

Ways of Terminating

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preliminary version

2001

published in: Cecchetto, Carlo, Gennaro Chierchia, and Maria Teresa Guasti (Eds.), 2001, **Semantic Interfaces: Reference, Anaphora and Aspect**. Center for the Study of Language and Information, Chicago. (CSLI-LN)

In this paper we develop a theory of telicity and atelicity according to which these notions are dependent on the terminative/ non-terminative distinction. After discussing a number of proposals available in the literature, we conclude that terminativity and non-terminativity are properties of event particulars and propose a formal account in terms of the topological properties of eventive domains. With terminativity so modelled, we go on to suggest that the telic/ atelic distinction can be understood as corresponding to the two different ways topological closure can be formally obtained: either by directly introducing the relevant closure operator (atelicity), or by making available an extra eventive variable for the telos/boundary. This will lead us to a form of the two-events theory for telicity, where the presence/absence of the extra eventive variable for the telos/boundary is ruled by the presence/absence of a functional category. Such phenomena as the role of arguments in determining telicity or atelicity will be shown to be reflexes of morphosyntactic conditions; in particular, of the role they play in licensing the relevant functional category. Applications of the framework are also discussed to such phenomena as the interpretation of temporal phrases and the imperfectivity/perfectivity paradox.

1. Basic Facts

The notion of telicity arises in connection with sentences such as those in (1)–(2), which seem to convey the idea that the relevant events reach a sort of privileged end point, or *telos*:

- (1) John ate an apple
- (2) John ran home.
- (3) John reached the top.
- (4) John died.

In (1), it is not only the case that the event in question (the eating of the apple) is finished. It must also be true that a certain goal, the telos or *terminus ad quem*, has been attained—e.g., that the whole apple has been consumed in the course of the eating. Similarly, the truth of (2) does not only require that the subject was involved in an activity of running directed towards home. It is also necessary that the telos—namely, John’s being at home—is obtained by virtue of that very running. Concerning (3) and (4), it may be observed that although they are similar to (1) and (2) in that they entail that a telos has been attained, they differ since there is no explicit mention of an activity leading to the relevant telos. For if it is obviously true that the telos of (1) was achieved by eating, it is meaningless to maintain that the telos of (3) and (4) are attained by *reaching* or by *dying*.

Telos seem to be “privileged” end points of events in the following sense. If we are told (2), we do not only know that the event of running performed by John and directed towards his own place got to an end. We also know that that event could not have possibly continued any further. On the other hand, there are infinitely many ways an event of a similar kind could have finished: John might have stopped running halfway home, almost close to home, far away from home, etc. In each case a continuation (until the telos ‘John is at home’ is reached) seems to be possible.

Atelic sentences contrast with telic ones since they do not seem to involve privileged end points:

- (5) John ate apples.
- (6) John ate.
- (7) John ran.
- (8) John pushed the cart.

As in (1)–(4), these examples are about finished events. However, there is a sense in which the reported events in (5)–(8) might well have continued: John might have eaten more apples, he might have ran a little longer, he might have pushed the cart a lot further. In this sense, the notion of atelicity does not simply capture the fact that, e.g., in (5) no telos is specified. The point seems to be that a telos for (5) cannot even be envisaged.

This intuitive characterisation of the telic/atelic distinction can be given firmer empirical grounds by resorting to the well-known *for-X-time*/ *in-X-time* adverbial test. It can be observed that sentences, which have been classed as telic, can be modified by *in-X-time* adverbials while rejecting *for-X-time* ones.

- (9) John ate an apple *in/ *for* ten minutes.
- (10) John ran home *in/ *for* ten minutes.
- (11) John reached the top *in/ *for* ten minutes.
- (12) John died *in/ *for* ten minutes.

Conversely, atelic sentences admit *for-X-time* adverbials and yield infelicitous results with *in-X-time* ones:

- (13) John ate apples *#in/ for* ten minutes.
- (14) John ate *#in/ for* ten minutes.
- (15) John ran *#in/ for* ten minutes.
- (16) John pushed the cart *#in/ for* ten minutes.

Finally, the telic/atelic distinction is affected by the nature of the arguments the verb combines with. Thus (9), where the direct object is countable, is telic, whereas (13), with a bare plural, is atelic. Similarly, (10) with a prepositional locative phrase is telic, whereas (15), where such a phrase is missing, is atelic.

The *in-X-time/for-X-time* adverbial test seems to be a rather secure basis for telling telic and atelic sentences apart. Extending it to languages other than English, and to tenses other than the English simple past, yields interesting results. Thus, consider the Italian imperfect tense. When used with eventive predicates, this verbal form is usually ambiguous between a habitual/generic reading and a factual one:

(17) (Alle tre) Mario mangiava una mela.

(At three o'clock) Mario ate(IMPF) an apple.

Depending on the context, (17) might convey that at a given past time Mario was involved in an ongoing event of eating an apple—a factual reading, also known as the *continuous* reading of the imperfect. Example (17), however, can also mean that it was an habit of Mario that, in given circumstances, he ate an apple (at the given time). The two readings can be disambiguated by either suitably fixing the time location, this way yielding only the continuous reading, as in (18a), or by means of an appropriate when-clause, which forces habituality, cf. (18b):

(18) a. Ieri alle cinque Mario mangiava una mela.

Yesterday at five Mario ate(IMPF) an apple.

b. Ogni volta che tornava a casa, Mario mangiava una mela.

Everytime he returned(IMPF) home, Mario ate(IMPF) an apple.

Now, the use of *in-X-time/for-X-time* adverbials makes the factual, continuous reading unavailable, whereas, depending on the actional nature of the verbal predicate, the habitual reading might still be there:

(19) a. Mario mangiava (una mela) *in / *per un'ora.

Mario ate (IMPF) (an apple) in/ for an hour.

b. Mario correva (a casa) *in / *per un'ora.

Mario ran (home) in/ for an hour.

(For our purposes, the asterisks in (19) mark the unavailability of the factual reading.) Factoring habituality out, these facts seem to show that the telic/atelic distinction simply does not apply to continuous sentences with the imperfect. So what's wrong with the imperfect? A possibility is that the problem is caused by the aspectual value of the imperfect—namely, imperfectivity—a conclusion strengthened by the observation that the same pattern as in (19) can be reproduced with the Italian present tense, another imperfective tense:¹

(20)a. Mario mangia (una mela) (*in / *per un'ora).

¹We haven't reproduced examples with achievement predicates because they are ungrammatical with the present tense, irrespectively of the presence of *in-time/for-time* adverbials. This fact holds crosslinguistically and is but another manifestation of the intrinsic perfectivity of achievement predicates, which will be discussed below. For more on this point, and the reasons why perfective predicates are not available with the present tense, see Giorgi and Pianesi (1997; 1998).

Mario eats (an apple) in/ for an hour.

- b. Mario corre (a casa) (*in / *per un'ora).
Mario ran (home) in/ for an hour.

Whereas sentences with most present tense eventive predicates are grammatical in Italian, yielding a *continuous* reading, the same sentences become ungrammatical when featuring an *in-X-time* or *for-X-time* adverbial. Therefore, it seems possible to propose the following generalisation: the telic/atelic distinction does not apply to imperfective predicates. This, however, is not completely correct.

2. Perfectivity/imperfectivity

In this section we defend the following two related theses:

- (21) a. the notional counterpart of morphologically perfective verbal forms is *terminativity*;
b. the morphological distinction between perfective and imperfective verbal forms does not correspond to two distinct aspectual (notional) values, but to the presence vs. absence of the unique aspectual value of terminativity.

The first thesis is rather simple and, in a way, uncontroversial. Sticking, for the time being, to an intuitive notion of *terminativity*, Thesis (21a) states that the events referred to by perfective predicates are terminated. The second thesis, on the other hand, says that the distinction between perfective and imperfective verbal forms does not amount to that between terminated and non-terminated events. Rather, perfectivity/ imperfectivity distinguishes between verbal forms enforcing terminativity, and verbal forms that do not impose any requirement to this effect. Using a technical term, the perfective/imperfective distinction is a *privative* one.

Consider the following sentences:²

- (22) a. (Alle tre) Mario mangiava una mela (e la sta mangiando tutt'ora).
(At three) Mario ate (IMPF) an apple (and he is still eating it).
(continuous, non terminated)
b. *(Alle tre) Mario mangiò/ha mangiato una mela (e la sta mangiando tutt'ora).
(At three) Mario ate (SP)/ has eaten an apple, and he is still eating it.
(perfective, terminated)

In its continuous reading, it is possible to understand example (22a) as made true by an event *e* such that *e* was ongoing at a past time, and *e* is still ongoing at the utterance time.

²Here and in other examples we resort to both the Italian simple past (the so-called *passato remoto*) and to the present perfect as cases of perfective verbal forms. Perfect tenses deserve a more complex analysis than the one we are going to provide here. In particular, they have been argued to involve reference to the consequent state of the event described by the past participle (see Parsons 1990; Higginbotham 1994; Giorgi & Pianesi 1997). For our purposes, however, we can neglect the stative component since it is clear that the eventuality described by the past participle falls under the generalisation we are going to draw—namely, that they are terminated.

Such a possibility is not available if the imperfect tense of (22a) is substituted with a perfective one, as in (22b): in this case the intuition is that the event has terminated at a past time and that it cannot continue at the utterance time. Similar effects can be obtained if the accomplishment predicates of (22) are substituted by activity ones:

- (23) a. Questa mattina Mario spingeva il carretto, e lo sta spingendo tutt'ora.
This morning Mario pushed(IMPF) the cart, and he is still pushing it.
b. ?Questa mattina Mario ha spinto il carretto, e lo sta spingendo tutt'ora.
This morning Mario pushed the cart, and he is still pushing it.

While it is possible to understand (23a) as made true by one and the same event which is ongoing both at a past time and at the time of utterance, this is not the case with (23b). If accepted, (23b) requires two different events: a terminated event making the first clause true, and a non-terminated one, which is going on at the utterance time.³

These differences do not depend on the use of past tenses:

- (24) *Domani mattina Mario mangerà una mela. Alle tre del pomeriggio la starà ancora mangiando.
Tomorrow morning Mario will eat an apple. At three pm he will still be eating it.

To conclude, perfective verbal forms require events that are, in an intuitive sense, terminated, whereas imperfective ones may refer to non-terminated events. To completely establish Thesis (b)—concerning the non-committal nature of imperfective verbal forms as to terminativity—consider the following sentence:

- (25) Tre ore fa, Messner raggiungeva la vetta (*e la sta ancora raggiungendo). (*CONT)
Three hours ago, Messner reached (IMPF) the top (*and he is still reaching it).

This example is parallel to (22b). Despite the presence of the imperfect the event is terminated—Messner reached the top at a past time—and the continuous/ on-going reading is disallowed. Consider also (26):

- (26) a. #Mario raggiungeva la vetta quando un fulmine lo colpì (e lui non arrivò mai in cima)
M. reached(IMPF) the top when a bolt stroke him (and he never got to the top)
b. Mario stava raggiungendo la vetta quando un fulmine lo colpì (e lui non arrivò mai in cima)
M. was reaching the top when a bolt stroke him (and he never got to the top)

Example (26a) is odd because the first part asserts that Mario did reach the top, whereas the second implicitly negates that this was the case. However, if we replace the imperfect tense of (26a) with a progressive form, as in (26b), the oddness is removed. Now the sentence

³The possibility is open for the first event to be a part of the second, in case we admit that non-terminated event can have terminated parts. The important point is that (23a) differs from (23b) since one and the same non-terminated event can make true both clauses.

conveys that Mario was on the point/ about reaching the top, when a bolt stroke him so that he never got to the top.

Examples (25) and (26) show that sentences featuring an achievement predicate in the imperfect tense pattern together with perfective sentences, in the relevant respects—namely, they yield terminative readings. Given that in other cases, e.g. (22a) and (23a), sentences with an imperfective predicate can provide for non-terminated readings, it is possible to conclude that: i) the facts in (25) and (26) are due to the actional properties of achievements, a point to which we will return, and ii) the imperfect is compatible both with terminative and non-terminative readings. This proves Thesis (b): imperfective verbal forms are aspectually neutral.

Now, consider the following sentences:

- (27) a. Ieri Gianni raggiungeva la vetta in tre ore.
Yesterday Gianni reached(IMPF) the top in three hours.
- b. Ieri Mario correva il miglio in un'ora.
Yesterday Mario ran (IMPF) the mile in an hour.
- c. Due giorni fa Gianni leggeva la Divina Commedia in tre ore.
Two days ago Gianni read(IMPF) the Commedia for three days.

Despite the presence of the imperfect, these three sentences report about terminated events, something which is possible according to Thesis b.⁴ Importantly, in this case *in-X-time* adverbials are allowed, showing that the predicates in (27), once terminative, are also telic.

These facts are important because they permit to improve on the conclusion of §1, concerning the impossibility for the telic/ atelic distinction to apply only to imperfective predicates. The right generalisation now seems that telicity/ atelicity is restricted to terminative predicates, and that the restriction is independent of the (morphological) ways terminativity is realised—either by means of a perfective verbal form, as in *Mario corse a casa in tre ore* (Mario ran home in three hours), or by means of imperfective ones, as in (27).

As expected, it is sometimes possible to force terminative atelic readings with the imperfect:

- (28) Nel 1995 Mario Rossi dormiva per tre giorni, battendo così il record.
In 1995 Mario Rossi slept(IMPF) for three days, this way beating the record.

Suppose that the topic of the discourse is how long people can sleep before awaking. Then (28) would be both appropriate and acceptable, reporting about a remarkable achievement

⁴The sentences in (27) have a strong reportive flavour. We will not discuss what reportivity amounts to. For our purposes it is enough to notice that, meaning nuances apart, the imperfect is compatible with terminative readings.

by Mario Rossi in this respect. The event making the sentence true is terminative and atelic, as witnessed by the availability of the *for-X-time* adverbial.

Thus in this section we have established the following three facts:

- (29) a. the notional counterpart of morphologically perfective verbal forms is *terminativity*;
 b. the morphological distinction between perfective and imperfective verbal forms does not correspond to two distinct aspectual (notional) values, but to the presence vs. absence of the unique aspectual value of terminativity;
 c. the telic/atelic distinction only applies to terminative predicates.

As already observed, the relevant connection is that between telicity/ atelicity and terminativity/ non-terminativity (both being two notional/ semantic distinctions). Perfectivity/ imperfectivity is a morphological distinction, and plays a role only as a vehicle for the latter. The proposal permits to account for the range of phenomena discussed in §1—namely, the vacuity of the telic/atelic distinction with continuous predicates—while extending to such facts as (27) – terminative predicates built out of imperfective verbal forms – without resorting to such devices as coercion.

If these conclusions are on the right track, the notion of terminativity is crucial for understanding the telic/atelic distinction. Thus, the next two sections, §3 and §4, will be devoted to a detailed discussion of the relevant phenomena, and of the proposals available in literature. This will enable us to present our own account in §5. Having set the stage, we will then return to telicity/atelicity in the last sections of this work, from §6 onwards.

3. Terminativity I

In this section we address the following two questions: granted that the terminativity/ non-terminativity distinction is empirically well-grounded, is there enough evidence that it should be countenanced by (event) semantics? In case of a positive answer, what kind of properties the distinction is a manifestation of: properties of events, of predicates, or of some other entity (e.g. propositions)?

Concerning the first question, whether it is correct to take the terminative/non-terminative distinction as relevant for semantics, a possible answer is in the negative. To take the simplest cases, it might be argued that the differences between perfectives and continuous imperfectives do not involve semantics, truth-conditional issues, but express the different *perspectives* or *points of view* which a speaker/hearer takes when talking about events: an external perspective—typically supported by perfective tenses—whereby events are somehow presented as wholes; and an internal one—made available by imperfective forms. Thus, when using a sentence such as (30a) the speaker intends to report about an event as seen from the ‘outside’, whereas he would utter (30b) if meaning to talk about an event as seen from the ‘inside’:

- (30) a. Gianni mangiò/ ha mangiato una mela.
Gianni ate/ has eaten an apple.
- b. (Alle tre) Mario mangiava una mela.
(At three) Mario ate (IMPF) an apple.

It must be acknowledged that the two kinds of sentences (can) indeed enforce different perspectives on events. But we also think that this does not eliminate the need for a semantic account—that is, the perspective distinction does not exhaust the differences between the two sentences, which are, in the very end, truth conditional.⁵

Such a conclusion is supported by the facts discussed above. As we saw, imperfective sentences are not committed as to terminativity/non-terminativity whereas perfective ones are. The former can be made true both by terminated and by non-terminated events, whereas the latter require terminated ones. In the particular cases exemplified by (31), there are events which can make true both (31a) and (31c), but no event can do the same job with respect to (31b) and (31c):

- (31) a. Mario mangiava una mela.
Mario ate (IMPF) an apple and he is still eating it.
- b. Mario ha mangiato una mela.
Mario has eaten an apple.
- c. Mario mangia una mela.
Mario eats an apple.

Events which persists at the utterance time can make (31a) true, whereas (31b) requires events which don't. This shows that terminative and non-terminative verbal forms can pick up different entities; therefore, that the differences between (31a) and (31b) cannot be reduced to a matter of perspective, but pertain to reference—that is, they are semantical. To be sure, the possibility of a non-terminative reading is compatible with a from-inside perspective. But the latter does not explain the former; rather, the perspective facts seem to be parasitic upon the semantic ones.

⁵The discussion does not mean to address such variants of the perspective theory as Kamp and Reyle's (1993) or de Swarts' (1998). These theories, in fact, do (more or less explicitly) acknowledge truth-theoretical differences between the relevant verbal forms, usually in the form of different relationships between the (time of the) relevant eventuality and the temporal anchor: in continuous readings the eventuality is said to be temporally included within the temporal anchor, whereas terminated readings give rise to a relation of temporal overlap. Implementational details aside—e.g., the nature of the truth conditional differences between terminative and non-terminative verbal forms—our favoured theory basically agrees with Kamp and Reyle's and with de Swarts'.

However, once we get to the semantic nature of the differences, we will maintain that there is ground to believe that non-terminated events ontologically differ from their terminated counterparts. One relevant case in this respect is the existence of non-terminated events that lack a terminated counterpart (and are not going to have any—e.g. so-called eternal processes). Also, it can be argued that being a non-terminated event, whatever this might turn out to mean, amounts to lacking some essential, individuating property—e.g., a temporal one—so that, again, the two kinds of events need be ontologically distinguished.

Concerning the second question—what kind of property the terminative/non-terminative distinction is a manifestation of—we believe the right level of analysis is that of event particulars. However, it is possible to take a different attitude and argue that terminativity/non-terminativity is due to the existence of different predicates. Some predicates, which correspond to the core meaning of ‘ordinary’ verbs, account for terminativity; the other, which are derivative on the former, account for non-terminativity. Crucially, both kinds of predicates can range on the same individuals.

This is the core of the *partitive* account to imperfectivity, which will be discussed in the next section. Here we want to discuss another common proposal that assimilates such non-terminative verbal forms as the Italian imperfect and present tense (in their relevant readings) to the (English) progressive. Given the wide consensus concerning the intentional nature of the latter, the proposal ends up seeing the differences between terminativity and non-terminativity as one between extensional and intensional ways of talking about event particulars.

It seems that the assimilation of non-terminative verbal forms to progressive ones is less than perfect. On the one hand, in fact, progressive and continuous imperfective sentences have overlapping, but not identical distribution. For instance, achievement predicates are not allowed with the present tense (an imperfective, non-terminative tense), whereas they are possible with the progressive periphrasis:

- (32) a. *Mario raggiunge la vetta.
Mario reaches the top.
b. Mario sta raggiungendo la vetta.
Mario is reaching the top.

The relevance of (32a) can be better appreciated if its ungrammaticality is contrasted with the grammaticality of other eventive predicates with the present tense in Italian. In these cases we have typical imperfective, continuous readings, which are (nearly) synonymous with the corresponding progressive forms: ⁶

⁶The case of achievement predicates in the imperfect tense is only apparently more complicated. While discussing examples (27) we observed that those sentences have only a reportive reading. Such a reading is always terminative—that is, there is no non-terminative meaning for (ia):

- (i) Mario raggiungeva la vetta.
Mario reached(IMPF) the top.

The non-terminative reading is available with the progressive:

- (ii) Mario stava raggiungendo la vetta.
Mario was reaching the top.

- (33) a. Mario mangia (una mela)/ corre (a casa)
 Mario eats (an apple)/ runs (home)
 b. Mario sta mangiando (una mela)/ correndo (a casa)
 Mario is eating (an apple)/ running (home)

A contrast parallel to that exhibited by (33) can be found with the imperfect tense in subordinated clauses:

- (34) a. Mario ha detto che Gianni raggiungeva la vetta. (*SIMUL; SHIFTED)
 Mario said that Gianni reached (IMPF) the top.
 b. Mario ha detto che Gianni stava raggiungendo la vetta. (SIMUL; SHIFTED)
 Mario said that Gianni was reaching the top.

Example (34a) has only a backward shifted reading—that is, the reaching necessarily precedes the saying.⁷ The simultaneous reading, according to which Mario reported about a reaching that was going on at his own time, is not available. Importantly, when the progressive is used such a simultaneous reading *is* available.⁸ Thus (32) and (34) show that the continuous readings of imperfective tenses, and the progressive periphrasis have a different distribution.

Another reason for rejecting the attempt at assimilating continuous imperfective sentences to progressive ones is that the progressive is intensional (Landman, 1992), but continuous imperfective forms are not (Giorgi & Pianesi, 1997; Bonomi, 1998). Thus consider Landman's discussion of (35):

- (35) When Lucifer interrupted him, God was creating a unicorn.

The main verb, *create*, is extensional and we might safely agree that in a sentence featuring such a verb the individual denoted by the direct object comes into existence as a result of the occurrence of the event itself. When the tense is a past one, such an object must exist, or

⁷Caveat: sentence (34a) is acceptable only if enough background is provided. For instance, suppose that Mario underwent an oral examination in history. Then you might ask what happened and someone reply with the following:

- (i) Il professore ha chiesto a Mario cosa fosse accaduto nel 1510 e Mario gli ha detto che (in quell'anno) Cristoforo Colombo scopriva l'America.
 The professor asked Mario what happened in 1510, and Mario told him that (in that year) Cristoforo Colombo discovered America.

As in matrix contexts, the imperfective verbal forms of achievement predicates have a strong reportive flavour.

⁸The reason why (34) is parallel to (32) is that in both cases the contrast is due to the behaviour of terminated events with respect to their anchoring event. Giorgi and Pianesi (1997) showed that terminated events cannot be simultaneous to their anchoring event/time. In matrix clauses, such as (32a) and (32b), the anchoring event is the utterance event/time. Thus, the terminated event of (32a) cannot be simultaneous with the utterance. However, simultaneity with the anchoring time is what the present tense requires, thence the ungrammaticality of the sentence. In subordinated clauses, the anchoring event is the matrix one. The same constraint as before excludes the simultaneous reading of (34a): the terminated event of the subordinate clause cannot be simultaneous to the anchoring (matrix) one.

have existed for some while after the end of the creation process. Thus an utterance of the following sentence is odd, since it commits the utterer to believe in the (past) existence of unicorns:

(36) God created a unicorn.

Example (36) contrast with (35) in this respect, since the latter does not require any similar commitment by the utterer. This shows that the position of the direct object of (35) is not extensional but intensional. Given that the verb by itself is extensional, and that the only difference between (36) and the relevant clause of (35) is the progressive form, intensionality must be due to the latter.⁹

Now, imperfective sentences differ from their progressive counterparts on the intensionality issue:

- (37) a. Quando Lucifero lo interruppe, Dio stava creando un unicorno.
When Lucifer interrupted him, God was creating a unicorn.
- b. Quando Lucifero lo interruppe, Dio creava un unicorno.
When Lucifer interrupted him, God created (IMPF) a unicorn.

Sentence (37a), where the Italian progressive periphrasis is used, is like English (35) in the relevant respects: it doesn't commit the utterer to believe in actual unicorns. Example (37b), with the imperfect, does exhibit such a commitment showing that imperfective verbal forms differ from the progressive periphrasis in that the latter are intensional, whereas the former remain extensional. That is, continuous imperfectives do not affect the intensional/extensional nature of the base verb.

⁹Landman's discussion of (35) goes further to refute the extreme extensionalist. For instance, Parsons (1989) maintains that the progressive does not affect the extensional nature of the main predicate, arguing that the extensionality of *create* does not require that a whole unicorn be in existence when Lucifer interrupted God. It is sufficient that *partial* unicorns (pieces thereof, so to speak) were, and this is possible since creation is a typical stepwise process. Landman's reply involves considering a scenario in which (35) can be felicitously used to report on a situation in which the creation process was not stepwise, or not so in the way Parsons' argument would require. For instance, God might have been acting as a magician, pronouncing magic formulae, etc., with the unicorn expected to appear in a flash at the very end of this (possibly long) process. No partial unicorns, or unicorn's parts would be involved in this case. If Lucifer interrupted God amidst this process, *nothing* was there which can justify the extensional analysis.

It can be noted that example (35) also provides a good counterargument to theories of aspect which emphasise the role of so-called *incremental themes*, and of the *graduality* of the thematic relation, as in Krifka (1989, 1992, 1998). It shows, in fact, that incrementality and graduality—that is, the existence of a regular relationship between parts of the event and parts of the (affected) object—is subject to contextual determination. In Landman's example, verbs such as *create* which typically have a gradual thematic relation to the object can be felicitously used in scenarios excluding graduality. In the same scenario telic sentences are appropriate.

(ii) Good created the unicorn in three minutes.

Suppose that Lucifer had not interrupted God, and that the whole process lasted three minutes. Then the unicorn would have come into existence, in the manner described above (formulae, etc.) which exclude graduality. In this case (i) are perfect, casting doubts on the hypothesis that telicity depends on graduality/incrementality.

The different distribution of imperfective continuous forms and progressive forms with achievement predicate, and the differences along the extensional/ intensional dimension show that the attempts at equating imperfective verbal forms to the progressive is incorrect. In particular, if the right analysis of the progressive involves the presence of some sort of intensional operator, then such an approach cannot be extended to imperfective verbal forms.

To summarize the discussion in this section:

- i) the terminative/ non-terminative distinction cannot be reduced to the different perspectives the utterer can take on the same event. On the contrary, the distinction has a semantic import, and the perspective differences are parasitic on such semantic facts.
- ii) attempts at explaining the terminative/ non-terminative distinction by equating non-terminativity to progressives neglects important empirical and conceptual differences.

We therefore propose that the terminative/ non-terminative distinction is something that directly pertains to event, and that event semantics must provide means for telling terminated events apart from non-terminated ones.

4. Terminativity and non-terminativity: which comes first?

Within event semantics, the terminative/non-terminative distinction hasn't received much attention. One possible reason is that English lacks a verbal form corresponding to the Italian (and Romance) imperfect, which is non-terminative and does not involve the quirks of progressives. More generally, following Giorgi & Pianesi (1997) it can be argued that English lacks imperfective verbal forms tout court, so that the terminative/non-terminative distinction hardly arises in this language.¹⁰ As a result, the kind of predicates and events discussed by most philosophers (including Davidson) and linguists correspond to the "terminated" events of the previous sections. The events making true sentences such as *John ate apples*, *Jones buttered the toast*, *Brutus killed Caesar* are all on a par with respect to terminativity regardless of the telic or atelic nature of the reporting sentence. Practically, all the theoretical set-ups proposed in the literature, including those rejecting event semantics, restrict their attention to terminated events.

Consider, for instance the simple eventive sentences in (38). Adopting an event-based semantics, the truth conditions of the English (38a) and of its Italian counterpart (38b) are as in (38c).

¹⁰*Contra* a consolidated tradition, and for the reasons explained in §3, we crucially do not consider the progressive as an imperfective form.

- (38) a. John ate an apple.
 b. Gianni mangiò/ha mangiato una mela.
 c. $\exists x(\text{eat}(e) \wedge \text{Agent}(e, \text{John}) \wedge \text{Theme}(e, x) \wedge \text{apple}(x))$

Those truth conditions make explicit a number of commitments. In the first place, an ontological commitment towards events conceived as particulars. In the second, that verbs are predicates/ classifiers of events and that they introduce eventive variables. Finally, that most eventive sentences are existentially general over events. Current event semantics theories, however, do not have much to say about the distinction between terminative and non-terminative sentences. They can provide the (intuitively) correct truth conditions for the former, but are often silent about the latter—e.g., the continuous readings of the Italian imperfect or present tenses. Moreover, once the necessity for the terminative/non-terminative distinction is acknowledged, truth conditions such as those in (38c) are correct only as far as we understand the eventive variable as restricted to terminative events.

Taking these facts as reflecting some empirical generalisation, rather than a mere theoretical bias, one might think that terminativity is the default case, with non-terminativity as a derivative notion. A common implementation of such a view is the *partitive* account, which we exemplify by discussing Krifka's (1992, 1998) proposal. The basic ingredients of the partitive account of non-terminative sentences are that a) ordinary eventive predicates—e.g., *eat*—are terminative, and b) non-terminativity is due to 'derived' predicates whose denotation is related to that of the 'ordinary' terminative predicates by the *part-of* relation. Within a basic event semantics framework the 'non-terminative version' of the predicate Q is a predicate $Q\text{-}p$ such that $Q\text{-}p(e)$ iff there is an event e' such that $P(e')$ and $Q(e, e')$, where P is the part-of relation. Therefore, the interpretation of the non-terminative Italian sentence (39a) relies on the truth conditions in (39b), along with the condition in (39c):

- (39) a. Gianni mangia.
 Gianni eats.
 b. $\exists e(\text{eat-}p(e) \wedge \text{Agent}(e, \text{Gianni}))$
 c. $\text{eat-}p(e)$ iff $\exists e'(\text{eat}(e') \wedge P(e, e'))$
 d. Mario ha mangiato.
 Mario has eaten.

Sentence (39a) is true iff there is an event e whose agent is Gianni, and e is classified by the non-terminative predicate *eat- p* . In turn, such a derived predicate requires that there exists another event e' which is an eating and such that e is part of it. It is important to realise that (39b) does not require that e itself be an eating event; the predicate *eat* enters the semantics only through the condition (39c) where it classifies the larger event of which e is a part-of. More than this, for (39c) to work properly, and provide an account of the distinction

between terminativity and non-terminativity it is crucial that the two variables be assigned different values. Were this not the case, in fact, a) (39c) would be vacuous, and b) nothing would prevent it from being used for terminative sentences too, e.g. (39d). In this case, in fact, (39b) would be true iff there is an *eat-p* event *e*, where this amount to requiring that there is an even that is an eating and is part-of *e*. But *e* itself satisfies these two conditions, hence (39b) and (39c) would be adequate for terminative sentences. Eventually, the distinction that the partitive approach tries to capture would be lost.

However, it seems that the two variables in (39c) can indeed be assigned the same value. Italian speakers have the clear intuition that events making true (39a) are as much eatings as those making true, say, the corresponding terminative sentence (39d). If so, a variable assignment for (39c) might well assign *e'* the same value as *e*. With this (39c) would be irrelevantly true, and fail to distinguish terminativity/ non-terminativity. To counter this argument, one might reply that *mangiare* (eat) is not the right kind of predicate to probe the theory with, since, in isolation, it is homogenous. Things would be different if a non-homogeneous predicate is used, e.g., *mangiare una mela* (eat an apple), *bere un bicchiere di birra* (drink a glass of beer), which are such that, once they apply to an event, they do not apply to subparts. Unfortunately, this is only partially true. As will be seen in §6.4, predicates such as *mangiare una mela* (eat an apple) are non-homogenous only in their terminative meaning, whereas all the predicates that appear in non-terminative sentences are homogeneous:¹¹

- (40) a. Gianni mangiava una mela.
Gianni ate(IMPF) an apple.
- b. Gianni ha mangiato una mela.
Gianni has eaten an apple.

If *e* is the event making (40b) true, then no proper part of it is in the extension of the terminative *ha mangiato una mela* (has eaten an apple). As expected, the predicate is homogeneous. However, any part of the event making true the non-terminative (40a) is in the extension of the same predicate. Then we are with (40a), and its present tense version, in the same situation as with (39a): condition (39c) is always true, and does not help distinguish between terminative and non-terminative sentences.

¹¹We do not consider sentences such as

- (i) a. Gianni corre a casa.
Gianni runs home.
- b. Gianni trova un libro.
Gianni finds a book.

which are not available with any continuous imperfective forms, because they are always terminative.

Another possibility to rescue the partitive approach might be to simply require that *part-of* be substituted in (39c) by *proper-part-of*. Apparently, this move is capable of avoiding the problems just discussed, since in no case the same event would be assigned to both variables in (39c). However, it commits the (extensional version of the) theory to the actual existence of a larger event of eating, e' , of which e , the truth maker, is a proper part. But ordinary utterances of (39a) do neither assert nor presuppose such an entity. For all is known, e might end exactly at that point (while the speaker utters the sentence); in this case $e=e'$ so that resort to the proper-part-of relation is precluded. Nonetheless, in such a case (39a) is felicitous. Moreover, it is possible to use (41) at a later time, another non-terminative sentence, to describe what happened at the point when (39a) was originally uttered:

- (41) Gianni mangiava.
Gianni ate(IMP).

Thus, the existence of an actual larger event is not necessary for the truth of (39a).

At this point, the only way out for the supporter of the partitive view is to go modally, and hypothesise that the greater e' needs not be actual. But this threatens to make non-terminative verbal forms hardly distinguishable from progressives, a view which we have already discussed and rejected in §3.¹²

These criticisms address the basic features of any partitive account of continuous imperfective (non-terminative) verbal forms (within an event semantics). Given the reliance on the part-of relation, any such a theory need commit itself to one of the followings: a) besides the truth maker, e , non-terminative sentences require the existence of a larger event, e' , of which e is a proper part, and which is classified by the basic predicate. b) simple part-of suffices, but then it is necessary to supplement (39c) with some further requirement in order to properly characterise the terminative/ non-terminative distinction. We have shown that the first requirement cannot be met. The second possibility is still open to investigation, even if it is not clear what could be added to (39c) to make it do the job it was proposed for. We, therefore, conclude that the partitive account of non-terminativity is incorrect, and, a fortiori, we reject the idea that non-terminativity is semantically a derivative notion.¹³

¹²The notion of a 'possible' event continuation, often taken to show up in progressives (Landman, 1992; Bonomi 1998), is indeed modal. In this connection, the remarks in §3 should be understood as entailing that no appeal to such a notion is justified for non-terminative verbal forms.

¹³This conclusion does not deny that the event in the logical form of a continuous imperfective sentence can be a part-of (or be somehow related to) that making true the corresponding perfective one. Thus the non-terminated event of *Mario mangiava una mela* (Mario ate-IMP an apple) is related to the terminated event of *Mario mangiò una mela* (Mario ate an apple). The point in the text, however, can be rephrased by saying that the truth of the former sentence does not require the truth of the latter, so that the event in the first sentence cannot be characterised in terms of that in the second.

Returning to the very idea that terminativity is the default case, it should be noticed that it is hardly tenable on morphological grounds. The discussion in §1 and §2 showed that morphologically imperfective verbal forms are compatible with both non-terminative and terminative meanings—that is, they are aspectually neutral/unspecified. On the other hand, morphologically perfective forms can never yield non-terminative meanings—e.g. continuous readings. Given that the perfective is the morphologically marked form, one is led to conclude that, contrary to the tacit assumption outlined above, non-terminativity is primitive and terminativity is derived by means of morphosyntactic operations. That is, bare verbal forms, as encoded in the lexicon, correspond to non-terminated events, terminativity being due to perfective morphemes, and to particular syntactic configurations (see below).

Such a conclusion is strengthened by the observation that eventive nominals too usually introduce events that are aspectually un-specified:

- (42) La conferenza/ descrizione è stata noiosa, quindi me ne sono andato. (terminated)
The conference has been boring, therefore I left.
- (43) La conferenza/ descrizione era noiosa, quindi me ne sono andato. (non terminated)
The conference was (IMPF) boring, therefore I left.

The same eventive nominal, *la conferenza/ descrizione* (the conference/ description), can yield a terminative reading, as in (42), and a non-terminative one, as in (43), depending on the choice of the tense. That is, the event, as contributed by the nominal, is aspectually underspecified.

So we conclude that the bare forms of event-introducing lexical items (verbs and nouns, and whatever else) are (universally) un-specified as to aspect, hence as to the terminative/non-terminative distinction. In languages such as Italian, verbal imperfectivity does not modify such a state of affairs, so that forms such as *correvo* (ran-IMPF-1sn), *mangiavo* (ate-IMPF-1sn) or *canta* (sings) surface as aspectually neutral. Verbal perfectivity adds a specification, let us call it *perf*, to the effect that the event must be terminated, as in the Italian verbal form *mangiò* (ate-SP-3sn).

Following many other scholars, we hypothesise the presence of a functional category hosting *perf*, called ASP, which takes the VP as its complement.¹⁴ Thus, a perfective verb is associated with the structure in (44a), whereas a continuous imperfective form is associated with the structure in (44b):¹⁵

¹⁴But see Cinque (1999) for a more articulated view of clause structure.

¹⁵We also hypothesise that ASP can host the *hab* feature responsible for habitual readings. This would straightforwardly explain why such readings are always associated with verbal imperfectivity, in languages having the perfective/imperfective distinction. Moreover, it also explains some facts concerning the possibility of licensing temporal locating phrases in which perfective verbal forms pattern together with habitual ones, and differ from continuous imperfectives, see fn. 26.

- (44) a. 3
 T AspP
 3
 Asp[*perf*] VP
 5
- b. 3
 T VP
 5

In Giorgi & Pianesi (1997; 1998), it was argued that such a situation is common to many other languages—e.g., French, German, Slavonic, etc. English, however, behaves differently. In the first place, English verbal forms don't exhibit an imperfective/perfective morphological distinction. Secondly, it can be shown that the eventive verbal forms of this language always pattern together with the perfective/terminative forms of languages such as Italian, German, Slavonic, etc. Thus, it must be concluded that verbal forms such as *ate*, *ran*, but also *eats*, and *runs* always enter the derivation with a *perf* specification—that is, they are always associated with the structure in (44a). Given the absence of any morphological opposition in English, it follows that the *perf* specification of English eventive verbs is due to a process different from the morphological one of Italian, French, etc. The idea developed by Giorgi and Pianesi (1997) is that the specification is added to the feature bundle of the bare verbal form after it is extracted from the lexicon (where all eventive items are aspectually neutral, see above), and before it is inserted in the derivation. Such a process is due to the morphosyntactic properties of English lexical items, in particular to the poverty of English inflectional morphology.

The underlying rationale (discussed at length in Giorgi and Pianesi 1997) is that languages can resort to (at least) two means to encode the categorial distinction between nouns and verbs: either by resorting to the formal ϕ -features, or by exploiting the substantive features of Asp—namely *perf*.¹⁶ When inflectional morphology is poor or absent, as in English, it cannot provide an adequate basis for supporting categorial distinction—cf. English forms such as *love*, *loves*, *dress*, etc. which do not bear categorial distinctions on their sleeves. Thus, English must resort to aspectual specifications. From the point of view of the computational systems this means that each eventive lexical item, once extracted from the lexicon, must be endowed with the *perf* specification in order to be recognised as a verb. Thus, we have the following arrangement of features for bare verbal forms and tense morphemes in the initial numerations of Italian and English:

¹⁶That is, we believe that (at least) eventive items need not be distinguished in the lexicon along the $\pm N$ and $\pm V$ dimensions, the categorial distinction being the side effect of the interplay between other morphosyntactic properties, and the syntactic structures created in the course of the derivation.

(45)

	Verbal form	Tense morpheme
English	[...; <i>perf</i> ...]	[...; $\pm$ <i>past</i> ; ...]
Italian	[.....]	[...; $\pm$ <i>past</i> ;] [.....; + <i>past</i> ; <i>perf</i>]

English eventive bare verbal forms are always inserted in the initial numeration with the feature *perf*, so that the tense morphemes of this language only contribute tense information. In Italian, on the other hand, the bare verbal forms are unspecified as to aspect; tense morphemes, in turn, can contribute *perf* besides their tense value, this being the basic difference between the Italian imperfect (no aspectual specification, only anteriority) and the Italian simple past (anteriority *and* the aspectual specification). Ultimately, English bare verbal forms are always aspectually specified, whereas English tense morphemes are not; in Italian, the opposite is true: bare verbal forms are aspectually neutral, whereas tense morphemes can contribute the aspectual specification.¹⁷

In this section we have argued against the view that terminativity is the default notion and non-terminativity a derivative one, and have concluded that the basic aspectual value of bare eventive forms is neutral. To this end, we have discussed a proposal to serve as a framework for the morphosyntax of the perfective/imperfective distinction. We are now in a position to present a formal framework for encoding terminativity and non-terminativity.

5. Terminativity/non-terminativity: the formal framework

In the previous two sections we discussed reasons to reject the idea that the terminative/non-terminative distinction is to be explained as a property of verbal predicates. The alternative we are going to discuss consists in taking it as expressing properties of events. In this respect, there are two possible ways to proceed: the indirect way, which hypothesises that what matters are the properties of the times of the events; or the direct way, which takes the conclusion at face value and directly encodes the distinction in terms of properties of events.

Concerning the first possibility, once expressed in an event semantics framework the basic idea is that terminative events are those having a bounded/ closed time *trace*, whereas non-terminativity involves events with non-bounded/ closed time traces.¹⁸ Therefore, if τ is the function associating every event with its temporal trace, an event e would be terminated iff the interval $\tau(e)$ is closed. It would be non-terminated if $\tau(e)$ is open, half-open, etc. As

¹⁷In a way, English tense morphemes are all imperfective, in the sense that they never contribute anything to the aspectual value of the sentence.

Independent confirmations to this theory come from languages where, as in English, verbal inflectional morphology is very poor or absent – e.g., Haitian Creole, Fong Be, Vata and other languages discussed in Giorgi and Pianesi (1998). All these languages pattern with English.

¹⁸See Smith (1991).

can be seen, the substantive part of the theory is not about time entities, but about the temporal trace function. Indeed, it is said that e is terminated iff τ ‘associates’ it with a closed interval; e is non-terminated if τ associates it with non-closed interval. Thus, unless something more is known about τ , the theory really doesn’t say much. In particular, the theory should clarify under which conditions e is assigned a closed or a non-closed interval. Ultimately, unless the pairing of an event with an interval is an entirely arbitrary matter (and hence unsuitable for our purposes), it must be constrained by the properties of the event—e.g., if e is so-and-so then $\tau(e)$ is closed; otherwise it is non-closed; or, more explicitly, if the event is bounded then its temporal trace is so as well, etc. But then, why not considering directly those eventive properties? So it seems that, if the theory is to have any explanatory value, we can’t but characterise the terminative/ non-terminative distinction by resorting to properties of events, a task to which we now turn.¹⁹

The basis of our formal framework are provided by an extensional mereology on a domain of events. Symbolising the part-of relation by means of P , the mereology allows us to talk about parts and proper parts of a given event, about overlapping conditions between events, and so on. As usual, mereology provides us also with the sum operator, $+$ and the product operator, $\times$.²⁰

Turning to terminativity, we take the relevant distinction at face value, proposing that events are distinguished according to whether they are terminated or not. The connection between the two kinds of events can be formalised by means a function, *ter*, associating events with their terminated counterparts. Such a function has a number of interesting properties: in the first place, if event e is non-terminated, and if its terminated counterpart, *ter*(e), exists, then e is part of it. If e is terminated, the same relationship trivially obtains between e and itself. Thus (46a) holds:

- (46) a. $P(e, \text{ter}(e))$
 b. $\text{ter}(\text{ter}(e)) = \text{ter}(e)$
 c. $\text{ter}(e) + \text{ter}(e') = \text{ter}(e + e')$

Secondly, if e is terminated; then we might safely assume that the function *ter* applies vacuously—that is, $\text{ter}(e) = e$. With this convention, when e is non-terminated we have that $\text{ter}(e) = e = \text{ter}(\text{ter}(e))$. Therefore, (46b) holds. Finally, if e and e' are two terminated events, so will be their sum, yielding (46c).

¹⁹Another possibility would be to exploit to the notion of *continuation*: an event is non-terminative iff there is another event that is its continuation; otherwise, it is terminative. In many respects, this is a variant of the partitive theory, and is subject to basically the same criticisms. In particular, it must be shown that it is possible to provide an adequate characterisation of ‘continuations’ without resorting to intensional notions.

²⁰For mereology, see Simons (1985) and Pianesi and Varzi (1996). See also Link (1983, 1987) and Krifka (1989, 1992, 1998). The mereological set up we are exploiting is described in the appendix.

The statements in (46) establish that the function *ter*, which models terminativity, is: *extensive* (every event is part of its terminated counterpart), *idempotent* (the terminative counterpart of a terminated event is the event itself), and closed under finite sum. That is, *ter* meets the axioms defining a *topological closure operator*.²¹ If the proposed characterisation of terminativity is accepted, we can take (46) as definitory, and conclude that the terminative/ non-terminative distinction is a manifestation of (some of) the topological properties of eventive domains.

According to such a view, there are two kinds of events: those that are topologically closed/terminated, and those that are topologically non-closed/non-terminated. The former are the *e*'s such that $ter(e)=e$; the latter are those for which $ter(e) \neq e$ is true.²² Notice that this way of encoding the terminative/non-terminative distinction does not require heavy ontological commitments. Beyond the original commitment towards events as particulars, we have simply introduced some structure in the eventive domain. In this respect, the situation is similar to that of traditional set-theoretic topology. Closed and open sets are not new entities with respect to those already countenanced—namely, sets. They are simply entities obeying different structural constraints.

Before concluding this discussion of the topological properties of eventive domain, let us introduce some more formal apparatus.²³ We symbolise with $b(x)$ the boundary of a terminated event—intuitively, the totality of the parts of x which separate it from the rest of the eventive world. If we strip away the boundary from a terminated event e , what we obtain is the *interior* of e —namely, the maximal part of e that is completely unbounded, symbolised with $int(e)$. As in set-theoretic topology, we can then prove the following statement:

$$(47) \quad ter(e)=int(e)+b(e)$$

Thus (47) establishes that every terminated event can be decomposed into its interior part, and a boundary, the latter being conceived of as the entity delimiting the event.²⁴

²¹The axioms in (46) are the mereological counterpart of the Kuratowskian axioms for operators of topological closure. For more on this topic see Pianesi & Varzi (1996).

²²We leave open the possibility that *ter* be a partial function on the eventive domain. On this point see Pianesi and Varzi (1996).

²³For a more complete treatment of the mereo-topological setting, see Pianesi and Varzi (1996). See also Giorgi and Pianesi (1997) for further application of these notions to event semantics.

²⁴We can then define *open* events as follows:

(i) $Op(x) =_{df} x=int(x)$

That is, open entities are those which do not contain any part of their boundary. This way we have reconstructed the basics of traditional topology within our mereological framework. Notice, however, that the closed/ open dichotomy does not exhaust the terminated/ non-terminated one. As stated in the text, e is non-terminated as soon as $ter(e) \neq e$. This definition applies both to events which are open according to (i), and to events which are neither open nor closed—that is, entities that contain some, but not all of their boundary.

We are now in a position to provide different truth conditions for terminative and non-terminative sentences. Using a predicate t , true only of terminated events, the truth conditions for the terminative sentences in (48a) and (48b) are as in (48c):²⁵

- (48) a. Mario ha mangiato una mela.
 b. Mario ate an apple.
 c. $\exists e \exists x (\text{eat}(e) \wedge t(e) \wedge \text{apple}(x) \wedge \text{Theme}(e, x))$

Abstracting away from tense, (48c) establishes that an utterance of (48a) or of (48b) is true iff there is a terminated event of eating an apple, where terminativity is modelled according to (46).

The truth conditions for a non-terminative sentence do not mention the predicate t :²⁶

²⁵The predicate t is defined as follows:

- (i) $t(e) =_{\text{df}} \text{ter}(e) = e$.

²⁶The truth conditions provided in the text for terminative and non-terminative sentences are not complete since they do not mention the contribution of tense and that of temporal localisations. Indeed, the two kinds of sentences crucially differ in this respect, see also Delfitto and Bertinetto (2000):

- (i) a. Alle tre Mario ha preso il tè.
 At three Mario had tea.
 b. Mario ha preso il tè alle tre.
 Mario had tea at three.

In perfective sentences, e.g. (i), the initial vs. final position of temporal locating phrases does not affect the truth-conditions. Thus both (ia) and (ib) are true iff there is a past and terminated event of Mario having tea which occurred at three o'clock:

- (ii) $\exists e (\text{have-tea}(e) \wedge t(e) \wedge \text{at}(e, \text{three-o-clock}))$

However, when we turn to imperfective sentences, the position of the temporal phrase does matter:

- (iii) a. Alle tre Mario prendeva il tè. (CONT; HAB)
 At three Mario had (IMPF) tea.
 b. Mario prendeva il tè alle tre. (*CONT; HAB)
 Mario had (IMPF) tea at three.

Imperfective sentences with temporal locating phrases in final position lose their continuous reading, and maintain only the habitual/generic one. With achievement predicates, which always provide terminative readings, we have the same pattern as in (i): the position of the temporal phrase does not affect the truth conditions:

- (iv) (Alle tre) Mario raggiungeva la vetta (alle tre).
 (At three) Mario reached(IMPF) the top (at three).

Thus, setting habituals aside, we can conclude that sentence final locating temporal phrases are allowed only with terminative readings.

Those differences can be related to the fact that in terminative sentences temporal phrases fix the temporal location of the event, whereas this is clearly not the case in non-terminative, continuous ones. Both (ia) and (ib) can be paraphrased by saying that there was an event such-and-such whose temporal location is as specified by the temporal phrase. A sentence such as (iia), in its continuous reading, doesn't mean that there was an event such-and-such and that its temporal location is three o'clock. More precisely, temporal phrases in non-terminative sentences do not serve to provide a temporal location for events. Rather, these sentences convey that the relevant time was one having a certain property—namely, that it was a time at which a certain event was ongoing. An interesting possibility for accounting for these observations consists in exploiting the fact that the *at* relation in (ii) is asymmetric relation between a localisee and a localiser, and hypothesising that

- (49) a. (Alle tre) Mario mangiava una mela.
 (At three) Mario ate(IMPf) an apple.
 b. $\exists e \exists x (\text{eat}(e) \wedge \text{apple}(x) \wedge \text{Theme}(e, x) \wedge \dots)$

To summarise, we propose to encode terminativity as topological closure in a (mereological) domains of events; non-terminativity simply amounts to the lack of such a requirement. The perfective aspect then is a morphological means to enforce topological closure on the reference of the predicate, whereas, as argued, the imperfective aspect is simply the absence of any such a specification.

Before returning to the issue of telicity vs. atelicity, let us see how the topological framework just introduced helps in accounting for the fact, discussed above, that the event making a sentence such as (31b) true cannot be on-going at the utterance time, whereas that involved in the non-terminative (31a) can. We resort to an important difference between terminated and non-terminated events—i.e., the fact that the former enter a network of temporal relations, whereas the latter don't. A terminated event has a beginning and an end, thus it is possible to say that it precedes, or follows another event, or even localise it by means of localising temporal adverbials (e.g., *at three*, *when Mary left*, etc.). Non-terminated events, on the other hand, do not have such a possibility: if e is non-terminated, it can't be said of it that it precedes another event, or that its location is such-and-such. All we can say of e is that at a certain time it was/is/will be ongoing. Vice versa, if e is such that we can specify its position, by either relating it to other events, or by means of locating temporal phrases, then such an event is terminated. It is this basic difference that accounts for the data discussed in §2 and §3—see also the discussion in fn.26. Sentence (31c) is a possible continuation of (31a) because the event of the latter is not localised, hence it is possible for it to be still ongoing when (31c) is uttered. This is clearly not possible for the event of (31b), because it is localised at a past time.

Ultimately, event e is located at location x if and only if its starting and its ending points are located at (within) x . A natural way to express this fact within our topological framework consists in resorting to the notion of boundary introduced above: an event is located at x iff its boundary is at x . Together with (47), which established that only topologically closed events are guaranteed to have boundaries, this entails that the notion of localisation is restricted to closed events.

in terminative sentences the temporal phrase and the event provide the localiser and the localisee, respectively, whereas the situation is reversed in non-terminative sentences.

We can't pursue this topic any further here. Let us only add that, if correct, this account could explain the often otherwise stipulated asymmetries between the way temporal localising phrases work with continuous imperfective (and statives) and perfectives – cf. Kamp & Reyle's (1993) and de Swarts' (1988) use of temporal overlap with terminatives, and of temporal containment with continuous imperfectives. If the sketched account is tenable, those asymmetries could be reduced to the different ways the event and the temporal phrase enter the same relation, *at*.

These informal considerations do not exhaust the problem of the different behaviour of terminated and non-terminated events with respect to temporal localisation. However, they provide further evidence that the topological framework developed in this section is an important means to understand the distinction between terminativity and non-terminativity, and aspectual phenomena in general. In this connection, it should be noticed that it is crucial that topology be applied to events, rather than to temporal intervals (a possibility we already discarded). Indeed, resorting to closed and non-closed intervals cannot accommodate the different localisation properties of events we have discussed. With respect to them, in fact, open and closed intervals are on a par, all being part of the same network of temporal relations. Thence, if we were to model the terminated/ non-terminated distinction as due to whether the temporal trace of the relevant events are closed or non-closed time intervals, we would lose a simple and natural explanation of the contrasts in (31).²⁷

6. Back to telicity/atelicity

In this section we are going to see how an account of the telicity/atelicity distinction can be developed on the basis of the proposal for terminativity/non-terminativity put forth in the previous sections. The analysis to be developed departs from many current theories in that it does not take notions such as incrementality, graduality, or event measuring as the basic ones upon which the explanatory apparatus is to be construed. Our theory, based on Higginbotham (2000), rejects the idea that what underlies aspectual phenomena is the presence/ absence of regular relationships between the denotation of verbal predicates, and that of their arguments. Rather, we will argue that the telicity/ atelicity distinction is to be explained by means of the presence/ absence in the logical form of an eventive variable for the boundary (the *telos*) of a terminated event. We will also show that such a theory can account for the mentioned relationships between the denotation of verbal predicates and that of their arguments as derived phenomena.

Given the crucial role that such the mentioned regularities plays in many current approaches, we start by discussing two well-known theories that implement such a general idea—namely, Verkuyl's (1993; 1999) and Krifka's (1989; 1992; 1998) trying to highlight the empirical and conceptual problems they give rise to. Then, in §6.2 we will present our proposal.

²⁷One might endeavour to propose a non-standard topology for time intervals to account for the facts. However, why doing so, if standard (mereological) topology applied to events seems to work?

6.1. The regularity approach

The incremental/regularity approach to telicity/atelicity is motivated by contrasts such as those between (9) and (13). In the presence of the very same verb, properties of the direct object seem to play a crucial role in determining whether the resulting sentence is telic or atelic. Thus (9), with a countable direct object, is telic, whereas the mass term of (13) enforces atelicity. It seems natural to hypothesise, then, that some relationships between the denotation of the direct object and that of the resulting complex verbal predicate is at play so that the latter inherits (part of) the properties of the latter.

Verkuyl (1993, 2000) pursues this program by giving up the notion of event, as endorsed in Davidsonian semantics. He resorts to (abstract) times structures and noun phrase denotations, using the tools of generalised quantifier theory. The idea is that the meaning of a verb phrase consists of a function relating the denotation of the subject to the denotation of the object at different (abstract) times, where time is given a discrete structure, basically akin to that of the natural numbers. Therefore, the role of VPs denotations is to relate the subject denotation with pairs consisting of a time and an abstract *position* in the object denotation, such a position being conceived of as a member of a given partition of the noun denotation. To use a metaphor, Verkuyl conceives of the verb as providing an abstract clock whose functioning specifies the *path* the subject goes through in the object denotation. It is from this basic structure—the path in the object denotation—that aspectual phenomena stem, and it is this basic structure that realises the regular/gradual/incremental relationship mentioned above.

With respect to such facts as (50)—namely, the role of arguments in determining aspectual properties—in his 1972 work Verkuyl pointed out that what distinguishes objects which (in the appropriate environment) induce telicity, from those which (in the same environment) determine atelicity is some abstract notion pertaining to cardinality, which he called SQA (Specified Quantity of A, where A is the noun denotation).

(50) John ate an apple/ two/most of the/all the apples in/ *for half an hour.

John ate apples *in/for half an hour.

A direct object DP such as *an apple* differs from the bare plural *apples* in that the former has a constraint on the cardinality of its denotation (one element) that the second lacks. Generalising this property to all the determiners to which the +SQA specification applies, and given that the verb denotation (the ‘clock’) works on members of a partition of the nominal phrase denotation, if the latter does not have a specified cardinality, the partition lacks a specified cardinality as well. But this means that it is not possible to determine when the clock *stops*. This, Verkuyl argues, is the basis of the distinction between telicity and atelicity: telicity reflects the presence of a final point for the path the subject goes through

in the object denotation, whereas atelicity is due to the absence of such an end point. If in (50) cardinality information about the (denotation of the) direct object is available, the stopping point—that is, the point in the noun denotation wherefrom the *path* cannot continue any further—can be specified, this way obtaining telicity. When cardinality information is missing, no such an end point in the abstract *path* can be specified, hence atelicity.

However, consider the following sentence:

(51) John counted the reals in three hours.

On the one hand, temporal structures are discrete—that is they have the structure of the naturals. On the other, Verkuyl's requires the verb to map such discrete structures into a partition of the object's denotation, this way making the latter discrete. Now, the cardinality of the direct object in (51) exceeds that of the naturals. Countable partitions of the reals can be considered, e.g., by understanding (51) as saying that the counting went through a partition formed by the numbers which are less than 1000, those which are greater or equal than 1000 and less than 10000, and those greater or equal than 10000. But there is a clear sense of (51) in which the relevant partition is one in which each real is a singleton, and it seems impossible for the verb function to map a discrete structure into any appropriate partition of the reals preserving the intended meaning. Obviously, the sentence is absurd, and probably necessarily (analytically) false, at least if we intend 'counting' as meaning 'enumerating'. However, the point is not the oddity or impossibility of the depicted situation. The point is that the sentence *is* grammatical, contrasting with **John counted apples in two hours*, which is not. In our understanding, this is a problem for the theory: there are cases in which the attempt at capturing aspectual phenomena in terms of a regular/discrete relationship affecting the argument denotation does not yield the desired results.

Another well-known version of the regularity/incremental approach is Krifka's (1989; 1992; 1998). Contrary to Verkuyl, he has events in his ontology, and exploits an algebraic semantics framework with the *part-of* relation, symbolised by $\sqsubseteq$ as the basic structuring device, to model the relationships between the denotations of the direct object and of the verb. The carrier of the model consists of two lattice-theoretic structures, one for ordinary objects and the other for events.²⁸ He then defines a number of higher-order predicates and relations characterising different reference types. For instance, *cumulative* reference—the property holding of predicates which are closed under the join operation, + —can be used to model masses (e.g., *wine*, *bread*), bare plurals (*apples*), and, in the eventive domain, atelic predicates (*drink wine*, *eat apples*):

²⁸On the algebraic approach to semantics, see Bach (1981, 1986), Link (1983, 1987), and Landman (1991).

$$(52) \quad \forall P(\text{CUM}(P) \leftrightarrow \forall x,y(P(x) \wedge P(y) \rightarrow P(x+y))) \quad \text{Cumulative reference}$$

The reference of mass nouns or bare plurals such as *wine*, *apples*, *bread*, etc., in fact, is such that given two quantities of wine, apples, bread, etc., their sum is still a quantity of wine, apples, bread, etc. Likewise, in the eventive domain the reference of *run* is such that given two runnings e_1 and e_2 , their mereological sum (the lattice join $e_1 + e_2$) is still a running. Another relevant property of predicates is *quantised* reference:

$$(53) \quad \forall P(\text{QUA}(P) \leftrightarrow \forall x,y(P(x) \wedge P(y) \rightarrow \neg x \sqsubseteq y)) \quad \text{Quantised reference}$$

A predicate has quantised reference if and only if for any two entities in its extension, it is never the case that one is part-of the other. To exemplify, for any two events in the extension of *eat an apple* no one is part of the other.

Besides the eventive and the objectual domain, Krifka also consider a temporal domain T , also endowed with a lattice theoretic structure. The eventive domain E and the temporal domain T are connected by an homomorphic mapping τ , the *temporal trace function*, associating an event e with its ‘temporal trace’ $\tau(e)$.

Concerning telicity, Krifka first introduces the notion of the *terminal point* of an event—that is, the last time in the temporal trace of the event:

$$(54) \quad \forall e, t(\text{TP}(e)=t \leftrightarrow t \sqsubseteq \tau(e) \wedge \forall t'(t' \sqsubseteq \tau(e) \rightarrow t' \leq t)) \quad \text{Set terminal point of an event.}$$

Then, he singles out the class of eventive predicate having the *set terminal point* property in such a way that P is one of them if and only if any given event e in the extension of P is such that all of its parts which are in P have the same terminal point as e .

$$(55) \quad \forall P(\text{STP}(P) \leftrightarrow \forall e(P(e) \rightarrow \forall e'(P(e') \wedge e' \sqsubseteq e \rightarrow \text{TP}(e)=\text{TP}(e'))))$$

Telicity, according to Krifka, is due to the presence of a predicate with the set terminal point property—that is, he characterises telicity in terms of the coterminativity of the whole event with its parts. It is then straightforward to verify that quantised eventive predicates are telic: the set of parts of e that are in the extension of the quantised predicate P consists only of e itself; therefore, the STP condition is (vacuously) satisfied. This explains the telicity of *eat an apple*, *drink a glass of beer*, etc. On the other hand, it is easy to see that cumulative predicates lack the set terminal point property, thus making justice to their atelicity.²⁹

²⁹As observed in the text, the set terminal point property works as a characterisation of telicity because it applies vacuously to predicates with quantised reference. One might wonder whether there is any class of predicate to which the STP property applies non-vacuously. To this end, we would need a predicate P such that if e is in P then e has proper subparts which are in the extension of P and which share the same set terminal point as e —that is, predicates which are telics but do not have quantised reference. If no such a predicate exists in natural languages, then a theory exploiting the set terminal point notion should provide an explanation for this fact. Also, in case no such a predicate exists, it is reasonable to ask whether the connection between quantisation and telicity should not go the opposite way with respect to that explored by Krifka—namely, that quantisation/inhomogeneity is determined by telicity.

Krifka (1998, p 215) claims that the predicate corresponding to *eating for three hours* is both non-quantised and telic. That it is non-quantised can be seen by considering two simultaneous three hours long runnings.

Concerning the role of arguments, Krifka proposes that aspectual shifts are due to the transfer of the referential properties of the argument over those of the eventive predicate; this is possible because θ -relations can behave as homomorphic mapping between the objectual and the eventive domain. Thus, the quantised nature of the reference of *an apple* is inherited by the predicate *eat an apple*; conversely, the cumulativeness of *apples* determines the cumulativeness of *eat apples*.

In the end, taking for granted the quantised reference of *an apple*, *many books*, etc., telicity is a side effect of the quantisation of predicates such as *eating an apple*, *reading many books*, etc.; this in turn is determined by the homomorphic θ -relation applying to a direct object which has quantised reference. In the end, the part structure of *an apple* is mirrored by that of the events in the extension of *eat an apple*, this way realising the regularity/incrementality approach within an algebraic setting.

Krifka's proposal has been quite influential and has inspired a number of works exploring the consequences of the theory in various languages (Filip 1992, 1999; Ramchand 1997; Singh 1998). Criticisms have also been raised though. For instance, Verkuyl (1993, 1999) points out that some of Krifka's basic properties do not work the way they should. To illustrate, Verkuyl observes that there is reason to believe that every verb and every thematic relation are cumulative. Hence the only remaining place where to look for in order to account for the differences between (56a) and (56b) are the different denotations of the direct objects:

- (56) a. John ate an/some/most of/all the apple(s).
b. John ate apples.

Krifka treats bare plurals as involving existential quantification over the size of the denoted set, analysing the bare plural *apples* as

- (57) $\exists y \exists n (\dots \text{Apple}(y, n) \dots)$.

Their sum still falls under the same predicate, hence it is non-quantised. Telicity, on the other hand, can be proven as follows: suppose that the predicate $P = \text{eating for three hours}$ is not telic. Then, for an e such that $P(e)$ there is a proper part e' such that $P(e')$ and e' is not final in e . Then, there must be a proper part e'' of e such that $e = e' + e''$. Given that τ is an homomorphism, we have $\tau(e) = \tau(e') + \tau(e'')$. By hypothesis, both e and e' last three hours, hence e'' should have a null duration, which is impossible in Krifka's framework. This is all right as far as the formal account goes. However one could be dubious about the utility of a notion of telicity that extends to such predicates as *eating for three hours*. After all, sentences such as **John ate for three hours in three hours* are at least odd. Even if the oddity is attributed to some pragmatic factor—why specifying twice the duration of the event?—there are other examples that show that the combination of *for-X-measure* phrases with *in-X-time* ones is generally disallowed. If so, we lack clear empirical criteria to tell whether the predicates in question are telic, and remain with the doubt as to whether, at least in some cases, the formal characterisation adequately captures linguistic facts.

where *Apple*(y, n) means that y is a set of apples of size n . This makes bare plurals basically akin to such expression as *some apples*, in that they both involve an unspecified number of objects. However, *some apples* induces telic readings, as in

(58) John ate some apples in ten minutes

whereas bare plural objects induce atelicity. Thus, if Verkuyl observation is correct, the different status of (56a) and (56b), and the role of arguments in determining it, is unexplained.

Similarly, Schein (1992) observes that if *apples* has cumulative reference then *some apples* or *at least five apples* has it too. For if *some apples* applies to x and y it surely applies to $x+y$ as well. In the same vein, if both x and y are *at least five apples* x , then $x+y$ is so too. Thus, the cumulative/quantised reference distinction does not explain the contrasts above. In a way, Krifka (1998) agrees with his critics, and proposes a scope solution in which *some apples*, in a sentence such as *John ate some apples*, is scoped out, leaving a variable in situ. Such a variable has singular reference, as all variables, this way providing the VP predicate with the necessary quantisation. However, the solution casts doubts as to the explanatory value of the quantised/cumulative reference distinction, for it first distinguishes between, e.g., *some apples* and *an apple*, and then needs some extra mechanism to account for their similarities.

Turning to telicity, Schein (1999) points out that, in view of examples like (59), coterminativity—that is, the set terminal point property—fails to characterise telicity:

(59) John filled the room (up) with smoke.

Suppose that John is a heavy smoker and that he keeps on pouring smoke into the room. Then it seems that (59) can be uttered truthfully at different times, once a certain threshold of smoke thickness has been exceeded. Let t_1 be the time at which the threshold is reached, and let t_2 be a time after t_1 . If someone utters (59) at t_2 then, Schein argues, such an utterance seems to be made true both by the telic event e_1 consisting in John filling the room up to the threshold quantity of smoke—an event which has terminated at t_1 ; and by the telic event e_2 performed by John up to t_2 . Clearly, the two events are not the same: in particular, e_1 is a proper part of e_2 ; however, both apparently fall under the same telic predicate *filled the room (up) with smoke*. If accepted, this scenario is beyond the reach of Krifka's account. He would have to hold that the relevant predicate is not telic, given that it applies to two non co-terminative events e_1 and e_2 , the first of which is clearly a proper subpart of the second.

Finally, Schein (1999) casts doubts also on the overall rationale of the algebraic approach to aspect—namely, that aspectual phenomena are to be explained via the existence of a

regular (homomorphic) relationships between the parts of the object's denotation and those of the event. Consider the following example:

(60) John filled the balloon with helium.

Suppose this sentence is uttered at a country fair, where John is selling coloured balloons after inflating them with helium. The sentence is telic; therefore an incremental relationship between the object's denotation and the event must be available, making for a situation in which each part of the balloon is filled by some helium. However, it is not clear what such balloon-parts would be. Before being inflated, the balloon is a flat piece of plastic and there is no part of this object which is filled, or going to be filled with the helium. Even if we think of the balloon as a 'potential' volume, the homomorphism/regularity explanation does not work. A given quantity of helium does not occupy a fixed portion of the potential volume, but disperses uniformly into the whole volume. Incrementality, however, requires that each part of the gas affects a distinct part of the volume. Hence, it must be concluded that the telicity of (60) does not depend on the existence of a regular/incremental relationship between the parts of the 'potential' volume and those of the event/helium. If accepted, the criticism shows that the very attempt at characterising aspectual phenomena in terms of a regular/incremental relationship between eventive and objectual parts is deemed to failure.

6.2. *The Two Events Theory of Telicity*

In §2 we proposed a generalisation to the effect that the telicity/ atelicity distinction does not apply to non-terminative predicates. This, we think, is an important property of which calls for an explanation. In §5, on the other hand, we argued that the terminativity/ non-terminativity distinction is to be accounted for by resorting to the topological properties of eventive domains.

In this section we will develop a theory of telicity/ atelicity that capitalises on the dependence of such a distinction upon terminativity, crucially exploiting the topological set-up introduced in §5. Moreover, we will show that the theory derives some of the relationships between the eventive and the objectual domain, which motivated the accounts discussed in the previous section.

As seen, terminativity corresponds to topological closure on eventive domains. That is, terminative predicates are subject to a constraint to the effect that they denote topologically closed events. It must be observed that there are (at least) two formally equivalent ways of building topology in a given space: either by taking topological closure as the primitive notion, or by taking the notion of a *boundary* as a primitive. In §5 we followed the former route, and informally showed that closed/terminated entities can be put in a one-to-one correspondence with open/non-terminated ones (interiors) and boundaries, in such a way

that the former amount to the mereological sum of the latter. On the other hand, if topology is built out of the notion of boundary, it can be shown that derived entities exist—namely, closed/terminated and open/non-terminated events—where the former correspond to the sum of an open event and a boundary.

We suggest that these two formally equivalent ways of talking about topological entities and their properties—hence about terminativity and non-terminativity—are distinguished by language. That is, language tells apart means for providing for closed/terminative entities in a direct way, by imposing a closure/terminativity requirement, from means relying on the provision of limiting points/boundaries. Atelicity corresponds to the first strategy whereby terminativity is realised in a direct way, cf. the *t* predicate of §5. Telicity, on the other hand, corresponds to the second strategy: terminativity/closure is realised by providing a second eventive entity—namely, the boundary (*telos*) of a non-terminated event.

If correct, such an account would naturally explain generalisation (29c): telicity and atelicity only make sense with terminative predicate because they are the two faces (the two species, one might say) of terminativity. Moreover, it would make the differences visible already in logical forms. When the first, direct strategy—the one leading to atelic predicates—is followed, only one event (variable) is present in the logical form. The second strategy, on the other hand, requires *two* eventive variables: one for the non-terminated event in the denotation of the basic predicate, and the other for the boundary. Continuing to use the predicate *t* to range on closed/terminated events, and using the relation *rb*(*e*, *e'*) to indicate that event *e* is the right boundary of event *e'*, we have the following logical form schemata for atelic and telic sentences:³⁰

- (61) a. $\exists e(\phi(e) \wedge \dots \wedge t(e) \wedge \dots)$ atelic
 b. $\exists e\exists e'(\phi(e) \wedge \dots \wedge rb(e, e') \wedge \dots)$ telic

The idea that the logical form of telic sentences involves two events rather than one is not new. It was present in Pustejovsky (1995) and in Tenny (1993); more recently it has been discussed by Higginbotham (2000) who takes the two variables to refer to the *processual part* of the telic event and to the *telos* itself, respectively. Thus, he assigns the telic (62a) the truth conditions in (62b):

- (62) a. John ate an apple.
 b. $\exists \langle e_1, e_2 \rangle \exists x(\text{eat}(\langle e_1, e_2 \rangle) \wedge \theta_1(\langle e_1, e_2 \rangle, \text{John}) \wedge \theta_2(\langle e_1, e_2 \rangle, x) \wedge \text{apple}(x))$

³⁰We have moved from unqualified boundaries to consideration of the right boundary of an event for simplicity. On the one hand, it is clear that terminated events do have a right boundary; on the other, it is reasonable to assume that all the events we are considering have a left boundary because of the very fact that they occur. Thus, the relevant distinction is that between events having and events lacking a right boundary.

Concerning the atelic (63a), in our framework it is given the truth conditions shown in (63b):

- (63) a. John ran
b. $\exists e(\text{run}(e) \wedge \theta(e, \text{John}) \wedge t(e))$

6.3. *n-X-time and for-X-time adverbials*

An interesting feature of the two-events analysis is that it is able to provide a new and simple explanation for the distribution of *in-X-time* and *for-X-time* adverbials. For instance, Higginbotham (2000) proposes that *in-X-time* adverbials are expressions taking two events and measuring the time span between them:

- (64) a. John ate an apple in two minutes.
b. $\exists \langle e_1, e_2 \rangle \exists x (\text{eat}(\langle e_1, e_2 \rangle) \wedge \theta_1(\langle e_1, e_2 \rangle, \text{John}) \wedge \theta_2(\langle e_1, e_2 \rangle, x) \wedge \text{apple}(x) \wedge \delta_m(e_1, e_2) = 2)$

The truth conditions in (64b) differ from those in (62b) in that the former contain a specification, contributed by the *in-X-time* phrase, to the effect that the *distance* from the onset of e_1 to the onset of e_2 (the telos) is 2, as measured in minutes by the function δ_m . That is, *in-X-time* adverbials can be seen as providing a *metric* on eventive domains.³¹

From the fact that *in-X-time* adverbials have two eventive positions, it follows that they aren't available with atelics, given the simplex-event structure of the latter. Thus, ordinary utterances of (65) are not felicitous because one of the two eventive positions of the adverbial remains unsaturated:

- (65) #John walked in two months.

However, suppose someone utters (65) while talking about John's childhood:

- (66) He was such a lovely baby. Think that he walked in two months!

Sentence (65), as used in this discourse, is acceptable, and can be paraphrased as saying that 'John acquired the ability of walking in two months after his birth'. Thus, the contrast

³¹Metric is a neutral term, committing only to the existence of a function from pairs of entities of a domain into positive reals (or integers). In particular, it avoids commitment to time spans, hence to times. Given that in this paper we never resort to such entities, we prefer to remain as much neutral on this point as possible. Finally, metric functions have a well-known connection with topological spaces, since each metric can be associated with a suitable topology (Kelley 1956). This stresses the importance of the topology approach to events.

An interesting side effect of considering an abstract notion of metric is that it makes available different interpretations of *in-X-time* phrases, besides the 'geometrical' one suggested by time spans. For instance, *in-two-hours(x, y)* could be seen as measuring the effort, or event-stuff needed to pass from the onset of x to (that of) y . This physicalist interpretation might turn out to be useful in view of the proposal we are going to make for *for-X-time* phrases as providing functions measuring the amount of eventive stuff a given event *contains*. If the approach is correct, the two adverbials would basically contribute the same meaning (quantity of eventive stuff), and the differences would reduce to their arity: *in-X-time* phrases are binary, whereas *for-X-time* adverbials are unary.

between (65) and (66) can be explained by hypothesising that in the latter the first point/event needed by the *in-X-time* adverbial is contextually provided as John's birth, and the second by the inception of its walking ability. Similar considerations hold for the marginal, but still intelligible (67):

- (67) ??La conferenza piacque a Mario in due ore.
Mario liked the conference in two hours.

In this case, *in due ore* (in two hours) measures the distance from the beginning (the left boundary) of the conference and the point at which Mario started to like it. Eventually, far from requiring aspectual coercion mechanisms, examples such as (66) and (67), in which a typical atelic predicate enters a telic construction, can be given a straightforward explanation within the two-events theory framework.³²

The two-events theory of telicity suggests an interesting account of *for-X-time* adverbials too. Following Larson (1999) we take them to measure event quantities—namely, *for X hours* as applied to event *e* states that the quantity of eventive stuff *e* contains is *X*, as measured in hours. Now, the observations above concerning the impossibility of modifying a continuous imperfective predicate by using *for-X-time* can be understood by saying that event measuring functions only apply successfully to closed events. This would make sense, under the natural hypothesis that you can't tell the duration/amount of event-matter of a non-terminated event.³³ If so, *for-X-time* adverbials presuppose that the event they modify is terminated/closed, so that *for an hour* corresponds to the following predicate (where we have used ∂ for indicating the presupposition):

- (68) $\lambda Pe((P(e) \wedge \mu_h(e)=1) \wedge \partial(t(e)))$

Thus, a phrase such as *for two hours* combines with a closed/terminated event, partitions it into hours-quantities, and returns the number thereof.³⁴ Why, then, are *for-X-time*

³²For an account of this and other so-called 'aspectual shifts' in terms of coercion, see de Swarts (1998).

³³ The considerations here are very similar to those made at the end of §5 while discussing the possibility of terminated and non-terminated events to be temporally localised.

³⁴Following Krifka (1989, 1998) and Larson (1999) we assume that these measure functions are extensive:

- (i) μ is an extensive measure function for a domain *E* with respect to concatenation $\bullet$ iff:
- a. μ is function from *E* into the set of positive real numbers $\Re^+$;
 - b. $\forall x, y \in E (\mu(x \bullet y) = \mu(x) + \mu(y))$; additivity
 - c. $\forall x, y \in E (\mu(x) > 0 \wedge \exists z \in E (x = y \bullet z) \rightarrow \mu(y) > 0)$ commensurability

In our case, the concatenation function is replaced by the part-of relation *P*. This requires some readjustments to (ib), due to the fact that, *P* being not commutative, if entities *x* and *y* overlap then the contribution of the common part should not be counted twice for the purposes of measurement. For instance, the sum of two overlapping quantities of sugar, each amounting to 3 and 2 kilos respectively, is less than 5 kilos – see Krifka (1998) and Larson (1999).

Despite similarities, however, our treatment differs from that in Krifka (1989, 1998), who maintains that the measure functions of *for-X-time* adverbials is primarily concerned with time spans. More precisely, he takes them to apply to the temporal trace of events, as provided by the temporal trace function $\tau.E \rightarrow T$. Our measure

adverbials impossible with telic predicates? According to our proposal, the reason is that telicity is a property of two-events structures, whereas *for-X-time* adverbials can only modify simplex variables. Can (68) apply only to the processual part of a telic event? It could, but then we would have a presupposition failure, since the processual part, as it appears in the logical form, is not closed/terminated (recall that with telic predicates terminativity is due to the simultaneous presence of the processual part and of the telos; the two together form a terminated/closed event, but the former, by itself, is non-terminated). We might ask, then, whether the adverbial can apply to the second event, the telos. The following examples are evidence that it actually can, provided that we understand the second event not simply as a boundary, but as the resulting state of the processual part (which, in turn, bounds the latter):³⁵

(69) John left for half an hour.

Thus (69) means that John remained outside the room (the resulting state) for half an hour, and then re-entered. Ultimately, *for-X-time* phrases can combine with individual variables for every sort of eventualities, including states, cf. (70), provided that they are closed/terminated, as the contrast between (71a) and (71b) exemplifies:

(70) John loved Mary for three years.

- (71) a. Mario ha amato/amò Maria per tre anni.
 b. *Mario amava Maria per tre anni.
 Mario loved (IMPF) Mary for three years.

functions, as explained in the text, directly apply to the eventive domain, and purport to measure the quantity of event of a given individual $e \in E$. That is, *for-X-time* phrases measure event quantities rather than time quantities. Important differences between the two proposals, discussed by Larson (1999), arise in contexts such as the following. Consider two singing event: the first is performed by John, starts at 2 o'clock and ends at 4; the second singing event is performed by Mary, starts at 3 o'clock and ends at 5. Now the following two statements seem both correct:

- (ii) a. John and Mary sang for four hours.
 b. John and Mary sang for three hours.

If *for-X-time* adverbials measure time spans, as in Krifka (1989, 1998), then (iib) is accounted for: the temporal trace of the event, which is the sum of the individual singing starts at 2 o'clock and ends at 5 o'clock. This is because the temporal traces of the two events share a part that, as said before, must not be counted twice. However, sentence (iia) cannot be accounted for, given that, as far as temporal traces go, the situation is the same as in (iib). If we take *for-X-time* phrases to measure event quantities, (iia) can be explained. Sentence (iia), on the other hand, reports about two distinct singings (say, at different locations), which do not overlap in the eventive domain. Therefore, the total quantity of event-stuff the two singings contain correctly amounts to four hours.

³⁵This observation is related to an important perspective on telicity and telos—namely, that they be more correctly analysed as requiring the presence of a resultant state which, in turn, bounds the processual part, as in Tenny (1994); we won't comment on this possibility any longer.

What is excluded, if our approach is correct, is the possibility of *for-X-time* adverbials to modify telic predicates. This is impossible for the simple reason that they apply to simplex eventive variables, whereas two-event variables are needed for the purposes of telicity.³⁶

6.4. Homogeneity

Our approach to *for-X-time* adverbials apparently neglects a factor to which resort has been often made in the literature—namely, the role of the homogeneity of the predicates to which *for-X-time* phrases apply (Bach 1986; Krifka 1992, 1998; Higginbotham 2000). In our account, *for an hour* adverbials are felicitous only with terminative a-telic events because the two-event nature of telicity goes beyond the power of monoargumental *for-X-time* adverbials. Many theory, however, attempt at explaining the facts discussed in the previous section, by establishing some sort of relationship between one property, a-telicity, and the other, homogeneity, so as to logically reduce the former to the latter. In this section we investigate the status of the notion of (in-)homogeneity in the theory developed so far, trying to understand if and how it can contribute to improve the.

Let us start by considering the relationships between homogeneity and telicity/ atelicity. It can be observed that the hypothesis (Higginbotham 2000) that homogeneity entails atelicity and/or applicability of *for-X-time* adverbials is not supported by the data. For, (72) displays a seemingly homogeneous predicate, and yet the adverb is ungrammatical:

³⁶As Larson (1999) points out, an advantage of this approach to *for-X-time* phrases is that it naturally extends to measure functions which partition their domain differently than by resorting to ordinary ‘time’ periods:

- (i) a. John ran for two miles.
- b. $\exists e(\text{run}(e) \wedge \theta(e, \text{John}) \wedge t(e) \wedge \mu_{\text{miles}}(e)=2)$

In this case, the amount of event-stuff contained by the relevant event is measured in *miles*, rather than in hours or minutes. The possibility of resorting to functions which measure along different dimension is well known in the objectual domain, where we can talk about *two spoonful of sugar*, *three tea cups of flour*, *one Kilo of salt*, etc.

This gives us the possibility of reconsidering an argument about the possibility of combining *for-X-measure* adverbials with *in-X-time* phrases, discussed in fn.29. There we observed that the impossibility of (i) can be explained by resorting to pragmatic reasons: if both *in-X-time* and *for-X-time* adverbials ultimately measure the temporal trace of an event, then (ii) would simply state the same fact twice:

- (ii) *Mario ha corso per due ore in due ore
 Mario ran for two hours in two hours.

If so, we would expect something like (iii) to be acceptable:

- (iii) *Mario ha passeggiato per due chilometri in un'ora.
 Mario walked for two kilometres in one hour.

The unavailability of the sentence shows that *in-X-time* adverbials cannot attach to complexes of the type *VP+for-X-measure*. If, as we have hypothesised, the possibility of accepting *in-X-time* phrases is criterial for telicity, we must conclude that *VP+for-X-measure* phrases are not telic, contrary to Krifka’s proposal. This would not be a surprise in our framework: *VP+for-X-measure* phrases contain only one eventive variable, hence they are atelic, and unless something supplies an extra eventive variable, they cannot combine with *in-X-time* adverbials.

- (72) (Ieri pomeriggio) Mario dormiva (*per tre ore).
 (Yesterday afternoon) Mario slept(IMPF) (*for three hours).

As already observed in §4, the event making (72) true, which is classified by the imperfective predicate *dormiva*, is homogeneous: any one of its parts is still classifiable by the very same predicate:

- (73) Alle tre/dalle tre alle quattro di ieri pomeriggio Mario dormiva.
 At three/from three to four o'clock of yesterday afternoon Mario slept (IMPF).

The reason why the predicate in (72) is not atelic, we have argued, is that the continuous imperfective verbal form provides a non-terminated event, whereas *for-X-time* phrases and atelicity only make sense with closed/terminated ones.

However, homogeneity and terminativity together entail atelicity. Any terminative event, in fact, is either telic or atelic, and as we will see in a moment, telicity entails in-homogeneity. If in-homogeneous atelic predicates did not exist, then homogeneity could still be a useful notion to predict atelicity in the presence of terminativity. The existence of in-homogeneous atelic predicates is clearly an empirical matter, and at present we have no positive evidence in favour of it. Pending a final word on the question, it seems fair to conclude for the time being, that homogeneity is by and large unnecessary to the characterisation of the telic/ atelic distinction.

Let us turn, now, to the relationships between telicity/atelicity and in-homogeneity. In a framework such as Krifka's, the telicity of a given predicate is a consequence of its being quantised, the latter, in turn, stemming from the interplay between properties of the thematic relation (graduality) and those of the direct object (quantisation). Since quantised predicates are always in-homogeneous, it can be concluded that in-homogeneity is a prerequisite for telicity.

In the present framework, where the telic/ atelic distinction is characterised by means of the simplex/two-events divide, it seems natural to go the other way around, and try to derive in-homogeneity from telicity (Higginbotham 2000). The idea is that, given the predicate corresponding to, e.g., *eat an apple*, if such a predicate classifies (the pair consisting of) the processual part and the telos of an event, then it cannot apply to subparts of the same event since no one of them has the same telos as the whole. That is, the in-homogeneity of telic predicates is crucially due to the telos and the predicate classifying it. So suppose that the predicate corresponding to *eat an apple* has the following form:

- (74) $R = \lambda e e'. (P(e) \wedge Q(e'))$

where P applies to processual parts and Q to their telos. To implement the intuition above, we must characterise Q so that the entire predicate R does not extend to parts. For instance, the following would not work as a spell out of R :

- (75) $\lambda e e'. (\text{eat}(e) \wedge \theta_2(e, x) \wedge \text{telos}(e'))$

Let us understand the (thematic) relation $\theta_2(e, x)$ as meaning that the eating event e *applies* to the apple x . Let $p_1 = \langle e_1, e_2 \rangle$ be the eventive pair corresponding to the telic event of eating the whole apple, and $p_2 = \langle e_3, e_4 \rangle$ be the eventive pair corresponding to the telic event of eating the first half of the same apple, a subpart of the whole event. Then (75) could apply to both p_1 and p_2 . The processual parts e_1 and e_3 , in fact, are both events of eating applying to apple x , and the predicate *telos* holds of both e_2 and e_4 . What is needed to implement the intuitions above concerning the relationships between telicity and in-homogeneity is a finer classification of the *telos*, capable of telling apart the boundary of p_1 from the one of p_2 . In the case of *eat an apple* it must enable us to connect the *telos* of p_1 to the whole apple x , and the *telos* of p_2 to the half apple. If so, we can maintain that in a sentence such as *John ate an apple*, the predicate classifying the processual part is provided by the verb—i.e., *eat(e)*. The classification of the *telos*, in turn, depends on information coming from other sources—e.g., the direct object (or locative phrases).

To construe the complex telic predicate, we proceed as follows: let us understand *eat*($\langle e_1, e_2 \rangle$) in (64) as follows:

$$(76) \text{ eat}(e_1) \wedge \text{rb}(e_2, e_1)$$

As required, we let *eat* classify only the first event, the processual part, and explicitly state that the second event is the *telos* (the right boundary) of the first. Then, turning to the thematic relation $\theta_2(\langle e_1, e_2 \rangle, x)$, let us spell it out as follows:

$$(77) \theta_2(e_1, x) \wedge e_2 = f_{\theta_2}(x)$$

Here $f_{\theta_2}(x)$ is a function from objects to events built out of the thematic relations, and classifying the *telos*/boundary. That is, we regard the thematic relation as functional, at least as far as the second event is concerned, with the intention of having the boundary/*telos* classified by combining the contributions of the thematic relation with that of the (referent of the) direct object. With this, the telic predicate corresponding to *eat x (an apple, two sandwiches)* is, e.g., (78):

$$(78) \lambda e e'. \exists x (\text{eat}(e) \wedge \theta_2(e, x) \wedge e' = f_{\theta_2}(x) \wedge \text{rb}(e', e) \wedge \text{apple}(x))$$

We have a predicate applying to two eventive variables in such a way that the first is a non-terminative event of eating directed towards an apple, and the second is the boundary of the former. Moreover, the *telos* is identified through the contribution of the thematic relation holding between the non-terminative event and the apple.

Given (78), there are proper parts of the telic event of eating the apple which such a predicate cannot apply to; for instance, it would not apply to p_2 as defined above. In this case, in fact, the *telos* e_4 cannot be regarded as being in a functional relation with the whole apple x —that is, $e_4 \neq f_{\theta_2}(x)$. Thence the predicate in (78) is non-homogeneous.

The full logical form for a sentence such as (79a) is therefore (79b). Henceforth, we will refer to the predicate in (80), which incorporates the contribution of the direct object, as the *telic predicate*.

(79) a. John ate an apple.

b. $\exists e_1 e_2 x (\text{eat}(e_1) \wedge \theta_1(\langle e_1, e_2 \rangle, \text{John}) \wedge \theta_2(e_1, x) \wedge \text{apple}(x) \wedge e_2 = f_{\theta_2}(x) \wedge \text{rb}(e_2, e_1))$

(80) $\lambda e e'. Qx (e' = f_{\theta_2}(x) \wedge \text{rb}(e', e))$

In conclusion, the notion of in-homogeneity is parasitic upon that of telicity. To prove this, we have relied on a conception of telicity as involving a form of singular reference; more precisely, the existence of the direct object individual variable turns out to be crucial for classifying the telos. In the next section we will discuss some consequences of this analysis.

Before concluding this section, let us comment on some consequences of our account of telos as the value of a function, f_{θ_2} , from objects to events. Modifying the constraints on such a function, we obtain different results concerning the identity conditions holding of telos. If we do not add any further requirement, and stick to the definition given, the telic predicate allows for cases in which there are subevents of a telic event sharing the telos with the whole. With *eating an apple* this amounts to the possibility that some, possibly all, (telic) final subparts have the same telos as the whole.³⁷ For instance, the telic events of eating the second half, the last quarter, etc. of the apple could be considered as having the same telos as the whole. Notice, though, that nothing forces this conclusion—that is, the definition given above for the telic function does not commit to such an identity thesis about the telos of the whole and those of its final subparts. It only makes it possible to express it, if one is willing to do so.

The opposite thesis, to the effect that no proper part of a telic event can have the same boundary as the whole, can be explicitly enforced by requiring that the telic function be one-to-one. If so, final subparts have distinct, albeit possibly temporally coinciding, boundaries.³⁸

In these respects, therefore, the consequences of our approach are very different from those of Krifka's (1992, 1998). As discussed in §6.1, he takes as a defining property of telic predicates that every subparts to which they apply have the same terminus as the whole. Our theory, correctly we think, makes coterminativity a matter of independent choices, and does not assign it any explanatory role for the telic/ atelic distinction. This way, it is possible to accommodate Schein's observation concerning sentences such as (81):

³⁷A part e of an event e' is final in e' iff there is no other part of e' which is after e .

³⁸The telos of the whole might then be taken to be the mereological sum of the telos of the final parts. Or, we might want to endorse the (metaphysical) view of telos as *fiat* boundaries, rather than *bona fide* ones, see Smith and Varzi (1999).

(81) John filled (up) the room with smoke.

If Schein's judgements (cf. §6.1) are accepted, it is entirely possible for the telic predicate to apply to two different event pairs: $p_1 = \langle e_1, e_2 \rangle$ and $p_2 = \langle e_3, e_4 \rangle$ in such a way that $P(e_1, e_3)$, and $e_2 \neq e_4$. That is, the two events of filling the room up with smoke are such that the processual part of the first is a subpart of the processual part of the second. Moreover, they have different telos, possibly reflecting the fact that the final states attained by virtue of p_1 and p_2 are different, though of the same kind (=the room is filled up with smoke).

Turning to another consequence of our proposal, we hypothesise that the differences between atelicity/ telicity are explicitly encoded in the logical form as a distinction between simplex/ two-events structures. Therefore, the distinction is primarily linguistic and not ontological. We also agree that a given situation in which a terminated event occurs can be described both by means of an atelic/simplex event construction and by a telic/complex event one. Both constructions, in fact, report about terminated events, the difference being whether the decompositional strategy (consisting in presenting the non-terminated event together with its boundary) is followed or not (by directly referring to the closed/terminated event). In case it is, telicity arises; otherwise we have an atelic description—that is, telicity amounts to making the telos/boundary linguistically available for referential purposes. This move does not require modifications to the underlying ontology: whenever there is a terminated/closed event the ontology has a boundary for it. In this respect, therefore, we differ from Higginbotham (2000), who maintains the strong view that simplex events are ontologically distinct entities from complex ones.

We also differ from Krifka, though, who takes the difference to be simply a matter of description (Krifka 1998, p. 207). According to him one and the same event of running can be described both by means of the atelic sentence in (82a), and by means of the telic (82b):

- (82) a. John ran.
b. John ran home.

The logical forms he assigns to these two sentences are substantially identical, as far as the number of eventive variable they contain is concerned. For Krifka, the differences are in the type of predicates applying to the eventive variable: an atelic predicate in (82a) and a telic one in (82b). Such a difference, however, does not show up in the logical form. The consequence is that, under appropriate variable assignments, the two predicates might turn out to classify the same event.

According to our theory, however, this is never the case. Examples (82a) and (82b) have different logical forms: in the atelic case there is a single eventive variables, whereas in the telic case there is a complex event structure consisting of a processual part and a telos/boundary—that is, two eventive variables. Thus, atelic and telic sentences differ

because the former are made true by single terminated events, whereas the latter are made true by pairs of events, a non-terminated one and its boundary/telos. Thus atelic and telic predicates never classify the same events.

An important consequence is that the decomposition of terminated/closed events into an open part plus a boundary, which is always available at the ontological level, does not automatically carry over to the linguistic realm: if $p_1 = \langle e_1, e_2 \rangle$ is a telic event, and $e_3 = e_1 + e_2$ is the terminated/closed event corresponding to the sum of the components of the former, then, despite the ontological equivalence, p_1 can only make true the telic sentence (82b) failing to do so with the atelic one. Vice versa, e_3 can only make true the atelic (82a), failing to do so with the telic counterpart. The sum of the two components of what we have been sloppily calling ‘the telic event’ might well be identical to the event classified by the atelic predicate, but, the point is, telic predicates require two events and do not apply to the same entities (simplex events) as atelic ones.

This emphasises the point that the notion of telos is linguistic, and not ontological. Every time there is a terminated event there is a boundary in the ontology. This doesn’t mean, however, that there is also a ‘telos’. A telos is the ‘linguistic’ expression of a boundary.³⁹ As a consequence, it cannot be maintained that telic and atelic sentences can be used to talk about the same event; rather, we must concede that telic and atelic sentences can be used to talk about the same situation or scene (borrowing a term from Schein, forthcoming) by referring to different events.⁴⁰

7. The role of arguments

In this section we address two problems. The first is raised by the well-known contrasts exemplified below:

³⁹Some authors (e.g., Krifka 1989, 1992; Filip 1998) describe the distinction between atelic and telic predicates in terms of *arbitrary* vs. *natural* endpoints; see also our *privileged endpoints* of §1. In the present approach the distinction is superseded by that between the availability vs. non-availability of a variable for the boundary in the logical form. In this sense, the end-points of telics are no more natural than the end-points of atelics in any meaningful way. In both cases boundaries are ontologically available, since the events in question are terminated/bounded. However, they are linguistically relevant only with telics, because only in this case they are represented in the logical form. Similar considerations extend to the notion of an *intended endpoint* (Depraetere, 1995). In general, all these notions and distinctions seem superfluous once the correct distinctions are made.

Interestingly, that the mentioned notions and concepts are irrelevant and misleading is shown by the possibility of resorting to telic or atelic sentences to talk about the same situation, as discussed in the text. If it is true that (80a) and (80b) can be used to describe a single action performed by John, then, clearly, the telos/end-point/boundary in question cannot be in one case arbitrary and in the other natural, or intended and non-intended, for it is in both cases the same boundary.

⁴⁰ It must be noted that the procedure for identifying the telos we discussed in the text—namely, by the crucial contribution of the direct object—does not carry over to other cases, e.g., those in which a major role is played by direction PP, as in *John ran to the store*, or Schein’s sentence (81). We will briefly discuss directional PPs in the next section, whereas won’t have much to say about the other cases.

- (83) a. John ate an apple in/ *for two minutes.
 b. John ate apples/beef *in / for two minutes.
- (84) a. Mario ha mangiato una mela in/ *per mezz'ora.
 Mario ate an apple in/ for half an hour.
 b. Mario ha mangiato mele / manzo *in/ per mezz'ora.
 Mario ate apples/ beef in/ for half an hour.

As already observed, in languages such as English and Italian the availability of a telic vs. an atelic readings with certain verbs depends on the nature of the DP realising the direct object: bare plurals (BPs) or mass nouns (MNs) force atelicity, whereas in the other cases we have telicity.

In §6 we critically reviewed the idea that the different aspectual properties of the sentences in (81) and (82) are to be addressed by hypothesising a regular (incremental) relationship between the denotation of the direct object and that of the verb. We must now show that the two-events theory developed in §6.4 can provide a better account of the role of arguments in determining the telic/atelic distinction.

As stated at the end of the previous section, we believe that singular reference—that is, the availability of an individual variable for the direct object— is crucial for characterising telicity. More precisely, the presence of a singular variable for the argument enables the telic function to properly work, classifying the second eventive (telic) variable. If our theory is on the right track, then the atelicity of (83b) and (84b) shows that the relevant LFs do not host an individual variable.

The second problem we are going to address concerns the origin of the second eventive variable that the two-events theory of telicity hypothesises. There are two possibilities: either we follow Higginbotham (2000) and we take the lexical entries of most ordinary eventive verbs to be ambiguous, allowing them to provide both for a single eventive variable, yielding atelic readings, or for two eventive variables, suitable for telicity. Or we might take the choice between simplex/complex events to be basically a matter of morphosyntax. In this case, eventive verbs are not ambiguous, and always introduce just one eventive variable; some other phrase/functional projection is responsible for the second variable, and we might expect that syntax has a major role to play.

In this work, we want to explore the second possibility, the structural hypothesis. Besides considering Italian, we will also discuss evidence from Hindi (Singh 1991, 1998; Mohanan 1997) where two interesting phenomena can be observed. Firstly, the presence of BPs/MNs is compatible with telicity. Secondly, these languages morphologically distinguish between

telic and atelic predicates, contrary to English and Italian where the only overt distinction is that between perfectivity and imperfectivity.⁴¹

Hindi uses a particular *light* verb, *lena*, called the *explicator* that carries the perfectivity morpheme, and is responsible for completivity/telicity. Consider the following data (from Singh, 1998):

- (85) a. maine aaj apnaa khaayaa
I-ERG today mine cake eat-PERF.
I ate my cake today.
- b. maine kek khaa liya.
I-ERG cake eat take-PERF
I ate the cake
- (86) a. maine aaj apnaa khaayaa aur baakii kal khaaùgaa.
I-ERG today mine cake eat-PERF and remaining tomorrow eat-FUT.
I ate my cake today and I will eat the rest tomorrow.
- b. *maine kek khaa liya, jo bacaa hai wo raam khaayegaa.
I-ERG cake eat take-PERF, what remain is that Ram eat-FUT
I ate the cake and Ram will eat the rest.

In (85a) the verb *khaa* (eat) is marked as perfective. The sentence is terminative but not completive/telic, as shown by (86a). Completivity/telicity requires the presence of the explicator *lena* usually glossed as *take*, cf. (85b). Given the presence of such a constituent, (86b) is odd, since it states that the telic event can be continued.⁴² Note also that, as can be seen from the examples, Hindi nominal constituents are determinerless. In the presence of telic morphology, however, BP/MN direct object are interpreted as referential phrases.

Thus, the relevant generalisations seem to be that: when telicity has a morphological realisation which is independent from that of atelicity, as in Hindi, the relevant verbal forms can turn a BP/MN object into a referential phrase, and instantiate the telos. When a language—e.g., English and Italian—exploits one and the same morphological form for atelics and telics—namely, morphological perfectivity—BP/MNs remain non-referential and aspectual compositional effects obtain. Moreover, the data suggest that the explicator

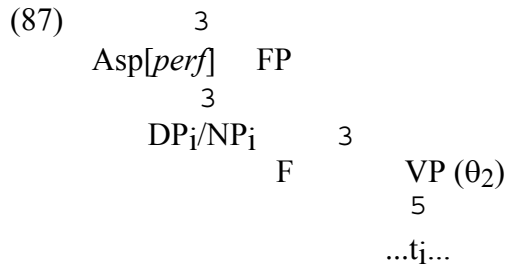
⁴¹We are simplifying the theory as far as English is concerned. As shown in §4 and in Giorgi and Pianesi (1997), English does not have the perfective/imperfective distinction (with the crucial proviso for progressive forms made in §3). English eventive verbs invariably enter the syntax as perfectives, mainly for morphosyntactic reasons (poverty of verbal inflection). For the purposes of this section, however, we disregard this difference and treat English and Italian on a par.

⁴²Notice that if Schein (1999) is right, the contrast in (84) is contingent on the meaning of *eat*. That is, it is a contingent fact that once the telos is attained the direct object of *eat* cannot be affected any more (since it has been consumed). The direct object of such verbs as *fill* would behave differently, and yet enter into telic constructions, so that a sentence such as (i) would be possible:

(i) John has filled the room with smoke and will continue to do so.

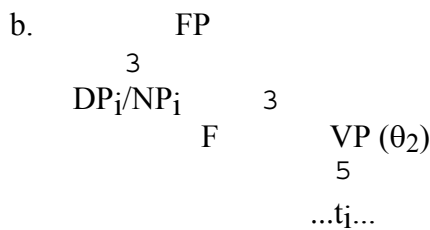
Such facts, even if confirmed, do not affect the possibility of using sentences such as (84a) and (84b) as a test for telicity, provided that we restrict their application to verbs like *eat*.

lena is responsible for introducing the second eventive variable. If so, we can conclude that the presence of the variable corresponding to the telos/boundary is due to a functional category which is lexicalised in Hindi-like languages, and is realised by a zero morpheme in English- and Italian-like ones. Thus we hypothesise the following structure for perfective telic predicates:



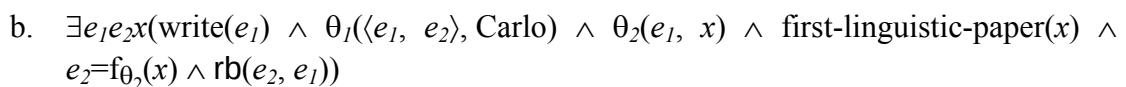
FP is the functional category projected by the explicator *lena* in Hindi, and by a zero morpheme in English and Italian. The head, F, provides an eventive variable, which is interpreted as the event boundary/telos in the manner suggested in §6.4. In order for this to be the case, Spec,FP must be occupied by a referential phrase, so that the functional thematic role is assigned to it.⁴³ Eventually, this yields the telic predicate discussed in §6.4, which in turn identifies the eventive variable of F. Finally, in (87) Asp only checks that the resulting eventive structure is terminated. It is predicted, therefore, that Asp can be absent, and yet telicity be available. This is what happened with the following sentence, which features the imperfect and is given the structure in (88b):

- (88) a. Nel 1989 Carlo scriveva il suo primo articolo di linguistica.
 In 1989 Carlo wrote(IMP)F) his first linguistic paper.



That is, for truth-theoretical purposes we propose that (88a) and (89a), where the verb is in the *passato remoto* (a typical perfective tense) are equivalent, both being assigned the logical form in (89b):

- (89) a. Nel 1989 Carlo scrisse il suo primo articolo di linguistica.
 In 1989 Carlo wrote his first linguistic paper.



⁴³Concerning the reasons why the object raises to Spec,FP, we might follow those scholars (e.g., Borer, 1994) who hypothesise that this happens for case reasons.

In this framework the English and Italian contrasts in (83)-(84) are due to the fact that when the direct object is a BP/MN, Spec,FP is either vacant or occupied by a non-referential phrase. In Hindi, on the other hand, the BP/MN can rise to Spec,FP and introduce a singular variable. The underlying hypothesis, therefore, is that the presence/absence of a referential phrase in Spec,FP is something that languages can, at least to a certain extent, control. In other words, languages may have, cf. Hindi, or lack, cf. Italian and English, mechanisms forcing referentiality upon otherwise non-referential constituents. In this respect we might follow de Hoop (1992) and hypothesise that the relevant device is strong case. Roughly, for de Hoop *strong* (direct) case is assigned to referential objects, whereas *weak* (oblique) case is used for non-referential ones. Referential phrases are generalised quantifiers, or individual-referring expressions. Non referential phrases are predicative.

Adopting de Hoop's theory of strong/weak case, the differences between Hindi, on the one hand, and English/Italian, on the other, can be explained by hypothesising that the Hindi overt telicity marker *lena* can assign/check strong case in Spec,FP. This way, BPs/MNs (which by themselves are predicative) are turned into referential phrases, accounting for the telicity of (90a) and the atelicity of (90b):

- (90) a. Us ne biiyar pii lii.
 lit.: he ERG beer drink take-PERF
 He drank (some salient amount of) beer.
- b. Us ne biiyar pii.
 lit.: he ERG beer drink-PERF
 He drank beer.

English and Italian, where the counterpart of *lena* is a zero morpheme, do not have the possibility of controlling the referentiality of the argument in the same vein. In these languages F does not assign/check strong case, therefore, BPs/MNs remains predicative, hence unfit to license the eventive F.

Concerning predicative phrases, we argue that they cannot enter semantic composition by the usual θ -theoretic mechanisms, but, we hypothesise, undergo semantic incorporation (Hoekstra and Moulder 1990; Borer 1994; van Geenhoven, 1997), forming a complex predicate.⁴⁴ According to van Geenhoven, in semantic incorporation the predicate contributed by the direct object is absorbed by the verb as the predicate of the variable corresponding to the internal argument. Thus, van Geenhoven hypothesises that verbs, when incorporating the direct argument, have the following meaning:

$$(91) \lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda w_s \lambda x_e \exists y (\text{Verb}_w(x, y) \wedge P_w(y))$$

⁴⁴Ultimately we conform to the idea that there are semantic composition mechanisms that crucially involve referential objects, hence individual variables. These are the common θ -assignment devices of generative grammar, which amount to saturating open thematic positions with individual variables, see Higginbotham (1985), Parsons (1990).

For example, assuming (92a) as the incorporating version of *eat*, we have (92b) as the complex predicate associated with the VP [*VP eat* [*NP apples*]]:

- (92) a. $\lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda w_s \lambda x_e \exists y (\text{eat}(x, y) \wedge P_w(y))$
 b. $\lambda w_s \lambda x_e \exists y (\text{Verb}_w(x, y) \wedge \text{apple}_w(y))$

Therefore, in van Geenhoven's proposal incorporated BPs *are* existentially bound, the existential interpretation being provided by the verb itself. This solution can be criticised in two respects. In the first place, it requires the meaning of each verb to be ambiguous between the incorporating version (91) and the normal, non/incorporating one. Secondly, as it is, the proposal does not immediately fit our needs since they make the semantic contribution of the BP *apples* indistinguishable from that of a true existential as *some apples*, this way threatening to blur the aspectual distinctions we are trying to explain, and raising problems similar to those discussed in §6.1 in connection with a Krifka's proposal. In our terms, van Geenhoven's hypothesis for semantic incorporation is close to providing a referential treatment for BPs/MNs, whereas we are trying to express the fact that BPs/MNs do not contribute such a semantic constituent.

The first objection can be met by adopting a theory in which thematic role assignment is a structural fact (Chomsky 1995; Hale and Keyser 1993; Borer 1994). According to a version of such a general view (Borer, 1994), the particular interpretation a DP receives depends on the functional projection it enters in construction with in the course of the derivation. In our case, the direct objects of telic predicates license the telic variable (by contributing to the telic function) because they end up in Spec,FP. If the direct object does not leave the VP, and does not enter in construction with the appropriate functional category, then semantic incorporation obtains. That is, it can be proposed that direct objects that at LF are within the VP are interpreted as semantically incorporated in the verb. Both the processes leading to the interpretation of phrases in construction with the appropriate functional categories, and those responsible for semantic incorporation are driven by syntax, so that the need for stipulating a systematic lexical ambiguity for verbs does not arise.⁴⁵

Concerning the second criticism to van Geenhoven proposal—namely, the fact that the existential closure on BPs/MNs introduces referential elements—it can be observed that such a process does not create a referential phrase which can move into Spec,FP. Referentiality, in fact, is a property of the whole predicate corresponding to [*v'* V BP/MN], and not of the BP/MN alone. As discussed by de Hoop (1992) and Ramchand (1997), incorporating phrases cannot move out of the VP, therefore the relevant singular variable is

⁴⁵Probably, it would suffice to assume the possibility of an existential closure process obtaining at a low level, e.g., within the VP, and affecting material that at LF is still within such a constituent. We will not pursue such a possibility any further, however.

not available for entering the appropriate semantic configuration—namely, as part of the semantic contribution of a referential phrase raised to Spec,FP.⁴⁶

The fact that week/incorporating phrases cannot move out of the VP, hence cannot move to Spec,FP, can be illustrated further. In Italian and English a sentence with a BP/MN is grammatical because FP need not be projected when semantic incorporation obtains. It is predicted, however, that a verbal form embodying, or always co-occurring with telicity, should be ungrammatical with BPs/MNs. This is what happens in Scottish Gaelic (Ramchand, 1997). This language differs from Hindi since it has only one perfective form. However, it also differs from English/Italian since such a perfective form is always telic. That is, *perf* always co-occurs with telicity/completivity, hence with F.

(93) Dh'ol mi leann.
I drank beer.

(94) *Dh'ol mi leann fad dà uair a thide.
Drink-PAST I-DIR beer for two hours.
I drank a beer for two hours.

(95) Leugh mi leabhar 'n taobh a-staigh dà uair a thide.
Read-PAST I-DIR book in two hours.
I read a book in two hours.

In Scottish Gaelic, strong case is the *direct* case and week case is the genitive. Given the co-occurrence of perfectivity with telicity, the F category, or its equivalent, must always be present. Therefore, the telic condition must always be available. However, if the object has

⁴⁶There are two other possibilities. The first, suggested by van Geenhoven (1997) analysis of indefinites, is to described the contribution of the verb's meaning in dynamic terms; when playing the incorporating role, the verb changes the assignment sequence to a new one containing a value for, say, an unspecified amount of apples or beef. The logical form, however, doesn't contain any singular variable, nor a referential phrase is available at LF to occupy Spec,FP and license the telic reading.

The second possibility is that we simply conceive of the cases of semantic incorporation we are after as yielding a restricted predicate, so that the phrase corresponding to *eat apples* is associated with the following predicate:

(i) $\lambda e x(\text{apple-eat}(e) \wedge \text{Agent}(e, x))$

The predicate *apple-eat* is an hyponym of *eat*: in such a way that each instance of apple-eating is an event of eating. Its truth conditions, in θ -theoretic terms, would be given by (ii):

(ii) $\text{apple-eat}(e, x)$ is true of objects e and x iff e is an event of apple-eating and x is the agent of e .

This would associate (iia) with a logical form which doesn't mention any variable for the direct object:

(iii) a. John ate apples
b. $\exists e(\text{apple-eat}(e) \wedge t(e) \wedge \text{Agent}(e, x))$

This is in line with our proposal that the atelicity of these sentences, in English and Italian, is due to the fact that the direct object does not contribute an individual variable. It also highlights the fact that cases such as *John ate apples/beef*, *drank beer*, *wrote letters*, etc. have the same logical structure as their intransitive counterparts: *John ate/drank/wrote*.

week case, it cannot rise to Spec,FP and F cannot be licensed. That is, a week case marked object with the perfective form is ungrammatical:

- (96) a. Chunnaic Calum a'chraobh
 See-PAST Calum the tree-DIR.
 Calum saw the tree.
 b. *Chunnaic Calum na chraoibhe
 See-PAST Calum the tree-GEN.
 Calum saw the tree.

Thus our proposal is that in the cases discussed so far, the eventive variable corresponding to the telos/boundary is introduced in the derivation, and in the logical form, by a light verb projection F. Such a category can be lexicalised, as in Hindi, or be a zero morpheme, as in English and Italian. The telic condition discussed in §6.4 is computed at the level of FP and requires Spec,FP to be occupied, in the course of the derivation, by a referential phrase. In Hindi (and Scottish Gaelic) F assigns strong, referential case. In Italian and English F does not have such a property so that BPs/MNs must undergo semantic incorporation. Semantically incorporated phrases cannot leave the VP, eventually explaining the failure to license F and the lack of telicity.⁴⁷

As developed so far, the theory is mainly meant to account for such telic sentences as *John ate an apple/ wrote a book* in which the telos/boundary is determined via the contribution of the direct object. It is well known, however, that there are cases in which other constituents control telicity. For instance, the English verb *push* yields telic readings only when an appropriate PP is provided:

- (97) a. *John pushed the cart in three hours.
 b. John pushed the cart to the store in three hours.

The question is: does the telicity of (97) rely on the same mechanisms as that of (84a)—namely, the presence of F together with the movement of the object to Spec,FP? It seems that the correct answer is no. On the one hand, in fact, the intuition tells us that the telos/boundary is due to the PP; on the other, were the telicity of (97b) determined by F, we

⁴⁷That semantically incorporated phrases cannot move out of the VP is also shown by the impossibility of focus movement:

- (i) *Birra, Mario ha bevuto per tre ore.
 Beer, Mario drank for three hours.

and by the failure of topicalisation:

- (ii) a. *Birra l'ho bevuta.
 Beer it I drank it.
 b. Una birra l'ho già bevuta.
 A beer it I have already drank.
 I've already drank a beer.

would be left without an explanation for why the same category can't make (98) into a telic sentence (in the relevant reading):

(98) *John pushed the cart in three hours.

Moreover, there is evidence coming from Hindi that the explicator *lena*, which played a crucial role in inducing telicity with such verbs as *eat*, *write*, etc., does not play the same role with (the Hindi counterpart of) *push*:⁴⁸

- (99) a. Raam-ne tiin ghante *tak/me kaar ghar tak dhakelii.
 Ram-erg three hours for/in car home to push-perf.
 Ram pushed the car to the house *for/in three hours.
- b. Raam-ne tiin ghante *tak/me kaar ghar tak dhakel lii.
 Ram-erg three hours for/in car home to push take-perf.
 Ram pushed the car to the house *for/in three hours.

The noticeable thing is that according to (99a) and (99b) the presence/absence of telicity is not determined by the presence/absence of the explicator, but simply by the directional PP. Therefore, there is converging crosslinguistic evidence that, in the sentences just discussed, the telos/boundary variable is directly contributed by the PP. More precisely, we take these sentences to host a small clause consisting of a predicate, the directional PP, and a subject (the verb's direct object). Such a small clause provides the telos/boundary—e.g., in the form of the state the car is in because of the event described by the main verb⁴⁹:

(100) a. $\exists e e' (\text{push}(e) \wedge \theta_2(e, \text{car}) \wedge \text{to}(e') \wedge \theta_3(e', \text{car}) \wedge \theta_4(e', \text{store}) \wedge \text{rb}(e', e))$

As observed, in these cases the presence/absence of the explicator is irrelevant for the telicity of (99), the PP being enough. However, when there is no PP the presence/absence of the explicator does again make a difference in Hindi:

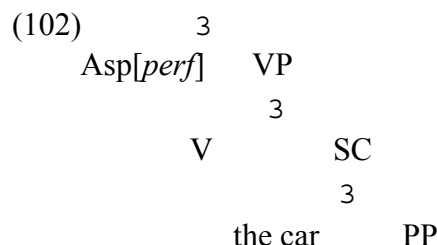
- (101) a. Raam-ne tiin ghante me kaar dhakel lii.
 Ram-erg three hours in car push take-perf
 Ram pushed the car in three hours.
- b. Raam-ne tiin ghante tak kaar dhakel lii.
 Ram-erg three hours for car push take-perf
 Ram pushed the car for three hours.

Example (101a), with *lena* is telic, whereas (101b) is atelic. Thus, Hindi terminative sentences featuring activity verbs can be telic either because of the presence of a directional PP, or, if the latter is absent, because of the explicator.

⁴⁸Thanks to A. Mahajan for the data and the observation.

⁴⁹We have already alluded to this possibility in fn.35. To integrate it in our framework an extended predicate rb^* could be defined in such a way that $\text{rb}^*(e', e)$ is true iff either $\text{rb}(e', e)$ holds, or e' is such that its left boundary is the right boundary of e .

Returning to English and Italian, the relevant sentences are telic only if a directional PP is available, as is well known, cf. the contrast in (97). This suggests that in English and Italian F is not available with activity verbs, so that (97b) has the following structure:



We take this to be a property distinguishing English-like languages from Hindi-like ones: verbs such as *push*, *spingere*, etc.—namely, so called activities—do not co-occur with F.⁵⁰ The resulting crosslinguistic contrast probably depends on the lexical/zero status of the morpheme realising F: when F is lexical, as in Hindi, it can co-occur rather freely with all eventive verbs, whereas its distribution is much more restricted in English/Italian. For instance, it might be proposed that in English and Italian the category F is only a device for telicity. Thus it crucially requires a referential DP to land in its Spec. For some reasons, however, such an option is not available to the direct objects of activity verbs. In Hindi, on the other hand, the lexical F can have different functions than that of a teliciser; as pointed out by Singh (1998) and Mahajan (p.c.) when *lena* does not force telic readings it has other meanings: abilitative, etc.

In conclusion, as is well known activities verbs give rise to telic readings in Italian and English, provided that a suitable directional PP is available. If so, the variable for the telos/boundary is directly provided by the PP (in the form of a state). In these cases, we have hypothesised, the F category is absent, reflecting a more general pattern banning the co-occurrence of zero F with activity verbs in these languages. In Hindi, on the other hand, such a restriction is not at play so that the explicator *lena* can co-occur with directional PP. Expectedly, the explicator can also be present in the absence of such a PP, forcing telic readings in cases such as (100a).

9. Conclusions

In this paper we have proposed a theory of telicity and atelicity according to which these notions are dependent on the terminative/ non-terminative distinction. After discussing a number of proposals available in the literature, we concluded that terminativity and non-terminativity are properties of event particulars and proposed a formal account in terms of the topological properties of eventive domains. With terminativity modelled as a form of

⁵⁰Such a restriction might reflect constraints concerning the thematic relation.

topological closure, we then suggested that the telic/ atelic distinction can be understood as corresponding to the two different ways topological closure can be formally obtained: either by directly introducing the relevant operator (atelicity), or by making available an extra eventive variable for the telos/boundary. This led us to a form of the two-events theory for telicity, where the presence/absence of the extra eventive variable is ruled by the presence/absence of a functional category we called FP. Such phenomena as the role of arguments in determining telicity or atelicity have then been shown to be reflexes of morphosyntactic conditions, in particular, of the role they play in licensing the F category.

We believe that this theory has far-reaching consequences, some of which have already been discussed. Before concluding, we want to focus on a few more facts. In the first place, the role of F in determining telicity permits to account in a straightforward way for the existence of telic (hence terminative) readings with the imperfect tense:

- (103) a. Nel 1983 Mario mangiava una cocomero in cinque secondi.
 In 1983 Mario ate(IMPF) a watermelon in five seconds.
 b. Nel 1983 Mario raggiungeva la vetta del K2 in due ore.
 In 1983 Mario reached(IMPF) the K2 top in two hours.

These sentences show that the form of terminativity attained by means of the expression of a boundary, hence through the F projection, is possible both with perfective and imperfective verbal forms. These data also show that in Italian F can appear without *perf* (this is another difference between Hindi and Italian: in Hindi telic readings always require *perf*, be it directly attached to the verb or to the explicator). Thus we might conclude that the distribution of F is rather free with respect to that of *perf*, the only major restriction being that its Spec be occupied by a referential phrase in the course of the derivation.⁵¹

Another interesting application of our approach involves the *paradox of imperfectivity* (Dowty 1979) which can be described in the following terms: some times, the truth of a sentence containing a progressive form 'X was ϕ -ing' entails the truth of the sentence with the perfective form.⁵² That is, given the truth of a sentence instantiating the schema (104a), we can truthfully utter a sentence instantiating schema (104b):

- (104) a. X was ϕ -ing
 b. X ϕ -ed

This is what happens with the following pairs:

⁵¹On the other hand, the unavailability of atelic terminatives with imperfective verbal forms shows that the t predicate of §5 can only be introduced by Asp when the latter has *perf*.

⁵²Here we use English progressive sentences as examples of imperfective sentences. This is not in contrast with the discussion in §3 concerning the differences between progressive and continuous readings. These difference remaining, progressives do pattern (in the respects which are relevant here) with continuous imperfective sentences.

- (105) a. John was running. John ran.
 b. John was eating. John ate.

Not with the following ones, though:

- (106) a. John was running home. John ran home.
 b. John was eating an apple. John ate an apple.

In general, it is said that activities exhibit the imperfectivity paradox but not accomplishments (and achievements). Notice that the following pairs are licit entailments:

- (107) a. John was running home. John ran.
 b. John was eating an apple. John ate.

Within our framework, the paradox of imperfectivity can be approached as follows: the meaning of a progressive sentence refers to both a non-terminated event, and to an intensional abstraction including the terminativity part, cf. (Giorgi and Pianesi 1997). Restricting our attention to the extensional part, and hypothesising that, in the sentences above, the main verb classifies the non-terminated event, e , the valid atelic entailments (105) and (107) follows under the additional hypothesis that the atelic sentences are made true by events which are terminated and part of e . On the other hand, our theory doesn't permit validation of the entailments in (106). Thus, the problem of the imperfective paradox can be recast in terms of the entailments from (108a), to (108b) and (108c):

- (108) a. $\exists e(\phi(e)....)$
 b. $\exists e(\phi(e) \wedge t(e)....)$
 c. $\exists ee'x(\phi(e) \wedge f_\theta(x)=e'....)$

The fact that (108a) does not entail (108c) is now straightforward: there is no way for the latter to be obtained from the former by way of entailment, because of the extra eventive variable in (108c). That is, no imperfective (non-terminative) sentence can entail the corresponding terminative and telic one. The problem with the first pair of entailment is somewhat more intriguing: the passage from (108a) to (108b) is immediately licensed provided that the eventive variable in (108b) is taken to range on parts of the event making true (108a). With this additional stipulation it follows that the truth of a non-terminative sentence entails the truth of the corresponding atelic terminative one. But now take a predicate like *eat an apple*. The theory predicts that (109)a entails (109b), but this doesn't seem to be the case, apparently challenging our reconstruction of the imperfective paradox in a fatal way:

- (109) a. $\exists ex(\text{eat}(e) \wedge \theta_2(e, x)...) \wedge t(e)...$
 b. $\exists ex(\text{eat}(e) \wedge \theta_2(e, x) \wedge t(e)...) \wedge t(e)...$

However, we think that the counterargument can be resisted. Suppose that the apparent failure of the theory be not due to the failure of the entailment from (108a) to (108b), but to the fact that the relevant sentences are not available, for some independent reasons. Then our explanation of the imperfectivity paradox could be maintained.

Indeed, English and Italian seem to have only one type of perfective/terminative sentence when predicates like *eat an apple* are involved—namely, *John ate an apple*—and all these sentences are telic. For some reason, these languages cannot deliver terminative atelic sentences in these cases. However, there are languages that can—namely, Hindi—and in this case the entailment from (109a) to (109b) is clearly valid:⁵³

- (110) a. raam kaar dhakel rahaa thaa
 Ram car push prog be-pst
 John was pushing the car
 b. raam-ne kaar dhakeli thii
 Ram-erg car push-perf be-pst
 John pushed the car
 c. raam-ne kaar dhakel lii thii
 Ram-erg car push take-perf be-pst
 John pushed the car

The truth of the Hindi imperfective sentence (110a) entails the truth of the Hindi atelic one (110b), but, expectedly, not that of the telic (110c). So we can safely maintain that (108a) in general does entail (108b). Apparent exceptions are not due to the failure of the entailment from (108a) to (108b), but to the fact that there are languages, e.g., English and Italian, which for independent reasons lack the required atelic terminative sentences. Eventually, both the entailments from non-terminative sentences to the corresponding terminative atelic

⁵³That is, Italian and English exhibit co-occurrence restrictions affecting *perf* that Hindi doesn't. Focussing on accomplishments, there are cases in which *perf* can appear without F, and cases in which F is required:

- (i) a. Gianni ha letto un/il libro per un'ora.
 Gianni read a/the book for an hour.
 b. Gianni ha letto un/il libro in un'ora.
 Gianni read a/the book for an hour.

As (i) shows, the very same clause can be modified both by an *in-X-time* adverbial and by a *for-X-time* one. In our framework, this means that the atelic (ia) has only *perf* and lacks F. On the other hand, the telic (ib) has both categories. Other accomplishments, as seen in the text, behave differently:

- (ii) a. *Gianni ha mangiato una/la mela per un'ora.
 Gianni ate an/the apple for an hour.
 b. Gianni ha mangiato una/la mela in un'ora.
 Gianni ate an/the apple for an hour.

We do not know what motivates these co-occurrence restrictions, and the lack thereof in Hindi. Possibly, they are related to the zero/lexical status of F. It seems clear, however, that a mere (lexical) semantic explanation cannot work, for it would leave the differences between English/Italian and Hindi unaccounted.

ones, and the failure of the former to entail their telic counterparts are a matter of logical form, which finds an explanation within our framework.

Finally note that the presence/lack of atelic sentences for accomplishment verbs is the same phenomenon as the one discussed by Singh (1992, 1998) and which she dubbed *the perfectivity paradox*. If so, the theory presented in this paper offers a unified perspective on both the imperfectivity and the perfectivity paradoxes.

Appendix

Mereology

Let P be the part-of relation. Derived notions can be introduced as follows:

(1)	$x=y$	$=_{df}$	$P(x, y) \wedge P(y, x)$	x is identical with y
(2)	$O(x, y)$	$=_{df}$	$\exists z (P(z, x) \wedge P(z, y))$	x overlaps y
(3)	$X(x, y)$	$=_{df}$	$O(x, y) \wedge \neg P(x, y)$	x crosses y
(4)	$PO(x, y)$	$=_{df}$	$X(x, y) \wedge X(y, x)$	x properly overlaps
(5)	$PP(x, y)$	$=_{df}$	$P(x, y) \wedge \neg P(y, x)$	x is a proper part of y
(6)	$\sigma x \phi x$	$=_{df}$	$\iota x \forall y (O(y, x) \leftrightarrow \exists z (\phi z \wedge O(z, y)))$	sum of all ϕ -ers
(7)	$\pi x \phi x$	$=_{df}$	$\sigma x \forall z (\phi z \rightarrow P(x, z))$	product of all ϕ -ers
(8)	$x+y$	$=_{df}$	$\sigma z (P(z, x) \vee P(z, y))$	sum of x and y
(9)	$x \times y$	$=_{df}$	$\sigma z (P(z, x) \wedge P(z, y))$	product of x and y
(10)	$\sim y$	$=_{df}$	$\sigma z (P(z, x) \wedge \neg O(z, y))$	difference of x and y
(11)	$\sim x$	$=_{df}$	$\sigma z (\neg O(z, x))$	complement of x
(12)	U	$=_{df}$	$\sigma z (z=z)$	universe

Operators and terms defined by means of the fusion operator (6) may be partial; thus, the product of non-overlapping individuals will be undefined, and the universe will have no complement. The operators can be turned into total ones by introducing an appropriate term for the null individual that is part of everything.

The axioms are the following:

- (13) $P(x, y) \leftrightarrow \forall z (O(z, x) \leftrightarrow O(z, y))$
- (14) $\exists x \phi[x] \rightarrow \exists y \forall z (O(z, y) \leftrightarrow \exists x (\phi[x] \wedge O(x, z)))$

The first axioms secures that part-of is an extensional partial ordering. Axiom (14), the ‘fusion’ axiom, guarantees that every satisfied (non-empty) condition (predicate) picks out an entity consisting of all the ϕ -ers.

Topology I – Version based on the operator of topological closure

The axioms are the followings. Note that, differently than in the text, we follow the common usage for the closure operator and indicate it with c .

- (15) a. $P(e, c(e))$
 b. $c(c(e))=c(e)$
 c. $c(e)+c(e')=c(e+e')$

Let B be the relation ‘boundary-for’, defined in such a way that $B(x, y)$ is true iff x is a boundary for y . Such a notion differs from the close relation of ‘boundary-of’, since the latter refers to a maximal boundary. In general, any boundary *for* something is a boundary *of* some part of that something. With these, we can introduce the following definitions:

- (16) $b(x)$ $\stackrel{=df}{=} \sigma z(B(z, x))$ the (maximal) boundary of x
 (17) $c(x)$ $\stackrel{=df}{=} x+b(x)$
 (18) $i(x)$ $\stackrel{=df}{=} x-b(x)$ interior of x
 (19) $Cl(x)$ $\stackrel{=df}{=} x=c(x)$ x is closed
 (20) $Op(x)$ $\stackrel{=df}{=} x=i(x)$ x is open

Topology II – Version based on the notion of boundary

The primitive notion is that of x being a boundary for y , $B(x, y)$. The definitions are as in (16)-(20). The axioms are the followings:

- (21) $B(x, y) \rightarrow B(x, \sim y)$
 (22) $B(x, y) \wedge B(y, z) \rightarrow B(x, z)$
 (23) $P(z, x) \wedge P(z, y) \rightarrow (P(z, b(x \times y))) \leftrightarrow P(z, b(x)+b(y))$

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