Event individuation by objects: Evidence from frequency adjectives[1]

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Abstract. Adverbially-interpreted temporal frequency adjectives (FAs) such as *frequent*, *sporadic*, and *daily*, are usually restricted to modifying event-denoting nominals (e.g. *The house underwent frequent cleanings* = *Frequently, the house underwent cleanings* vs. *We saw frequent sailors/the frequent sailor* ≠ *Frequently, we saw sailors/the sailor*). In this, they contrast with what Gehrke and McNally (2012) refer to as nontemporal FAs (e.g. *odd*, cp. *The odd sailor strolled by* = *A sailor strolled by on odd occasions*). However, there is a systematic set of exceptions to this generalization, e.g. *She wrote frequent letters*, which have never been explained. In this paper we provide an analysis of these exceptional cases. Our account points to interesting parallelisms between the construction of interest and Kennedy's (2012) use of Kratzer's (1996) Event Identification to account for event measurement via measure expressions on incremental themes. It also situates this use of FAs within the family of semantic incorporation constructions, providing a novel example of how the varied morphosyntactic resources of a language can make it possible to fulfill the pragmatic functions that incorporation constructions serve for a wide variety of propositional contents.

Keywords: semantics, adjectives, semantic incorporation, temporal modifiers, distributivity.

1. Introduction

It has been well known since at least the work of Verkuyl (1972) that in certain cases events can be measured by one or more of their participants, for example, their incremental themes. In this paper we present a case in which something similar happens with event individuation. Specifically, frequency adjectives (FAs), which contribute entailments about the individuation and distribution of objects, can, under the right conditions, indirectly contribute entailments about the individuation and distribution of events those objects participate in.

In Gehrke and McNally (2012) we show that FAs (Bolinger, 1967; Stump, 1981; Larson, 1998; Zimmermann, 2003; Schäfer, 2007; Gehrke and McNally, 2011) fall into two categories, illustrated in (1). Some FAs (e.g. *occasional*, (1a)), when modifying non-event nouns, systematically allow the so-called *adverbial reading*, i.e. can be paraphrased as sentence adverbs. Other FAs (e.g. *daily, frequent*), do not ((1b), see Schäfer 2007).

(1) a. The occasional sailor strolled by. = Occasionally, a sailor strolled by.

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b. A frequent sailor strolled by. $\neq$ Frequently, a sailor strolled by.

We argue in that paper that the contrast is related to whether the FA expresses strictly temporal distribution (e.g. *frequent*, *daily*, some uses of *occasional*; hereafter, *temporal FAs*) vs. non-temporal distribution (*rare*, *odd*, other uses of *occasional*; hereafter, *non-temporal FAs*), a distinction to which we return below.

However, there seem to be exceptions to this generalization (Gehrke and McNally, 2011). FAs like *frequent* can sometimes have an adverbial reading in combination with non-event nouns in certain argument positions of certain verbs, e.g. with themes of verbs of creation and consumption ((2)). Though we were able to observe that the exception does not hold for incremental theme arguments more generally ((3)), and we identified some other suggestive contrasts, e.g. that in (2b) and (4b) vs. (4a), until now we have had no analysis of these facts.

(2) a. She wrote me frequent letters. = Frequently, she wrote me a letter.
b. She baked frequent batches of cookies. = Frequently, she baked a batch of cookies.
c. She drank frequent cups of coffee. = Frequently, she drank a cup of coffee.

(3) a. ??She read frequent books to her mother.
b. ??She mowed frequent lawns.

(4) a. ??She baked frequent cookies.
b. She baked frequent cakes.

The goal of this paper is to account for these exceptions. We show that the adverbial reading in these exceptional cases requires that the atomic events described by the VP 1) be uniquely individuated by the (temporal) FA-modified argument, 2) have a uniform, continuous internal structure (in the sense we elaborate on below), and 3) describe stereotypical activities. In addition, the nominal modified by the FA must be plural. We then argue that semantic composition in these cases proceeds via semantic incorporation (McNally, 1995; van Geenhoven, 1995; Chung and Ladusaw, 2003; Farkas and de Swart, 2003, among others), implemented via a generalized version of Chung and Ladusaw's **Restrict** rule. Ultimately, the analysis points to interesting parallels between event individuation by temporal FAs and event measurement via incremental themes as analyzed by Kennedy (2012). It also situates this use of FAs within the family of semantic incorporation constructions, providing a novel example of how the varied morphosyntactic resources of a language can make it possible to fulfill the pragmatic functions that incorporation constructions serve for a wide variety of propositional contents.

The paper is structured as follows. Section 2 sharpens the empirical generalizations concerning the

requirements that have to be met in order for the adverbial reading to arise exceptionally with FAs like *daily, frequent* etc. in combination with non-event nouns. Section 3 spells out the analysis and situates the construction within the context of semantic incorporation constructions more generally. Finally, section 4 concludes.

2. Sharpening the empirical generalization

In this section, we show that four conditions have to be met in order for a verb phrase to allow a temporal FA with a non-event noun on the adverbial reading. To substantiate our claims about the sorts of examples that are unacceptable, we have carried out searches on the GloWbe web corpus of English available at http://corpus.byu.edu and some complementary searches using Google; the sorts of VPs we mark as infelicitous have failed, except in a few very residual cases to be noted below, to have counterparts in the corpus.[2]

First, **the distribution expressed by the FA has to involve one unique discernible event for each discernible object described by the (singular form of the) nominal**. This accounts for one of the contrasts mentioned in the introduction and repeated in (5), as well as for the contrast in (6).

(5) a. ??She baked frequent cookies.
b. She baked frequent cakes.
c. She baked frequent batches of cookies.
d. I smoked frequent cigarettes on the smoke-filled balcony.
(books.google.com/books?isbn=0307595323, p. 67)

(6) a. ??He ate frequent peanuts.
b. He ate frequent handfuls of peanuts.

The bare plural *cookies* in (5a) does not identify one unique discernible event because one typically bakes more than one cookie at a time. In contrast, the common unit for each baking event involving cakes *is* one cake per event, which is why (5b) is acceptable; the same holds, mutatis mutandis, for (5d). However, if we add a typical unit measure in which cookies are baked, such as *batches* in (5c), the example becomes acceptable: each batch corresponds to a unique discernible baking event. Similarly, in the case of (6), as more than one peanut can be (and often is) eaten simultaneously, the condition of one unique event per discernible object is not satisfied; however, the use of a distinct unit measure such as *handful* ameliorates such examples. More generally, unit measure nominals such as *instance*, *dose*, *sip*, *cup* can improve examples with verbs that would resist adverbially-used temporal FAs in cases where, without the measure nominal, the VP describes an event that involves a plurality or an undelimited mass that impedes an association between a unique discernible event

[2] Attested examples from this corpus are indicated simply as *GloWbE*; a few others extracted from Google searches are indicated with the corresponding URL.

and discernible object described by the nominal containing the FA ((7)).

(7) a. ...distribute your financial resources to purchase frequent doses of lovely things rather than infrequent doses of lovelier things. *GloWbE*
(cp. ??She purchased frequent CDs.)
b. Simple measures such as drinking frequent sips of water... *GloWbE*
(cp. ??They drank frequent beers.)

Other verbs that allow the adverbial reading with these FAs include *send* and *receive* in combination with the particular arguments in (8), which again typically involve one unique discernible event for each discernible object.

(8) a. Send frequent emails to your professor if something is hard to understand... *GloWbE*
b. Please make sure you check your child's book bag everyday because I do send frequent letters home informing you about upcoming information.
http://www.cabarrus.k12.nc.us/cms/lib07/NC01910456/Centricity/Domain/5154/sept.%205-9.doc
c. ...she has begun receiving frequent messages from doubting pastors... *GloWbE*
d. He received frequent letters asking for his prayers... *GloWbE*

The second generalization we observe is that **each event has to have a uniform, temporally continuous internal structure**, with little variability within or across events. Otherwise, the examples with FAs are generally infelicitous, as was the case, for instance, in (3), repeated in (9).

(9) a. ??She read frequent books to her mother.
b. ??She mowed frequent lawns.

The examples in (10) illustrate that, even if there is a unique, discernible event for each unique, discernible object, the sentence is not acceptable if this second condition is not met.

(10) a. ??He knitted frequent sweaters.
b. ??She painted frequent pictures of her sister.
c. ??He played/composed frequent sonatas.
d. ??She directed/starred in frequent movies.
e. ??He wrote/read frequent books. (cp. write frequent letters)
f. ??She ate frequent pizzas. (cp. eat frequent meals, (6b))
g. ??The child built frequent towers with blocks.

All of the above verbs in combination with the objects in question describe activities that are likely to have non-uniform or temporally discontinuous subparts. This may be due to the fact that the activity itself may develop in a discontinuous way, because it may involve taking breaks (e.g. knitting a sweater, composing a sonata) or repetitions over a particular part of the object (e.g. the examples with *movies*, playing a sonata, or reading a book). It may also be that the object is unlikely to be uniquely mapped to one event involving the same individual (e.g. eating a pizza is something often done by a group of people). Finally, uniformity may fail because the objects themselves have heterogeneous subparts that may affect the way in which the activity develops, as might be the case, e.g. with *build a tower* or *direct a movie*. In contrast, an event of writing a letter or email is much more likely to have simpler internal structure, and the mapping between the object and the development of the activity is more likely to follow a unique (metaphorical) two-dimensional path, e.g. from the beginning to the end of the letter/email.

The third generalization governing the acceptability of the adverbial reading with temporal FAs modifying non-event nominals is that **the verb-object combination (the VP) has to name a stereotypical activity**. The examples we have seen above all arguably involve stereotypical object-activity pairs (summarized in (11)):

(11) a. cake, (batch of) cookies: bake
b. letter: write, receive, send
c. e-mail, message: receive, send

In contrast, examples in which the relation between the event and the object described by the FA-modified nominal is not stereotypical sound odd, even though other formulations expressing the intended meaning are perfectly acceptable (contrast (12a,b) and (12c,d)):

(12) a. ??He married periodic heiresses.
b. He periodically married an heiress.
c. ??She received frequent posters in the mail.
d. She frequently received a poster in the mail.

These three generalizations have a pragmatic component to them, and thus it should not be surprising if some counterexamples are found. Nonetheless, our intuitions are quite robustly supported by corpus data. Our Google searches revealed only 1 example each (from clearly native speakers, non-translated English) of *mowed frequent lawns* and *wrote frequent books*, apparently contravening the uniformity generalization. Moreover, inspection of these examples showed that they are cases where the activity the VP denotes is being presented as stereotypical of or as characterizing the subject, i.e. they are consistent with the stereotypicality condition in their context of use. Thus, while further research is needed to fully consolidate these three generalizations, we consider them

sufficiently supported to use them as a basis for an analysis.

The fourth and final generalization is clearly grammatical: **the FA-modified nominals have to be plural**. The examples become systematically infelicitous if the nominal appears in the singular, and we have not found examples of this sort in Google searches:

(13) a. ??She baked a frequent cake/a frequent batch of cookies.
b. ??He ate a frequent handful of nuts.
c. ??I do send a frequent letter home...
d. ??...distribute your financial resources to purchase a frequent dose of lovely things
e. ??He received a frequent letter asking for his prayers.

Finally, we note in passing uses of temporal FA-modified non-event nominals that fall outside the scope of this paper. These examples involve light or support verb constructions and idiom chunks ((14)), as well as property-attributing (rather than possessive or literally locative) uses of *have* ((15)).

(14) a. Over the next 80 years Call, who would became one of the more successful commercial photographers in the state, took frequent pictures of the wilderness of Maine. *http://usmfreepress.org/2009/12/07/exhibit-review-capturing-two-centuries-of-affection-for-the-maine-woods/*
b. She undertook frequent responsibilities for the IB Organisation... *GloWbE*
c. The same can be said about the hundreds of people I once knew or had frequent beers with... (cp. ??He drank frequent beers with his friends.) *http://www.absolutepunk.net/journal.php?do=showentry&e=359172*
d. Keep frequent tabs on offenders... *GloWbE*

(15) a. If a person has frequent symptoms, would you suggest that they take that preventively every night... *GloWbE*
b. ...you should realize that the sources you quote have frequent errors about specific US losses... *GloWbE*

In the remainder of the paper, we set aside these cases, which introduce complexities that we cannot explore due to space limitations, and focus on accounting for the properties we have identified for the other cases: unique individuation by the FA-modified argument; uniform, continuous internal structure for the event; description of stereotypical activity; and the fact that the FA-modified noun has to be plural.

3. Analysis

3.1. Gehrke and McNally (2012)

We begin by providing the relevant basic ingredients for the analysis from Gehrke and McNally (2012). As noted above, we argue that FAs fall into two different classes, those that are strictly temporally distributing ((*in*)*frequent*, *periodic*, *sporadic*, and the fixed frequency adjectives *daily*, *weekly*, *monthly*, etc.; see (16)), and those that involve distribution over some non-temporal domain (*occasional*, *odd*, *rare*; see (17)).[3]

(16) a. The house underwent monthly/frequent/periodic/sporadic cleanings.
b. The house underwent a/??the monthly/frequent/periodic/sporadic cleaning.
c. ??A/??The monthly/frequent/periodic/sporadic sailor is 6 feet tall.
d. The reviews were ?monthly/frequent/periodic/sporadic.

(17) a. ??The house underwent odd cleanings. (on relevant reading)
b. The house underwent ??an/the odd cleaning.
c. ??An/The odd sailor is 6 feet tall.
d. ??The sailor was odd. (on relevant reading)

As these examples show, nouns modified by temporal FAs can appear in the plural ((16a)), whereas this is not possible with non-temporal FAs ((17a)). Furthermore, in combination with singular nouns, temporal FAs require an indefinite article ((16b)), whereas non-temporal FAs require the definite article ((17b)). The contrast in (16c) vs. (17c), based on an example provided in Stump (1981), illustrates what we mean by distribution over a non-temporal domain, which is only possible with non-temporal FAs: in this case the individuals in question can be temporally co-located as long as they are properly distributed over some other sort of contextually-identified domain (typically space). Finally, temporal but not non-temporal FAs can be used predicatively ((16d) vs. (17d)). In the remainder of this paper, we discuss only the temporal FAs, as these are the ones that

[3] *Occasional* shows properties of both temporal and non-temporal FAs ((i)); we argue in Gehrke and McNally (2012) that it is ambiguous.

(i) a. The house underwent occasional cleanings.
b. The house underwent an/the occasional cleaning.
c. The occasional sailor is 6 feet tall.
d. The cleaning/??sailor was occasional.

Rare has a predicative use under certain conditions despite meeting the criteria for nontemporal FAs according to the rest of our diagnostics. Fixed frequency temporal FAs such as *monthly* behave slightly more like relational adjectives than do variable frequency temporal FAs such as *sporadic* (see McNally and Boleda, 2004, on relational adjectives). The generalizations concerning temporal FAs apply most clearly to the latter. See Gehrke and McNally (2012) for further discussion.

occur in the cases that are the topic of this paper.

In Gehrke and McNally (2012), we propose that temporal FAs are sortally restricted to events, and that they can apply either to event kinds or to pluralities of event tokens (understood as sums of events in an algebraic model, e.g. Link, 1983). Our fourth generalization from the previous section was that non-event nouns modified by FAs generally must be plural, cf. (18).

(18) a. ??She wrote a frequent/periodic/sporadic letter to her mother.
b. She wrote frequent/periodic/sporadic letters to her mother.

Hence, we assume that only the plurality-of-event-tokens case is relevant here. Our semantic representation for temporal FAs is very simple: they introduce an intersective predicate of events ((19)).

(19) $[\![\text{FA}_{temp}]\!]$: $\lambda e[\mathbf{FA}_{temp}(e)]$

The satisfaction conditions on temporal FAs, stated in (20), provide information about the distribution of a set of events at a given spatiotemporal index. $\mathbf{FA}_{temp}$ holds of a plurality argument at an index i just in case the distribution of the set of atomic parts of that argument at i is what the FA requires (**distribution** is a function that yields the distribution *dist* of a set of entities at i, with values like *high*, *low*, *daily*, etc.):[4]

(20) $\forall e, i[\mathbf{FA}_{temp}(e) \text{ at } i \leftrightarrow \mathbf{distribution}(\{e' : \mathbf{atomic\text{-}part\text{-}of}(e', e) \text{ at } i\}) = dist]$

We posit that the FA can combine with the noun via an intersective predicate modification rule. Thus, e.g. *frequent cleanings* denotes a property of pluralities of cleanings whose atomic parts have a high distribution (see Krifka, 1989, for a definition of atomic part):

(21) $[\![\text{frequent cleanings}]\!]$: $\lambda e[\mathbf{cleaning*}(e) \wedge \mathbf{frequent}(e)]$
= $\lambda e[\mathbf{cleaning*}(e) \wedge \mathbf{distribution}(\{e' : \mathbf{atomic\text{-}part\text{-}of}(e', e) \text{ at } i\}) = high]$

We refer the reader to Gehrke and McNally (2011, 2012) for further discussion and arguments in favor of this analysis. With this semantics in hand, we turn to the analysis of the data that interest us here.

[4]The distribution function must guarantee that the members of the set be properly individuable and that the distribution be sufficiently regular (see Stump, 1981; Zimmermann, 2003; Schäfer, 2007, for discussion). As the means by which this is guaranteed is not crucial to our proposal, we will not discuss the options further here.

3.2. The adverbial reading with temporal FAs and non-event nouns

In order to account for the facts in section 2 using the basic semantics for temporal FAs from the previous section, two issues must be dealt with. First, we need to state more precisely the conditions that have to be met in order for the adverbial reading with FAs modifying non-event nouns to be possible at all. Second, we need to solve the sortal mismatch between the temporal FA, which denotes a property of pluralities of events, and the denotation of the noun it combines with, which, in the cases that interest us, is not a property of events.

3.2.1. Atomic Event-Entity Mapping and stereotypicality

To account for the conditions that there be a unique discernible event per discernible object and that the events described must have a uniform, temporally continuous structure, we propose that **Atomic Event-Entity Mapping (AEEM)**, stated in (22), must be satisfied. AEEM requires that there be a 1-to-1 mapping between the atomic parts of the entities in the denotation of the nominal containing the FA and those of the events in the denotation of the verb. Crucially (and perhaps controversially), we consider it necessary for an event to count as truly atomic that it be associated with a single, continuous temporal trace. This condition guarantees that the FA will eventually properly distribute over events.

(22) $\forall P[\textbf{AEEM}(P) \leftrightarrow \forall x, e[P(x,e) \leftrightarrow$
$[\forall x', \textbf{atomic-part-of}(x', x)\exists!e', \textbf{atomic-part-of}(e', e)[P(x', e')] \wedge$
$\forall e', \textbf{atomic-part-of}(e', e)\exists!x', \textbf{atomic-part-of}(x', x)[P(x', e')]]]]$

AEEM accounts for the oddness of sentences for which an argument can easily participate in atomic events in pluralities, such as those in (23):

(23) a. ??She baked frequent cookies.
b. ??He ate frequent peanuts.
c. ??They saw frequent sailors.

It also accounts for the the fact that adding a description of a unit measure to the FA-modified nominal can make the examples acceptable, as the AEEM can hold between the events and the unit measures in question ((24)).

(24) a. She baked frequent batches of cookies.
b. He ate frequent handfuls of peanuts.

Furthermore, it accounts for the oddness of sentences where the same atomic entity participates in multiple atomic events, whether because the object can undergo the same eventuality multiple times or because the event in which the entity participates is temporally discontinuous (or both).

(25) a. ??She baked frequent potatoes.
b. ??She knitted frequent sweaters.
c. ??She read frequent books.
d. ??She watched frequent movies.

More generally, this will keep the structure of the events and the objects involved relatively simple and uniform, accounting for the remaining examples in (9) and (10) as well.

In addition to AEEM, there needs to be a condition enforcing the **stereotypicality** of the event described by the VP. While we are skeptical that it is possible to define a formal condition on stereotypicality, Aguilar Guevara (2013) offers a few recent comments on the notion that we summarize here. According to Aguilar Guevara, stereotypes are conventional beliefs about concepts that are part of the world a community has access to. They are motivated by the regularity and homogeneity with which instances of these concepts occur, and they are often associated with artefacts, which tend to be produced by a particular sort of activity (e.g. baking) or used for a particular purpose (e.g. letters, for communication). Positing a felicity condition on the resulting VP that it describe a stereotypical activity will, as noted, account for the oddness of examples such as those in (26), repeated from above:

(26) a. ??He married periodic heiresses. (cp. He married heiresses periodically.)
b. ??She received frequent posters. (cp. She received posters frequently.)

There is obviously nothing impossible about marrying heiresses or receiving posters on multiple occasions, and both of these VPs describe eventualities that most likely satisfy AEEM. However, they arguably do not constitute stereotypical activities.

Why there should be a stereotypicality condition on the VPs containing temporal FA-modified non-event nominals, and how exactly it comes into play will emerge in the discussion of the compositional semantics of these VPs, to which we now turn.

3.2.2. The compositional semantics

Recall the fourth generalization we introduced in section 2, namely that the FA-modified nominal must be plural. To this we add an additional observation, namely that the nominal must be a *bare*

plural in order for the relevant reading to arise:

(27) a. ??She wrote me two/several/many/the frequent letters.
b. She wrote me those frequent letters. ≠ Frequently, she wrote me those letters.

These facts, together with the stereotypicality condition, lead us to hypothesize that the VPs we are analyzing fall into the family of incorporation constructions. There are various techniques for carrying out incorporation in a semantic sense (McNally, 1995; van Geenhoven, 1995; Chung and Ladusaw, 2003; Farkas and de Swart, 2003; Dayal, 2003, 2011; Espinal and McNally, 2011).[5] What characterizes them all is that the nominal that combines with the verb via incorporation denotes a property, rather than an entity or a quantifier over entities, despite the fact that semantically it corresponds to an entity-type participant in the eventuality denoted by the verb. In other words, in Chung and Ladusaw's (2003) terms, incorporated nominals *restrict*, rather than *saturate*, the verb's denotation.

For the purposes of illustration, consider Chung and Ladusaw's (2003) **Restrict** and Existential Closure (**EC**) composition rules for incorporation constructions ((28)).

(28) a. $\textbf{Restrict}(\lambda y\lambda x.P(x,y), \lambda z.Q(z)) = \lambda y\lambda x[P(x,y) \wedge Q(y)]$
b. $\textbf{EC}(\lambda y\lambda x.P(x,y)) = \lambda x\exists y.P(x,y)$

An example of how this rule would work with the FA modifying an event nominal is given in (29).[6]

(29) ⟦underwent frequent cleanings⟧:
$\textbf{Restrict}(\lambda y\lambda e[\textbf{undergo}(y,e)], \lambda z_{ev}[\textbf{cleaning*}(z_{ev}) \wedge \textbf{frequent}(z_{ev})])$
$= \lambda y_{ev}\lambda e[\textbf{undergo}(y_{ev},e) \wedge [\textbf{cleaning*}(y_{ev}) \wedge \textbf{frequent}(y_{ev})]]$
After **EC**: $\lambda e\exists y_{ev}[\textbf{undergo}(y_{ev},e) \wedge [\textbf{cleaning*}(y_{ev}) \wedge \textbf{frequent}(y_{ev})]]$

[5]There is a further distinction in the literature between incorporation and pseudo-incorporation (Dayal, 2003). Space limitations preclude a discussion of this distinction here, but we note that according to the diagnostics used in Dayal (2003) and Espinal and McNally (2011), the examples we are analyzing would constitute regular semantic incorporation and not pseudo-incorporation. These diagnostics include the fact that the construction involves bare plurals rather than (number-neutral) bare nouns, that the nominal containing the FA systematically licenses the accommodation of a persistent discourse referent, as illustrated in (ia), and that it can be modified by a full range of adjective and relative clause modifiers, as in (ib).

(i) a. She wrote me frequent letters. I have saved them all.
b. She wrote me frequent, long letters that I really enjoyed.

[6]Unlike Chung and Ladusaw, we follow Kratzer (1996) in "severing" the external argument from the verb. Thus, the y variable in the example corresponds to the internal argument of the verb. We also add an eventuality argument to the verb's representation.

For the satisfaction conditions for (29) we posit that for a plurality like that described in (21) to participate in an event, each atom that supports the distribution should participate in a distinct atom of the event described by the verb. Thus, for (29) to be true, there has to be a set of token cleaning events with a distribution that can be described as "frequent".

We can use the same compositional mechanism for cases involving non-event nominals by adding just one additional and, we would argue, independently motivated ingredient to the analysis. We assume that the property denoted by the FA has exactly the semantics we attributed to it, i.e. it is *not* attributed to the sort of entity described by the non-event noun itself. Rather, we predicate the FA of an event variable associated with that noun, building on the analyses of sortal mismatches in adjectival modification of nouns in Pustejovsky (1995) and Larson (1998). Our treatment of the noun resembles Pustejovsky's insofar as we take the event variable we need to be part of its "deeper" semantics, rather than taking the noun to directly denote a relation between entities and events, as Larson does. However, like Larson we assume that this variable must eventually become explicitly visible in the semantic composition process if it is to be targeted for predication. We differ from Pustejovsky in using not qualia structures to introduce this event variable; rather, we introduce it via a contextually-valued relation R. The semantic composition of *frequent cakes* is thus as in (30).

(30) a. $[\![\text{cakes}]\!]$: $\lambda z \lambda e[\textbf{cake*}(z) \wedge R(z, e)]$
b. $[\![\text{frequent}]\!]$: $\lambda e[\textbf{frequent}(e)]$
c. $[\![\text{frequent cakes}]\!]$: $\lambda z \lambda e[\textbf{cake*}(z) \wedge \textbf{frequent}(e) \wedge R(z, e)]$

In order to integrate this relation into the compositional semantics, we take inspiration in Kennedy's (2012) semantics for combining incremental theme verbs with measure phrases. Kennedy uses Kratzer's (1996) Event Identification, shown in (31), to combine incremental theme verbs with their themes.[7]

(31) **Event Identification** (Kratzer, 1996, p. 122): If α is a constituent with daughters β, γ such that $[\![\beta]\!]$ is type $\langle \epsilon, t \rangle$, and $[\![\gamma]\!]$ is type $\langle e, \langle \epsilon, t \rangle \rangle$, then $[\![\alpha]\!] = \lambda x \lambda e\ [\![\beta]\!](e) \wedge [\![\gamma]\!](x)(e)$.

The composition process proposed by Kennedy is illustrated in (32) (NU is a a parameterized measure function that measures things according to 'natural units' based on the intension of the noun; cf. Kennedy, 2012, 116).

(32) a. $[\![\text{eat}]\!]$: $\lambda e[\textbf{eat}(e)]$

[7] Kratzer assumes that external arguments do not form part of the semantics of verbs; Kennedy implicitly generalizes this to the internal argument.

b. $[\![\text{ten dumplings}]\!]$: $\lambda x \lambda e[\textbf{dumpling}(x) \wedge \text{NU}_{\Delta}(\textbf{dumpling})(x)(e) = 10]$
c. $[\![\text{eat ten dumplings}]\!]$: $\lambda x \lambda e[\textbf{eat}(e) \wedge \textbf{dumpling}(x) \wedge \text{NU}_{\Delta}(\textbf{dumpling})(x)(e) = 10]$

Kennedy's use of Event Identification in (32) is strikingly similar to **Restrict**. The only substantive difference is that instead of treating the verb as selecting for ordered arguments, as Chung and Ladusaw do, Kennedy treats the verb as a simple one-place predicate over events. This suggests a natural generalization of **Restrict** to all arguments ((33); recall that we "sever" the external argument), so that it can identify the entity-type variable in the verb's denotation (y in (34a)) with that contributed by the nominal (z in (34b)). Thus, we end up with the semantics in (34c).

(33) a. **Generalized Restrict**$(\lambda y \lambda e.P(y,e), \lambda z \lambda e'.Q(z,e')) = \lambda y \lambda e[P(y,e) \wedge Q(y,e)]$

(34) a. $[\![\text{bake}]\!]$: $\lambda y \lambda e.\textbf{bake}(y,e)$
b. $[\![\text{frequent cakes}]\!]$: $\lambda z \lambda e[\textbf{cake*}(z) \wedge \textbf{frequent}(e) \wedge R(z,e)]$
c. $[\![\text{bake frequent cakes}]\!]$: $\lambda y \lambda e[\textbf{bake}(y,e) \wedge \textbf{cake*}(y) \wedge \textbf{frequent}(e) \wedge R(y,e)]$

When R is valued as the thematic role borne by y in e and the verb satisfies AEEM, the adverbial reading will arise: The event described in (34c) is a plurality with atomic subevents of baking one cake individuated by the atomic subparts of the plurality described by *cakes*. The distribution of this plurality of events is described by the FA. If R is given some other value or the event arguments are not identified, some other interpretation (perhaps as in *Sue read a daily newspaper*) or anomaly will result.

What we have, in essence, is a generalized operation that allows the nominal to restrict the identity both of the theme participant and the overall event being described. While not formally identical to any previously proposed semantic incorporation operation, it clearly bears the hallmark of incorporation, namely the failure of the nominal to saturate the verb's internal argument. The fact that the construction belongs to the family of incorporation constructions helps explain the stereotypicality condition, as such conditions are often associated with incorporation. We can implement this condition as a felicity condition on the use of VPs generated by **Generalized Restrict**.

Though we have taken inspiration in Kennedy's analysis of measure phrase-modified incremental themes, we should emphasize exactly what the similarity consists in and insist that there is also one important difference. The similarity lies in the fact that information within the nominal about how the participants it picks out are individuated is used to provide information about how the events they participate in are individuated. The difference is that, as far as we know, there is no stereotypicality condition associated with incremental theme constructions involving measure phrases.[8]

[8]It is less clear to us whether one can say that Kennedy's analysis amounts to an incorporation analysis of the nominal. On the one hand, he treats the nominal as a first-order relation, rather than as quantificational or referential; in this respect, the nominal is similar to incorporated nominals. On the other, since the verb is treated as a simple one-

This leads us to a final, and more general reflection: Why would this use of FAs with non-event nominals require semantic incorporation and the corresponding satisfaction of a stereotypicality condition?

Incorporation constructions are well known to frequently impose "typicality" conditions (see Carlson, 2006, for a review). In this context Carlson (2006, 46) notes:

> "There are, logically speaking, a number of different types of restrictions that we might be dealing with, and possibly more than one might be at work at the same time in any given language."

We suspect that in the case of the use of temporal FAs with non-event nouns, the restriction is related to categorization.[9] Our development of this idea builds on observations made in Dowty (2000) about the so-called *swarm* alternation, illustrated in (35).

(35) a. (Many) bees swarmed in the garden.
b. The garden swarmed with (*many) bees.

The locative subject variant of the construction in (35b) requires a bare plural complement to the preposition *with*. Though Dowty did not consider this possibility, it seems highly likely that an incorporation analysis of this PP complement is called for (see Puig-Waldmüller, 2008, for a different sort of construction involving semantic incorporation of a PP complement). Such an analysis would fit well with another fact about the construction in (35b), namely that the VP has to describe 'perceptually simple' events with a sufficiently broad distribution over the location. In connection to this, Dowty (2000, 122) observes:

> "[Lexical constructions like the *swarm* construction] denote not just any classes of things or actions, but classes which are relevant for purposes of human activities, e.g. ascribing causation relations and making other generalizations. [... The *swarm* construction] ascribes an abstract property (expressed by the predicate) to a Location (denoted by the subject NP): the property a place or space has when it is 'characterized' by an activity taking place within it – that is, when the extent, intensity, frequency and/or perceptual salience of this activity [...] is sufficient to categorize the Location in a way that is relevant for some purpose in the current discourse."

place predicate of events, the issue of a choice between restriction vs. saturation does not even arise. While one might reasonably conclude that if there is no possibility of saturation, there must be restriction, it is not entirely obvious to us that this conclusion is correct. Unfortunately we must leave further investigation of this issue for the future.

[9] Another, somewhat different example of a language-specific restriction on incorporation that is sensitive to categorization can be found in the "potentially characterizing" condition on the use of bare (numberless) nouns in Spanish and Catalan (Espinal and McNally, 2011).

Dowty's point in this discussion was that the *swarm* alternation was not a strictly syntactic phenomenon, but that it correlated with subtle pragmatic differences that serve a specific communicative purpose. Similar remarks can be made about other sorts of incorporation constructions.

The conditions on the locative subject variant of the *swarm* construction are strikingly reminiscent of the uniformity and stereotypicality conditions on the VPs containing temporal FAs we have discussed in this paper. Imagine that it is the case that there are frequently occurring events of Marta baking batches of cookies during the winter months. Depending on the rhetorical structure of the discourse in which we want to report this information, we might choose to use (36a) or (36b).

(36) a. Marta baked frequent batches of cookies.
b. Frequently, Marta baked batches of cookies.

However, we also would want to ensure that whether we choose (36a) or (36b), the proposition describes the same basic distribution of eventualities. It is the AEEM that guarantees this semantic equivalence.

Obviously, the choice in (36) is not between two argument alternations for a single verb, but rather between an adjectival vs. adverbial modification strategy. Nonetheless, it is likely that existence of these alternatives facilitates much the same pragmatic distinction as the *swarm* alternation, namely that of presenting a distributed set of eventualities as a property characteristic of the subject vs. as something else, for example, as characteristic of a topic time (Klein, 1994).

The stereotypicality condition for purposes of categorization and similar restrictions of the sort Carlson had in mind are found with various phenomena that are restricted to the VP level. As a rule, when these conditions are associated with a construction, we find alternative competing strategies to describe the activity in question (of the sort in (35) or in (36)) where no such condition applies. These include, for example, constructions involving weak (in)definites (as opposed to strong ones) (Carlson, 2003; Carlson et al., 2006; Aguilar Guevara and Zwarts, 2011), adjectival passives in German (which 'compete' with verbal passives) (Gehrke, to appear), so-called P-drop in Greek (which 'competes' with full-blown PP structures) (Gehrke and Lekakou, 2013), and the so-called general-factual meaning of the Russian imperfective aspect (which 'competes' with the perfective aspect) (Mueller-Reichau, to appear). Mueller-Reichau, for instance, argues that the use of Russian factual imperfectives to refer to a completed event is characterized by a marked information structure which the competing construction with the perfective aspect does not have. All of these constructions point to the importance of understanding the roles that information structure and rhetorical structure play in the choice of one or the other strategy when more than one is available.

4. Conclusions

In this paper, we have addressed a systematic exception to the generalization that temporal FAs have to combine with event nouns in order to allow an adverbial paraphrase. We argued that the adverbial reading in these exceptional cases requires that the events described be uniquely individuated by the FA-modified argument, have a uniform structure, and describe stereotypical activities; it further requires the FA-modified nominal to be plural. We have proposed that semantic composition proceeds via semantic incorporation, implemented via a rule of generalized **Restrict**. Thus, the facts were easily accommodated, requiring no change in the analysis of temporal FAs that we have independently argued for.

Our analysis points to an important similarity between semantic incorporation and Event Identification as used by Kennedy (2012) to account for the way measure phrases in nominals measure out events. In so doing, it reveals something deeply common in the way FAs and measure phrases in nominals effect distribution and measurement, respectively, over events. It also reveals that, alongside already recognized structural resources such as argument alternations and the possibility for representing participants with non-referring expressions, natural language can also avail itself of nominally-embedded temporal expressions to help fulfill the general pragmatic function associated with incorporation.

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