nalliug-tur-*siur-*ga-mik*
Smith-&co-pl be.special.occasion-iv\cn-celebrate-FCT$_{\top}$-3p$_{\top}$

ilisarisimasatik *tamaasa* *qaaqquvaat.*
ilisarisima-gaq-tik *tama-isa* *qaa-qqu-pa-at*
be.acquainted.with-tv\rn-3p$_{\top}$.pl all-pl$_{\perp}$ come-tell-IND.IV-3p.3p

Hinrichs 1981, who only distinguishes events and states, cites English (51) as a problem for the event-clause of **U**. Similar problems are cited by

other researchers who also assume this standard aspectual classification (e.g. Kamp and Rohrer 1983, Webber 1988, Lascarides and Asher 1993, Hamm et al 2006, a.o). In the present theory, which further distinguishes atomic events from non-atomic processes, these problems disappear. (51)–(51′) is not counterexamples to the event-clause of **U**, but examples of the process-clause. This is supported by two facts. First, the Kalaallisut *-siur* 'celebrate' is lexically typed as a process. Secondly, discourses like (51)–(51′) have unambiguous process-paraphrases, where explicit stage-anaphora makes it clear that the process-clause of **U** predicts the correct interpretation:

(52) [1]The Smiths *threw a party* last year. [2]*First*, they decided on a date. [3]*Next*, they invited all their friends.

(52′)

[1]*Siurna*	*Smithikkut*	*nalliuttursiurput.*
siurna	*Smith-kku-t*	*nalliug-tuq*-siur-*pu-t*
last.year	Smith-&co-pl	be.special.occasion-iv\cn-celebrate-IND.IV-3p

[2]*Siullirmik*	*ullumik*	*aalajangiipput.*	[3]*Taava*
siulliq-*mik*	*ullu-mik*	*aalajangir-(ss)i-pu-t*	taava
first-sg.MOD	day-sg.MOD	decide.on-apass-IND.IV-3p	Then

ilisarisimasatik	*tamaasa*	*qaaqquvaat.*
ilisarisima-gaq-tik	*tama-isa*	*qaa-qqu-pa-at*
be.acquainted.with-tv\rn-3p$_{\top}$.pl	all-pl$_{\perp}$	come-tell-IND.IV-3p.3p

These paraphrases show that a telic process can be construed broadly, so that the process of throwing a party begins with the first idea, not with the arrival of the first guest. In general, unambiguous process-paraphrases may help to distinguish telic processes from atomic events in English, where aspectual underspecification blurs this anaphorically crucial distinction.

Finally, there is a three-way contrast between states, events, and processes in relation to the start-up temporal defaults. A speech process induces a distributed default—i.e., not a particular time, but a kind of time:

D. Temporal defaults (to be continued)

Given a perspective point $^{\top}a$ in $^{\top}w$, the default temporal topic is:
- the instant of $^{\top}a$-onset, if $^{\top}a$ is a state
- the instant of $^{\top}a$, if $^{\top}a$ is an event
- the kind of time instantiated by the instants of $^{\top}a$-stages, if $^{\top}a$ is a process

We have already relied on the process-clause of **D** to account for the stage-dependent interpretation of the direct quote in the context of a speech process in (41)–(41′). The process-clause of **D** is also relevant, e.g., for running commentaries, such as (53) (due to Comrie 1976: 77). The stages of this speech process correspond to the clauses of (53). Thus, in each clause the initial adverb *now* and the present tense refer to the time of the current

stage in the commentary, and the verbal event (or process) is located so that its (first) result state holds at that discourse instant (pace **L′**).

(53) *Now* the villain *seizes* the heroine, *now* they *drive* off towards the railway track, *now* he *forces* her out of the car, *now* he *ties* her to the track, while all the time the train is getting nearer.

The aspectual classification defined here in discourse anaphoric terms superficially resembles the Aristotelian classification into *states*, *events*, and *processes*. However, Aristotelian processes are necessarily atelic. In contrast, discourse processes can be either telic (like *build a house* or *throw a party*) or atelic (like *ask over and over* or *play chess*). What characterizes discourse processes is the ability to antecede discourse anaphors to stages—in English, anaphors such as *first*, *next*, *the end*, *begin, finish*, *stop*, etc. That is what distinguishes plural-like processes from atomic events. Formalizing this intuition, Bittner 2003, 2007 models atomic events as a basic type, and processes, as chains of causally linked atomic events, formally parallel to nominal pluralities modeled as sets of atomic individuals.

5 ANAPHORA WITH HABITS

In semantic literature habituals are usually assimilated to states (e.g. Moens and Steedman 1988, Krifka et al 1995, Smith 1997) or to processes (e.g. van Geenhoven 2004). However, in typological work habits are sometimes treated as a distinct aspectual class (e.g. Comrie 1976). This is also advocated by Bittner 2003, 2007 based on temporal anaphora in Kalaallisut texts, and by Smith 2005 based on temporal anaphora in English texts.

In relation to temporal anaphora habits are similar to states and processes, but not identical. They also interact with part-whole anaphora in distinctive ways. To capture these patterns, we need discourse referents for habits as modally as well as temporally distributed episodes. In the implementation of Bittner 2003, 2007, habits are partial functions from worlds and times to the instantiating episodes. In what follows I argue for this analysis on crosslinguistic grounds.

5.1 *Quantification as discourse reference*

For each type of episode—state, event, and process—we can talk about a related habitual pattern. For instance, (54)–(54′) evokes a pattern of habitual states of confusion; (55)–(55′), habitual events of inquiry; and (56)–(56′), habitual processes, each of which consists of a series of inquiries:

(54) [1]Whenever he finishes reading instructions, [2]Jim *is* confused: [3]"What do I do first?" [4]*This* {*habitual behavior*, #state, #process, #fact} has already got him fired from two jobs.

(54′) [1]*Jimi ilitsirsuutinik atuariiraangami*
Jimi ilitsirsur-ut-nik artuar-riir-gaanga-mi
Jim instruct-means-pl.MOD read-have.finished-HAB$_{\top}$-3s$_{\top}$

[2]*paatsiviirusimaartarpuq*:
paatsiviirut-sima-ar-tar-*pu-q:*
get.confused-prf-longish-habit-IND.IV-3s

[3]"*Siullirmik sussaanga*?"
"*siulliq-mik su-ssa-pi-nga*?"
"first-sg.MOD do.what-prospect-QUE-1s?"

[4]*Pissutsip taassuma qangali sulivvinnit*
pissusiq-p taassuma *qangali suli-vik-nit*
hab.behavior-sg.ERG this.ERG already work-place-pl.ABL

marlunnit suraarsitaatippaa
marluk-nik suraar-tit-gaq-u-tit-pa-a
two-pl.ABL stop.work-cause-tv\rn-be-cause-IND.TV-3s.3s

(55) [1]When I finish reading instructions, [2]Jim often *asks* me: [3]"What do I do first?"[4]Today I told him to quit this {habit, #state, #process, #fact} or else.

(55′) [1]*Ilitsirsuutinik atuariiraangama*
ilitsirsur-ut-nik artuar-riir-gaanga-ma
instruct-means-pl.MOD read-have.finished-HAB$_{\top}$-1s

[2]*Jimip apirigajuttarpaanga*:
Jim-p apiri-gajut-tar-*pa-anga*
Jim-sg.ERG ask-often-habit-IND.TV-3s.3s

[3]"*Siullirmik sussaanga*?"
"*siulliq-mik su-ssa-pi-nga*?"
"first-sg.MOD do.what-prospect-QUE-1s?"

[4]*Ullumi uqarvigaara pissutsini taanna*
ullu-mi uqar-vigi-pa-ra pissusiq-ni taanna
day-sg.LOC say-to-IND.TV-1s.3s hab.behaviour-3s$_{\top}$.sg this

unitsissagaa unitsinngikkaluariliuk.
unig-tit-ssa-ga-a unig-tit-nngit-galuar-li-uk
stop-cause-prospect-ELA$_{\perp}$.TV-3s$_{\perp}$.3s stop-cause-not-…but-OPT-3s.3s

(56) [1]Last year whenever we worked our way through instructions, [2]Jim and Tom routinely *asked* me over and over, by turns, with increasing desperation: [3]"What do I do next?" [4]They began to do *this* with increasing frequency, [5]and I finally had enough of *this* {*routine*, #state, #process, #fact}.

(56′) [1]*Siurna* *ilitsirsuutit* *malittariniaranngatsigit*
siurna *ilitsirsur-ut-t* *malittari-niar-gaanga-tsigit*
last.year instruct-means-pl follow-try-HAB$_{\top}$-1p.3p

[2]*Jimmip* *Tommillu* *tulliriiaarlutik*
Jimmi-p *Tommi-p=lu* *tulliq-giiaar-llu-tik*
Jim-sg.ERG Tom-sg.ERG=and next-v.in.many.rn.pairs-ELA$_{\top}$-3p$_{\top}$

apiriqattaartarpaannga *ilungirsuraluttuinnarlutik*
apiri-qattaar-tar-*pa-annga* *ilungirsur-galuttuinnar-llu-tik*
ask-keep.v.ing-habit-IND.TV-3p.1s struggle-increasingly-ELA$_{\top}$-3p$_{\top}$

[3]“*Tulliamik* *sussaanga*?”
“*tulliq-a-nik* *su-ssa-pi-nga*?”
“next-3s$_{\perp}$.sg-MOD do.what-prospect-QUE-1s?”

[4]*Annirtusiarturtumik* *taamaaliurtalirmata*
anniq-tusi-iartur-tuq-mik taama=*iliur*-tar-*lir-mm-ata*
big-get.more-increasingly-iv\cn-sg.MOD thus=do-habit-begin-FCT$_{\perp}$-3p$_{\perp}$

[5]*kiisa* *pissusiat* *taanna* *qatsutivippara.*
kiisa pissusiq-at taanna *qatsut-vig-pa-ra*
finally hab.behavior-3p$_{\perp}$.sg this get.tired.of-really-IND.TV-1s.3s

As these examples illustrate, any habitual sentence can antecede a demonstrative anaphor of the form *this habit*, *this routine*, or *this habitual N*. In contrast, it cannot antecede episodic anaphors such as *this state* or *this process*—a puzzle for theories that conflate habits with episodic states or processes. Thus demonstrative anaphora provides initial evidence that habituals are a distinct aspectual type which refers to habits.

Some habituals support anaphora by *this fact*. In (54) through (56′) this option is ruled out by predicates that do not make sense for facts. They do, however, make sense for habits—patterns of recurrent episodes. A recurrent state of confusion can cost a person two jobs (54)–(54′); the agent of a recurrent event can be told to quit this behavioral pattern or else (55)–(55′); and the increasingly annoyed experiencer of a habitual process can run out of patience after the *n*th instance of this pattern (56)–(56′).

Habituals are normally analyzed in terms of quantification over the instantiating episodes (Lewis 1975, Kamp and Reyle 1993, Krifka et al 1995, a.o.). Combined with E-type anaphora, this may account for simple habit-anaphors, e.g. by *this habit*. But it cannot account for habit-modifiers that do not distribute down to the instantiating episodes, e.g. *routinely* or *with increasing frequency*. An episode cannot be routine or increasingly frequent, and neither can a sum of episodes nor a quantificational structure.

Another problem for the standard analysis is the interaction of habitual reports with direct quotes. In the context of habitual thoughts or habitual speeches direct quotes receive an instance-dependent interpretation,

exemplified in (54)–(54′), (55)–(55′), and (56)–(56′). The problem is that one cannot quantify into a quote, so the instance-dependent interpretation is difficult to capture in terms of quantification over the instantiating episodes.

The discourse referential analysis of Bittner 2003, 2007 does not have these problems. In this theory habitual verbs are analogous to kind-level nouns. That is, they refer to habits, which are formally parallel to kinds. In the implementation of Carlson 1977 kinds were modeled as entity-level correlates of intensional properties—i.e. world- and time-dependent sets of individuals. To extend this idea to verbs—including habitual verbs with kind-level arguments—Bittner 2003, 2007 models habits as world- and time-dependent episodes, and kinds, as world- and episode-dependent nominal objects. The latter include not only atomic and plural individuals (e.g. *dog*(*s*)), but also times (e.g. *day*), places (e.g. *inside*), and propositions (e.g. *belief*). Thus, habits as well as kinds are modally and temporally distributed patterns. Formally, both are characterized by functions that map each point in the distribution to the corresponding instance of the pattern.

In this theory habit-anaphors like *this habit*, *this habitual N*, or *this routine* anaphorically refer to antecedent habit-functions, while habit-modifiers such as *routinely* or *with increasing frequency* are predicates of habit-functions. A habitual report can serve as a perspective point, just like an episodic report. In the context of a habitual report any episode-dependent items in a direct quote are distributed over the episodes that instantiate the antecedent habitual report (see Bittner 2007). Depending on whether these episodes are attitude states (as in (54)–(54′)), speech events (55)–(55′) or speech processes (56)–(56′), this interpretation yields distributed counterparts of episodic reports (cf. the attitude state in (35), speech event in (40), and speech process in (41)–(41′)).

In the nominal domain, anaphora to kinds has been shown to differ from anaphora to particular pluralities (Carlson 1977). I now turn to show that in the verbal domain too habits exhibit a distinctive anaphoric behavior.

5.2 *Instantiating anaphora*

In naturally occurring discourse speakers often shift from habitual to episodic passages by instantiating the currently salient habit in the topical modality at the topic time. I dub this phenomenon *instantiating anaphora*.

Simple instantiating anaphora is illustrated in (57)–(57′). Sentence one sets up a discourse referent for a habit instantiated by events of John dropping in on a Sunday. Not necessarily every Sunday, just enough instances to report this as a habit. In sentence two, the topic time is first updated to the day of the speech event, which must be a Sunday. Instantiaing anaphora then evokes the event that instantiates this habit on that particular Sunday and that has already been realized in the speech reality by the time of this speech event (English past tense, Kalaallisut current verifiability **V**).

(57) [1]John has formed a *habit* of dropping in on Sundays. [2]Today, *as usual*, he did *that*.

(57′)	[1]*Johnip*	*iliqqurilirsimavaa*	*sapaatikkut*
	Johni-p	iliqquq-*gi-lir-sima-pa-a*	*sapaat-kkut*
	John-sg.ERG	habit.of-rn\tv-begin-prf-IND.TV-3s.3s	Sunday-sg.VIA

isirtarluni.	[2]*Ulluminaasiit*	*taamaaliurpuq.*
isir-tar-*llu-ni*	*ullu-mi*=aasiit	taama=*iliur-pu-q*
enter-habit-ELA$_{\top}$-3s$_{\top}$	day-sg.LOC=as.usual	thus=do-IND.IV-3s

Instantiating a habit may also involve its modal distribution. This variety of instantiating anaphora is common in modal reasoning—e.g. the prediction in (58)–(58′) that a current habitual pattern is likely to be instantiated.

(58) [1]John has formed a *habit* of dropping in on Sundays. [2]Today, *as usual*, he's likely to do *that*.

(58′)	[1]*Johnip*	*iliqqurilirsimavaa*	*sapaatikkut*
	Johni-p	iliqquq-*gi-lir-sima-pa-a*	*sapaat-kkut*
	John-sg.ERG	habit.of-rn\tv-begin-prf-IND.TV-3s.3s	Sunday-sg.VIA

isirtarluni.	[2]*Ullumiaasiit*	*taamaaliurumaarpuq.*
isir-tar-*llu-ni*	*ullu-mi*=aasiit	taama=*iliur-jumaar-pu-q*
enter-habit-ELA$_{\top}$-3s$_{\top}$	day-sg.LOC=as.usual	thus=do-be.likely-IND.IV-3s

In addition or instead, instantiating a habit may involve instantiating an associated kind. The example in (59)–(59′) is based on a Kalaallisut text. The speaker is a hunter who has accidentally got his kayak cut on sharp new ice and has just made an emergency landing on an iceberg. Sentence one describes the next two events. Sentence two relates this particular kayak trip to the speaker's habit of customary kayak use and a correlated habit of carrying a patching kit. Sentence three shifts back to the episodic mode, via an anaphoric demonstrative which refers to the particular kit that instantiates this kind in the aforementioned stage of this particular instance of customary kayak use.

(59) [1]When I got out, I poured out the contents of my kayak. [2]Whenever I was out in a kayak, I *always carried* something to patch it. [3]I grabbed *that* and hastily began to patch up the tear in my kayak.

(59′)	[1]*Niugama*	*qajara*	*imaarpara.*
	niu-ga-ma	*qajaq-ga*	*ima-ir-pa-ra*
	get.out.on.land-FCT$_{\top}$-1s	kayak-1s.sg	content-remove-IND.TV-1s.3s

[2]*Qajarturtillunga*
qajaq-tur-tit-llu-nga
kayak-use.as.customary-state-ELA$_{\top}$-1s

ilaassamik *nassartuaannartarpunga*
ilaar-ut-ssaq-mik *nassar*-tuaannar-tar-*pu-nga*
patch-means-prospective-sg.MOD carry-always-habit-IND.IV-1s

[3]*Taanna* *tiguriarlugu* *tuaviinnaq*
taanna *tigu-riar-llu-gu* *tuaviinnaq*
that take-…and-ELA$_{\top}$-3p$_{\perp}$ hastily

qaannama *alinnira* *ilaalirpara.*
qajaq-ma *alig-niq-ga* *ilaar-lir-pa-ra*
kayak-1s.sg.ERG tear-iv\rn-3s$_{\perp}$.sg patch-begin-IND.TV-1s.3s

Assuming the generalized theory of kinds of Bittner 2007, which extends to kinds of propositions (recall section 5.1), the discourse in (60)–(60′) exemplifies a parallel phenomenon in the modal domain:

(60) [1]My dad *plays* chess. [2]The next day he *often says*: "I won." [3]The first time I doubted *it*.

(60′) [1]*Ataataga* *skakkirtarpuq*.
ataata-ga *skakki-r*-tar-*pu-q*.
dad-1s.sg chess-do-habit-IND.IV-3s

[2]*Aqaguani* *uqarajuttarpuq*: "*Ajugaasimavunga*."
aqagu-a-ni *uqar*-gajut-tar-*pu-q* "*ajugaa-sima-pu-nga*"
next.day-3s$_{\perp}$.sg-LOC say-often-habit-IND.IV-3s "win-prf-IND.IV-1s"

[3]*Siullirmik* *uanga* *tamanna* *qularaara.*
siulliq-mik *uanga* tamanna *qulari-pa-ra*
first-sg.MOD I that$_{abstract}$ doubt-IND.TV-1s.3s

Here, sentence one evokes a habit instantiated by processes where the speaker's father plays chess. Sentence two evokes a reporting habit of this topical individual. This habit is instantiated at the currently topical kind of time, which in turn depends on how we resolve the anaphoric presupposition of the quantifier 'often'. On one reading, for many chess games the topical kind of time is instantiated once during the day after the game. On another reading, for each chess game the topical kind of time is instantiated many times during the day after the game. In either case, in each reporting event the agent expresses a certain kind of proposition. The discourse referent for this propositional kind is elaborated by the direct quote. In every world where the proposition expressed in the current reporting event is true the reporting agent, at the time of the reporting event, is in the result state of winning the previous day's chess game.

This analysis (formally spelled out in Bittner 2007) straightforwardly accounts for the instantiating anaphora in sentence three. The initial noun evokes the first instance of the reporting habit and updates the temporal topic to the result time of this first reporting event. The pronoun 'I' updates the individual topic to the speaker of (60)–(60′), while the anaphoric demonstrative updates the background to the proposition expressed in this first reporting event (i.e. the proposition that instantiates the aforementioned kind of proposition in this event). Finally, the verb relates all of these discourse referents: it evokes a state of doubt experienced, at the current topic time (the result time of the first reporting event), by the current topic (the speaker of (60)–(60′)) in relation to the current background (the reported proposition).

As these examples illustrate, instantiating anaphora is a multifarious phenomenon. Nevertheless, it is amenable to a unified account in terms of discourse reference to habits modeled as world- and time-dependent episodes and kinds modeled as world- and episode-dependent nominal objects (atomic or plural individuals, times, places, or propositions). As we will see, the interaction with temporal anaphora also falls into place.

5.3 *Temporal anaphora with habits*

We are now ready to complete our aspect-based temporal system, by extending it to habits.

In relation to topical instants habits are located unlike any type of episode. A case in point is the discourse-initial location relative to the start-up topic time—i.e. the instant right now (recall **D** and **I**). Relative to a topical instant, **L′** requires a state to be current and a processes, (normally) to be in progress. A habit must likewise be current, but it need not be instantiated at the topical instant. Thus, recall that in (18) (Kalaallisut as well as English) only the episodic state-sentence entails that the speaker has a headache right now. Similarly, in (19) (again, both Kalaallisut and English) only the episodic process-sentence entails that a chess game is in progress. These contrasts are included in the following final version of **L′**:

L′. Location relative to topical instant

In the topical modality $^{\top}p$,
- a *state* includes the topical instant
- an *event* has a result state that includes the topical instant
- stage *n* of a *process* has a result state that includes the topical instant
- a *habit* includes (but need not be instantiated at) the topical instant.

In relation to topical periods, we find similar contrasts, spelled out in the following final version of **L**. The habit clause has already been exemplified in (56)–(56′) and (59)–(59′).

L. Location relative to topical period

In the topical modality $^{\top}p$,
- a *state* includes the topical period
- an *event* is included in the topical period
- stage *n* of a *process* is included in the topical period
- a *habit* includes (but need not be instantiated during) the topical period.

The parenthesized caveat in this clause is illustrated in sentence two of (61)–(61′). John's glory chess days extend through his first meeting with Ann, but this meeting need not have taken place during a chess game.

(61) [1]As a young man, John used to be a good chess player. [2]When he first met Anne, he still *often played* chess.

(61′) [1]*Johni inuusuttuugallarami* *skakkirlaqqippuq*
John inuusug-tuq-u-gallar-ga-Ni *skakki-r-llaqqig-pu-q*
John$_{\top}$ be.young-iv\cn-be-no.more-FCT$_{\top}$-3s$_{\top}$ chess-do-well-IND.IV-3s

[2]*Aani naapiqqaaramiuk* *suli skakkirajuttarpuq*.
Aani naapit-qqar-ga-Niuk *suli skakki-r*-gajut-tar-*pu-q*
Anne$_{\perp}$ meet-first-FCT$_{\top}$-3s$_{\top}$.3s$_{\perp}$ still chess-do-often-habit-IND.IV-3s

In addition to topical instants and periods, temporal topics can also be topical kinds of time. In the following examples each sentence begins with a habitual dependent clause, which presupposes a topical kind of time. Based on the aspectual type of the instantiating episodes (states, events, or processes), the initial habitual clause updates the temporal topic to a new topical kind of time, as stated in the final version of **U** below:

(62) When Dad {is away, comes home, cooks}, Mum gives me a ring.

(62′) *Ataata* {*aallarsimagaangat*, *tikikkaangat*, *igagaangat*}
ataata {*aallar*-sima-gaang-*at*, tikit-gaang-*at*, iga-gaang-*at*}
dad {leave-prf-HAB$_{\perp}$-3s$_{\perp}$, arrive-HAB$_{\perp}$-3s$_{\perp}$, cook-HAB$_{\perp}$-3s$_{\perp}$}

anaanama *sianirvigisarpaanga*.
anaana-ma sianirvigi-tar-*pa-anga*
mum-1s.sg.ERG give.a.ring-habit-IND.TV-3s.1s

(63) When Dad {is away, comes home, cooks}, Mum is happy.

(63′) *Ataata* {*aallarsimagaangat*, *tikikkaangat*, *igagaangat*}
ataata {*aallar*-sima-gaang-*at*, tikit-gaang-*at*, iga-gaang-*at*}
dad {leave-prf-HAB$_{\perp}$-3s$_{\perp}$, arrive-HAB$_{\perp}$-3s$_{\perp}$, cook-HAB$_{\perp}$-3s$_{\perp}$}

anaana *nuannaartarpuq*.
anaana nuannaar-tar-*pu-q*
mum be.happy-habit-IND.TV-3s

U. Temporal update

If a verb refers to a in ${}^{\top}p$ and updates the temporal topic to ${}^{\top}t$ or ${}^{\top}k^{\tau}$, then:
- ${}^{\top}t$ is the time of a in ${}^{\top}p$, if a is a *state*
- ${}^{\top}t$ is the result time of a in ${}^{\top}p$, if a is an *event*
- ${}^{\top}t$ is the result time of stage n of a in ${}^{\top}p$, if a is a *process*
- ${}^{\top}k^{\tau}$ is the kind of time that, in each a-world w,
  sends each a-state to its time, if a is a *habitual state*
  sends each a-event to its result time, if a is a *habitual event*
  sends stage 1 of each a-process to its result time, if a is a *habitual process*

The matrix habits—instantiated by events of making a phone call in (62)–(62′) or states of happiness in (63)–(63′)—are then located, in relation to the new topical kind of time, on an instance-by-instance basis, as follows:

L″. Location relative to topical kind of time

Let h be a habit located at a topical kind of time ${}^{\top}k^{\tau}$. Then in each ${}^{\top}k^{\tau}$-world at each ${}^{\top}k^{\tau}$-time, there is an h-episode which is
- located according to **L**, if ${}^{\top}k^{\tau}$-times are (discourse) periods
- located according to **L**′, if ${}^{\top}k^{\tau}$-times are (discourse) instants

Current verifiability also extends to habits in a straightforward manner:

V. Current verifiability

In a speech event ${}^{\top}e$ in ${}^{\top}w$, the speaker may report:
- a *state* s as a ${}^{\top}w$-fact, iff the beginning of s precedes ${}^{\top}e$ in ${}^{\top}w$
- an *event* e as a ${}^{\top}w$-fact, iff e precedes ${}^{\top}e$ in ${}^{\top}w$
- a *process* ee as a ${}^{\top}w$-fact, iff stage 1 of ee precedes ${}^{\top}e$ in ${}^{\top}w$
- a *habit* h as a ${}^{\top}w$-fact iff instance 1 of h precedes ${}^{\top}e$ in ${}^{\top}w$

Suppose my friend Susan has come to see me in New York once, we had a lot of fun, and I hope she'll visit again. Then I can already make the factual report (64). The habit instantiated by processes of our having fun is already a fact—in the sense of **V**—so the indicative mood is felicitous.

(64) *Suusat New Yorkimut tikikkaangat nuannisaartarpugut.*
Suusat New York-mut tikit-gaang-at nuannirsaar-tar-pu-*gut.*
Susan New York-DAT come-HAB$_{\perp}$-3s$_{\perp}$ have.fun-habit-IND.IV-1p
When Susan comes to New York, we have fun.

In Kalaallisut factual moods (IND and FCT) presuppose current verifiability in this sense (recall section 3.2). Uninstantiated habits cannot be reported as facts. Unlike (64), expected but as yet uninstantiated habits can

only be reported as real states of expectation (as in (34′) and (65′)) or as real states of being under contract (as in (66′)), not as real habits.

- Rule for a new club. No emergencies so far

(65) Members of this club *support* each other in emergencies.

(65′) *Piqatigiivvimmi* *uani* *ilaasurtat*
pi-qat-gii-g-vik-mi *ua-ni* *ila-u-tuq-taq-t*
do-mate-sum-cn\iv-place-sg.LOC this-LOC part-be-iv\cn-attached-pl

ajurnartursiulirvimmi
ajurnar-tuq-siur-lir-vik-mi
be.difficult-iv\cn-experience-begin-time-sg.LOC

{*ikiuqatigiittussaapput*, *#ikiuqatigiittarput*}
{*ikiur-qatigiig-tuq*-ssaq-u-*pu-t*, *#ikiur-qatigiig*-tar-pu-*t*}
{help-rcp-iv\cn-prospective-be-IND.IV-3p, #help-rcp-habit-IND.IV-3p}

- Mary has been assigned a task she cannot possibly make hash of

(66) Mary *handles* mail from Mars.

(66′) *Mary* *Marsiminngaaniirsunik*
Mary *Marsi-minngaaniit=r-tuq-nik*
Mary Mars-sg.ABL=be-iv\cn-pl.MOD

{*allakkirisuuvuq*, *#allakkirisarpuq*}
{*allagar-liri-tuq*-u-pu-*q*, *#allagar*-liri-tar-*pu-q*
{letter-work.with-iv\cn-be-IND.IV-3s, #letter-work.w.-habit-IND.IV-3s}

English non-future tenses do not require current verifiability in the sense of **V**. They refer to the speech reality only by default, in general, refering to the topical modality (recall Table 1). So if instead of what *is*, the modal topic is what *is expected*, then uninstantiated English habituals like (65) and (66) are acceptable. This is not due to habitual aspect (contra Carlson 1977, Pelletier and Asher 1997, a.o.), but modally permissive tense.

Finally, recall that habitual thoughts and speeches induce kind-level temporal defaults for direct quotes ((54) through (56′) as well as (60)–(60′)). This generalization is captured in the following final version of **D**.

D. Temporal defaults

Given a perspective point $^{\top}a$ in $^{\top}w$, the default temporal topic is:
- the instant of $^{\top}a$-onset, if $^{\top}a$ is a *state*
- the instant of $^{\top}a$, if $^{\top}a$ is an *event*
- the kind of time instantiated by the instants of $^{\top}a$-stages, if $^{\top}a$ is a *process*
- the kind of time instantiated by the instants of $^{\top}a$-episodes, if $^{\top}a$ is a *habit*

This completes the development of a cross-linguistic theory of aspect-based temporal anaphora. This theory generalizes across English and Kalallisut and presumably also other languages between these typological extremes.

6 CONCLUSIONS

Systematic comparison of English and Kalaallisut reveals a cross-linguistic system of aspect-based temporal anaphora. This cross-linguistic system distinguishes three types of episodes: atomic *states*, atomic *events*, and non-atomic *processes*. In discourse referential terms, non-atomicity means support for discourse anaphora to proper atomic parts. To capture this, nominal pluralities are often modeled as sets of atomic objects (Kamp and Reyle 1993, a.o.). Factoring in temporal order, processes can be modeled as chains of causally linked atomic events—the discourse-transparent atomic stages of the process (Bittner 2003, 2007).

For each type of episode there is a related habit, just like for each type of nominal object there is a related kind. Habits and kinds support instantiating anaphora, which may involve both. In the implementation of Bittner 2007, habits are world- and time-dependent episodes, while kinds are world- and episode-dependent nominal objects (atomic or plural individuals, times, places, or propositions). This captures the characteristic ability of habits and kinds to support instantiating anaphora as well as other interactions, e.g. between habitual verbs and kind-level nominal arguments.

Like their nominal counterparts, these aspectual types also interact with other varieties of discourse anaphora. In particular, for temporal anaphora they determine aspect-based temporal defaults (**D**); aspect-based criteria for current verifiability (**V**); aspect-based criteria for discourse instants and discourse periods (**I**); aspect-based location relative to discourse instants (**L**′), discourse periods (**L**), and kinds of time (**L**″); and last, but not least, aspect-based temporal update (**U**).

Aspect-based temporal anaphora does not depend on a grammatical tense system. A tense system is just one of the grammatical options, attested in English and typologically similar languages. It is a grammatical system that specializes in temporal anaphora, taking care of the entire complex of anaphoric phenomena covered by the above generalizations. But each of these phenomena can also be dealt with by some other grammatical system, e.g. grammatical aspect, grammatical mood, and/or grammatical centering. So it is not surprising that there is a rich variety of tenseless languages, including, but by no means limited to, Kalaallisut (recall ftn 2).

Looking beyond temporality, this study employs two innovative methods of more general applicability. First, instead of attempting to extend an English-based theory to a typologically distant language it proceeds in the opposite direction—extending a Kalaallisut-based theory to English. From the theoretical point of view all languages have equal status, so either

approach can be employed in search of cross-linguistic insights. However, since formal semantics has only recently begun to look beyond English and similar languages, I believe that research that takes a genuinely different language as its point of departure is urgently needed in order to reveal and correct the Anglo-centric bias of current semantic theories.

Secondly, the strategy employed in this study offers a surface-based semantic alternative to drawing cross-linguistic parallels at the abstract syntactic level of Logical Form (LF). Instead of aligning LF structures, this strategy aligns communicative functions. The idea is that languages agree on the communicative ends, but not on the morphosyntactic means. If this is true, then trying to align LFs is precisely the wrong strategy—morpho-syntax is the locus of disagreement, not convergence. So do not ask whether an item is here or there at LF; instead, ask what communicative role it plays in this linguistic system. And then try to find its communicative, not structural, counterpart in the other language. Since the division of labor may be different, one may need to go down to communicative subtasks, until the two linguistic systems can be aligned. At this point, cross-linguistic parallels can be drawn in terms of similarities in the lexical meanings of actual morphemes—communicative counterparts—instead of abstract LFs.

So far nobody has succeeded in spelling out a theory that would derive all and only the requisite LFs for a significant fragment of any language. In view of this persistent failure, I for one have concluded that it is time to start exploring surface-based semantic alternatives—such as the present cross-linguistic theory of aspect-based temporal anaphora.

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