A birelational analysis of the Russian imperfective

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Abstract

This paper provides two puzzles for a theory of aspect. The first concerns the quirky behavior of the Russian imperfective with regard to its culmination properties: it seems to function like the perfect aspect in certain cases, but like the progressive in others. The other puzzle concerns how the Russian imperfective constrains the temporal location of a described event: it relates distinct event parts to a given temporal parameter. Which part is at play depends on how this parameter is specified. If it is specified by an adverbial, then an *event* is located in time. If it is specified by the discourse context, then a *consequent state* is located in time. I solve the former puzzle by appealing to the structure of atomic vs. non-atomic events and solve the latter by appealing to two temporal inputs required by an aspectual marker. These inputs reveal that aspectual meaning involves both temporal information and information about discourse connectivity.

1   Introduction

Moens & Steedman 1988 proposed that events have the tripartite structure shown below in Fig.1. The *culmination point* of an event is its inherent *telos*—i.e. a point at which an event ceases to take place. An *achievement* solely consists of a culmination point—i.e. it is over as soon as it is instantiated. An *accomplishment* (or *culminated process*), on the other hand, consists not only of a culmination point, but also a *preparatory process*, which in turn consists of a series of preparations leading to a culmination and in certain cases, the consequence of this culmination or an event's *consequent state* (cf. the term 'result state' in Dowty 1979). For example, an event of Dudkin walking to my house constitutes a series of preparations—e.g. Dudkin putting on his shoes, walking through the park, taking a short break, etc.—that lead him to the final step after which he is in front of my house. Finally, *activities* (or *processes*) solely of a preparatory process.

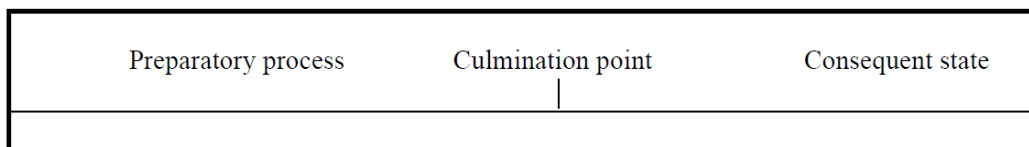| Preparatory process	Culmination point	Consequent state

Figure 1: Moens and Steedman's (1988) tripartite event structure

Aspectual markers provide evidence for a particular event structure. Moens and Steedman proposed that the English progressive combines with a VP and makes reference to the preparatory process of the VP-event, thereby implying 'non-culmination' or 'ongoingness'. The English perfect, on the other hand, makes reference to the consequent state of a VP-event and thereby implies a 'consequence' arising from an event's culmination. For this reason we understand the letter writing event to be ongoing in (1), but in (2), the consequence of the letter writing event is what's at issue.

(1)   Abelard is now writing a letter to Heloise's uncle, the Canon.
(2)   Abelard has now written a letter to Heloise's uncle, the Canon.

This paper present two puzzles for a theory of aspect that arise from the Russian imperfective. One puzzle concerns the observation that this aspect leads to an entailment that a described event culminated only in certain cases. In particular, it seems to function like the perfect aspect in certain cases, viz. (3), but like the progressive in others, viz. (4).

(3)   *Nedelju   nazad k nam **priezža-l**   otec.*
         Week   ago   to us   arrive.IPF-PST.3S father
         'Father had come to see us a week ago.'

(4)   *Nedelju nazad Marija **čita-l-a**   'Vojnu i   mir'.*
         Week   ago   Maria   read$_{IPF}$-PST.3s-FEM   War   and Peace
         'A week ago, Maria was reading *War and Peace*.'

Traditionally, this seeming 'optionality' has been dealt with by treating the imperfective as an unmarked member of an opposition with the perfective (Jakobson 1932)—the imperfective is thought to "posses no positive semantic mark which it would express constantly" (Bondarko 1971, cited from Rassudova 1984, pp. 14). Some have even claimed that "there is no such thing as the meaning of the imperfective; this 'aspect' is really a non-aspect" (Paslawska and von Stechow 2003, pp. 336). In search for a 'positive meaning' of this aspect, one often encounters analyses that treat it as being ambiguous, disjunctive or so grossly underspecified that they are 'nearly meaningless' (see Grønn 2003 for an overview). In this paper I propose to relate the culmination entailment properties of the Russian imperfective to atomicity. Extending analyses offered by Filip 2000 and Kagan 2007, I propose that the Russian imperfective is a partitive operator that encodes a generalized version of Landman's (1992) *continuation branch*—a function that allows one to trace how an event that is instantiated in the world of evaluation develops in some possible world. The idea is that the imperfective encodes a continuation branch function with the following restriction: an event is on the continuation branch for another event only if the latter is a part of the former. Assuming this part need not be proper, we allow for the possibility that an event 'develops' into itself in the world of evaluation and explain why an imperfective sentence can make reference to an atomic event, which in turn leads to a culmination entailment.

The other puzzle concerns how aspect constrains the temporal location of a VP-event part. The standard view (henceforth: *unirelational*) is to say that aspect constrains the temporal location of an eventuality relative to a single parameter: a *time* (cf. Reichenbach's

1947 REFERENCE POINT and Klein's 1994 TOPIC TIME). This time can be specified by a grammatical expression like an adverb. For example, the progressive in (1) locates the preparatory process of the letter writing event at the time denoted by *now*, while the perfect in (2) locates the consequent state of the letter writing event at this time.

The temporal parameter can also be specified by the discourse context. For example, the dinner making event described below, in (5b), is understood to follow *some time* after the coming home event described in (5a); (5) does not entail that the dinner making event occurred at the time denoted by *at 6*.

(5)   a.   Heloise came home at 6.
        b.   Abelard made her dinner.

To account for discourses like (5), Hans Kamp and colleagues (Kamp 1979, Kamp and Rohrer 1983, *et seq.*) proposed that aspect could locate a described eventuality relative to a contextually provided *event*. Assuming that eventualities can be mapped onto their run times, the view that aspect relates an eventuality to a *time* is maintained. A potential drawback of Kamp's proposal, however, is that events are related to times specified by an adverb differently from the way they are related to times provided by the discourse context—e.g. in (5a) the coming home is located *at* a time specified by an adverbial (i.e. 6 o'clock), but in (5b) the letter writing event is located *after* a time specified by the discourse context (i.e. run time of the coming home event). For this reason Kamp & Reyle (1993) distinguish the LOCATION TIME—i.e. the time specified by an adverbial—from the REFERENCE TIME—i.e. the time provided by the discourse context and thereby diverge from Reichenbach's (1947) unified notion of a REFERENCE POINT.[1]

Partee (1984) proposes to refine Kamp's analysis by saying that aspect can locate an eventuality relative to a salient time that is "just after" a previously mentioned discourse event. Webber (1988) recasts this idea in terms of the event structure in Fig. 1: aspect can locate an eventuality relative to the duration of a salient *consequent state* of a previously mentioned discourse event. On such an analysis, the letter writing event in (5b) is located *within* the duration of the consequent state of the coming home event (rather than *after* the coming home event). Such a proposal is elegant because it (i) makes use of an independently motivated event structure and (ii) relates events to times specified by an adverbial in the same way it relates events to times provided by the discourse context, thereby preserving Reichenbach's (1947) original insight.

Despite its elegance, I argue in the next section that the Partee-Webber approach cannot account for the dual nature of the Russian imperfective. This aspect is remarkable because it relates distinct event parts to a temporal parameter. Which part is at play depends on how this parameter is specified. If it is specified by an adverbial, then an *event* is located in time. If, on the other hand, it is specified by the discourse context, then a *consequent state* of an event is located in time. Based on these observations, I propose in the spirit of Kamp & Reyle (1993) that the Russian imperfective aspect is *birelational*: it requires two inputs—a grammatically constrained *time* and a salient discourse *state*—relative to which a described eventuality is located. The proposed analysis is presented in §3, where I also show how it generalizes to the English progressive.

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1   Based on *before* and *after* clauses, as well as temporal anaphora involving multiple event antecedents, Nelken and Francez (1997) provide independent evidence for positing two *time* parameters.

The main contributions of this paper can be summarized as follows. It provides two puzzles for a theory of aspect. The first concerns the quirky behavior of the Russian imperfective with regard to its culmination properties. The other concerns the dual nature of this aspect with regard to they way it constrains the temporal location of VP-event parts. I solve the former puzzle by appealing to the structure of atomic vs. non-atomic events and solve the latter by appealing to two temporal inputs required by an aspectual marker. These inputs reveal that aspectual meaning involves both temporal information and information about discourse connectivity.

2   A puzzle for a unirelational theory of aspect

Consider the flashback discourse in (6), which consists of a series of perfective sentences.[2] The initial two sentences in this discourse entail that the flower giving event precedes the kissing event. However, without the location adverbial in (6b), the understood event ordering is reversed: the flower giving is understood to follow the kissing. Moreover, the perfective clauses in (6b,c) form a narrative progression—i.e. the theater-inviting event is understood to follow the flower giving.

(6)   a.   *Nedelju nazad Marija po-celova-l-a   Dudkina.*
              Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin   **PFV**
              'A week ago, Maria kissed Dudkin.'

        b.   *Za   nedelju do togo on* **po-dari-l**   *ej   cvety*
              From week   to that   he PFV-give-PST.3s   her   flowers   **PFV**
              'A week before that he had given her flowers

        c.   *i*   **priglasi-l**   *ee   v   teatr.*
              and [PFV]invite-PST.3s   her   to theater   **PFV**
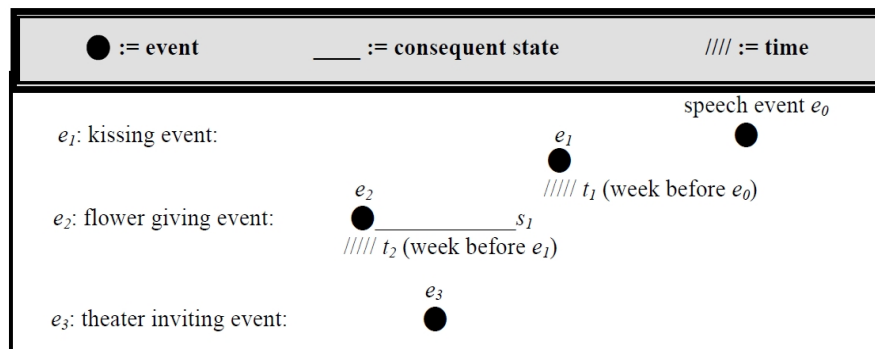   and (then) had invited her to the theater.'

Figure 2: Temporal ordering of events with the adverbial in (6b)

These observations are expected on a *unirelational* analysis of aspect, in which the temporal location of an eventuality is fixed relative to a single temporal parameter. For example, according to Webber's (1988) analysis sketched out in the previous section, the

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2   To the best of my knowledge Chvany (1985, 1992) was the first to discuss Russiab aspect in flashback discourses. See also Kamp & Rohrer 1983 for a discussion of flashback discourses in French, and Kamp & Reyle 1993 and Parsons 2002 for English.

flower giving event described in (6b) is located within a time that precedes the kissing event by a week (see Fig. 2 below); when the adverbial is not present, this event is located within the duration of the consequent state of the kissing event (see Fig. 3 below). Similarly, the theater inviting event described in (6c) is contained within the duration of the consequent state of the flower giving event described in (6b).[3]
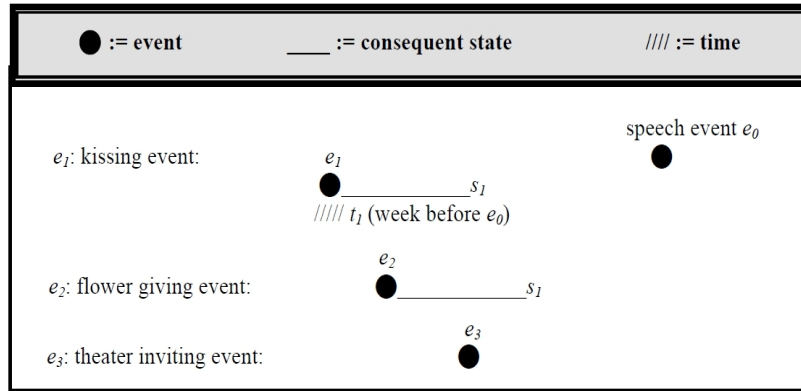

Figure 3: Temporal ordering of events without the adverbial in (6b)

Let us now consider the flashback discourse in (7), which is like (6), except that (7b) and (7c) are imperfective sentences.

(7) a. *Nedelju nazad Marija po-celova-l-a*   *Dudkina.*
         Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin   **PFV**
         'A week ago, Maria kissed Dudkin.'

     b. *Za   nedelju do togo on **dari-l**   ej   cvety*
         From week   to that he give$_{IPF}$-PST.3s her flowers   **IPF**
         'A week before that he had given her flowers

     c. *i   **priglaša-l**   ee v teatr.*
         and invite$_{IPF}$-PST.3s her to theater   **IPF**
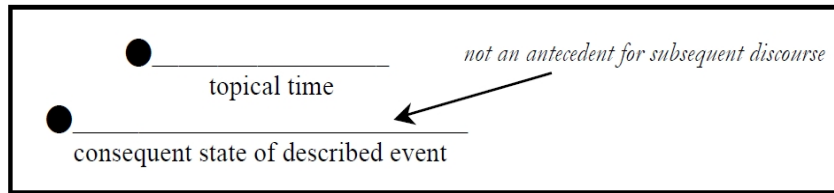   and (then) had invited her to the theater.'

Although there is no order that the events described in (7b) and (7c) are understood to have occurred in, both are understood to precede the kissing event in (7a). Interestingly, if the location adverbial in (7b) were not present, the understood event ordering in (7a,b) would remain unaltered.

A reasonable hypothesis that arises given theses generalizations is that the Russian imperfective is similar to the English perfect (cf. Paducheva 1996):

(8) HYPOTHESIZED ANALYSIS OF THE RUSSIAN IMPERFECTIVE
     The Russian imperfective encodes the temporal relation *topical time is contained within the duration of the consequent state of described event* (cf. Moens & Steedman 1988) and the consequent state of the described event does not serve as an

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3 Since an explicit theory of anaphora resolution is beyond the scope of this paper, I follow Kamp & Reyle 1993 and assume that we can identify the 'salient' antecedent in a given sentence based on our intuitions about the temporal ordering of eventualities—e.g. we know that the consequent state of the flower giving event serves as the antecedent in (6c) since we understand the theater inviting event to follow the flower giving event.

antecedent for subsequent discourse (cf. Muskens 1995).

Relating (8) to the discourse in (7), we would say that the topical time in (7b)—i.e. the duration of the consequent state of the kissing event—is contained within the duration of the consequent state of the event described in (7b)—i.e. the consequent state of the flower giving. This would explain why flower giving event is understood to precede the kissing event when there is no adverb in (7b). Moreover, assuming that the consequent state of the flower giving event does not serve as an antecedent for subsequent discourse, we would explain why there is no order that the events described in (7b) and (7c) are understood to have occurred in.

Despite its success, (8) cannot be maintained along with a *unirelational* analysis of aspect. To see why not, consider the following observation about (7b):

(9)   OBSERVATION
         (7b) entails that the described event culminated within the time denoted by the adverbial—i.e. (7b) is false if Maria did not successfully receive flowers from Dudkin a week before the kissing event.

Recall that according to a *unirelational* analysis, events are related to times specified by an adverbial in the same way they are related to times provided by the discourse context. Therefore, if (8) were right, then we would have to explain (9) in the following way: the imperfective in (7b) requires that the time denoted by the adverbial be contained within the duration of the consequent state of the giving event. As illustrated below in Fig. 4, this wrongly predicts that the consequent state of the flower giving event—rather then the flower giving event itself—took place a week before the kissing event:
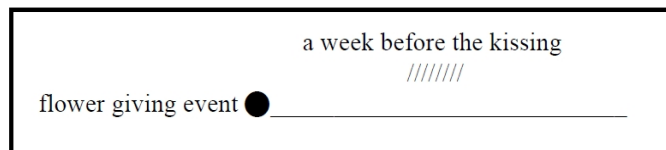

Figure 4: Wrong prediction

To make account for (9), we have to say that the flower giving event is contained within the time denoted by the adverbial. However, if that were right, and we wanted to maintain a *unirelational* analysis of aspect, then we would make the wrong prediction about the inferred discourse order in (7a,b) in cases where an adverbial is not present. In such cases, we crucially need an analysis along the lines of (8). Put differently, the Russian imperfective raises the following puzzle:

(10)   DISCOURSE CONNECTIVITY PUZZLE
         a.   If the temporal parameter is specified by an adverbial, then the Russian imperfective constrains the temporal location of an *event*.

b. If the temporal parameter is specified by the discourse context, then the Russian imperfective constrains the temporal location of a *consequent state*.

In the next section I propose what I call a *birelational* analysis of the Russian imperfective. After proposing a solution to the culmination puzzle discussed in the previous section, I extend the analysis by proposing that the Russian imperfective requires two inputs. Assuming that the value of one of these inputs is a time denoted by an adverbial expression (viz. Kamp and Reyle's location time) and the value of the other is a salient consequent state previously mentioned in a discourse (viz. Webber's consequent state-as-a reference point), I show how we can account for the discourse connectivity puzzle above. I end this paper by discussing a non-trivial issue concerning how the inputs required by the Russian imperfective are supplied.

3 A birelational analysis of the imperfective aspect

3.1 Solving the culmination puzzle

The analysis of the Russian imperfective proposed in this section is largely motivated by the first part of the discourse in (7), repeated below in (11). Recall that (11) is false if Maria did not successfully receive flowers a week prior to the kissing event.

(11) a. *Nedelju nazad Marija po-celova-l-a   Dudkina.*
Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin
'A week ago, Maria kissed Dudkin.'

b. *Za   nedelju do togo on **dari-l**   ej   cvety...*
From week   to that he give$_{IPF}$-PST.3s her flowers
'A week before that he had given her flowers...

The nuts and bolts of my proposal are as follows. An imperfective operator IPF combines with VP and requires that a VP-event stage be contained within a time denoted by an adverb (henceforth LOCATION TIME). Following Landman 1992, I assume that a stage of an event e is a part of the preparatory process of e that is "big enough and shares enough with e so that we can call it a less developed version of e" (Landman 1992: 23). Applying this idea to (11b), we would say that IPF combines with *darit' cvety* ('give flowers') and requires that a stage of a flower-giving event be contained within the LOCATION TIME, namely the time interval denoted by *za nedelju do togo* ('a week before that').

Fig. 5 illustrates the parallel between the Russian perfective and imperfective in (11a) and (11b) respectively: in both cases, an event is contained within the LOCATION TIME. The crucial difference is that IPF makes reference to a VP-event *stage* rather than a VP-event. However, this difference is neutralized in cases such as (11b), where the imperfective sentence describes an atomic event—i.e. a stage of an atomic VP-event is a VP-event.
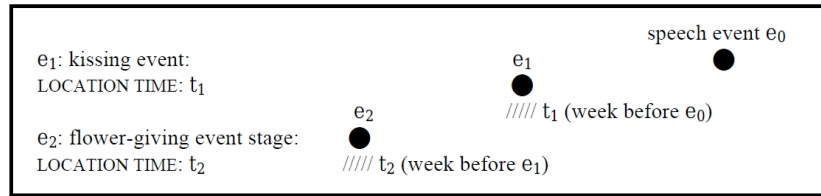
Figure 5: Locating a VP-event stage within the location time

In sentences like (12), however, the culmination difference is not neutralized. According to the proposal, this sentences entails that *some* VP-event stage culminated within the time described by *nedlju nazad* ('a week ago') and crucially not that the VP-event culminated within this time.

(12) *Nedelju nazad Marija čita-l-a   'Vojnu i   mir.'*
      Week   ago   Maria   read_{IPF}-PST.3s-FEM   War   and   Peace
      'A week ago, Maria was reading *War and Peace*.'

This prediction is captured by the unirelational imperfective operator in (13), where the t argument is intended to serve as the LOCATION TIME.

(13) UNIRELATIONAL IMPERFECTIVE OPERATOR (1ST VERSION)
      IPF ⤳ $\lambda P \lambda t.[w, e', e \mid \tau(e') \subseteq t, <e, w> \in \text{CONT}(e', w_0)]$; $P(e, w)$

Several comments are in order. To begin with, note that the representation in (13) combines λ-calculus of Montague Grammar (Montague 1970a,b; 1973) with DRSs of Discourse Representation Theory (DRT) developed by Hans Kamp and colleagues (Kamp 1981, Kamp and Reyle 1993). Such representations are commonly used in the literature on discourse interpretation to show the meanings of sub-sentential expressions.[4] Following Muskens 1995; 1996, I assume that representations like (13) do not get a direct interpretation, but rather serve as syntactic sugar that abbreviates more elaborate terms of typed λ-calculus that are interpreted. Due to space limitations I refer the reader to the aforementioned work for details about Muskens' abbreviations and interpretation rules.
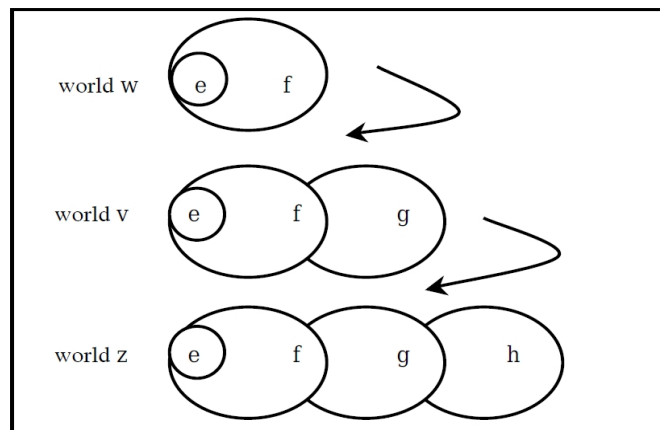

Figure 6: Continuation branch (to be amended)

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4   For example, see Latecki and Pinkal 1990, Asher 1993, Muskens 1995; 1996, Stone & Hardt 1999.

The other set of comments concern CONT in the meaning above. This is a generalized version of Landman's (1992) continuation branch function that allows one to trace how an event that is instantiated in the world of evaluation develops in some possible world. Landman's idea was as follows: when evaluating a progressive sentence, one takes the event stage that warrants the assertion in the world of evaluation and follows this event stage through its development. If it turns into a VP-event in the world of evaluation, then the sentence is true. If the event is interrupted before this happens, we jump to the closest world—which is like the world of evaluation, except that the event was not interrupted in this world—and follow through its development there. If there is another interruption, we jump to the next closest world and carry on following through the development of the event. Sooner or later, either one finds that the original event stage develops into an event of the desired type, in which case the sentence is true, or one decides that we are too far from the original world, in which case the sentence is false.[5]

In the discussion above, there is an implicit assumption that if an event is on the continuation branch for another event, then the latter is a *proper stage* of the former. This is captured by the axiom below, which has the predicate CONT* rather than CONT in (13).

AX1 $\forall e \, \forall e' \, \forall w \, \forall w' [<e, w> \in \text{CONT*}(e', w')) \rightarrow e' \sqsubset_{\text{stage}} e]$

Unlike CONT*, which is encoded by the progressive operator, CONT in (13) is more general: if an event is on the continuation branch for another event, then the latter is a *stage* of the former. This is captured by AX2 below. In turn, it follows that if an atomic event constitutes a single stage, an atomic event develops into itself in the world of evaluation and presumably in every other possible world.

AX2 $\forall e \, \forall e' \, \forall w \, \forall w' [<e, w> \in \text{CONT}(e', w')) \rightarrow e' \sqsubseteq_{\text{stage}} e]$

Given the proposed difference between the imperfective and progressive operators, we can now explain the differences between (14) and (15):

(14)   Mary was arriving at the station (when her cell phone went off).

(15)   *Marija priezža-l-a   na stanciju* (*vstrečat' svoix detej*).
         Maria arrive_IPF-PST.3s-FEM to station   meet   her   children
         'Maria (had) arrived at the station (to meet her children).'

The sentence in (14) has the following paraphrase: "there was an event going on which if not interrupted culminated in Mary's arrival at the station…" (Rothstein 2004: 48). According to this paraphrase, an arrival is not interpreted as an achievement (as is the case in the sentence *Maria arrived at the station*) but rather as accomplishment-like. This is expected given AX1 above: when the progressive operator combines with a VP, it requires that there be a proper stage of a VP-event. However, since achievements are atomic, coercion takes place whereby an achievement becomes accomplishment-like (see Moens & Steedman 1988, de Swart 1998, Rothstein 2004 and Bary 2009 for various formal implementations of this idea). On the other hand, given AX2, there is nothing in the grammar that forces an achievement to be coerced into an accomplishment when an achievement denoting VP combines with IPF.

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5   The idea of viewing the progressive as modal operator goes back to (at least) Dowty 1979. In addition to Landman's theory, there have been other implementations of Dowty's idea (see e.g. Bonomi 1997 and Portner 1998). To the best of my knowledge, they are all compatible with the analysis proposed here.

Consequently, it is not surprising that (15) can be paraphrased as follows: "there was an event which culminated in Mary's arrival at the station."

   I end this section by noting that (13) does not capture the aforementioned observation that without the adverb in (11b), the understood event ordering remains unaltered. That is, (13) does not account for the observation that the flower-giving event described in (16b) is understood to precede the kissing event described in (16a). This is the heart of the discourse connectivity puzzle described in the previous section and I now turn to providing a solution.

(16)   a.   *Nedelju nazad Marija po-celova-l-a   Dudkina.*
               Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin
               'A week ago, Maria kissed Dudkin.'

        b.   *On **dari-l**   ej   cvety...*
               He give$_{IPF}$-PST.3s her flowers
               'A week before that he had given her flowers...'

3.2   Solving the discourse connectivity puzzle

In order to make the correct prediction about (16), I propose that IPF not only makes reference to a VP-event stage but also to the consequent state of this stage. This means that a preparatory process of a given event consists not only of event stages, but also their consequent states. This is in accordance with Moens and Steedman's (1988) idea that "Any or all of [parts of an event] may be compound" (Moens & Steedman 1988: 18). Accordingly, I propose to revise Landman's continuation branch in Fig. 6 as in Fig. 7, where each stage consists of the entire event nucleus, i.e. a preparatory process, a culmination and a consequent state.
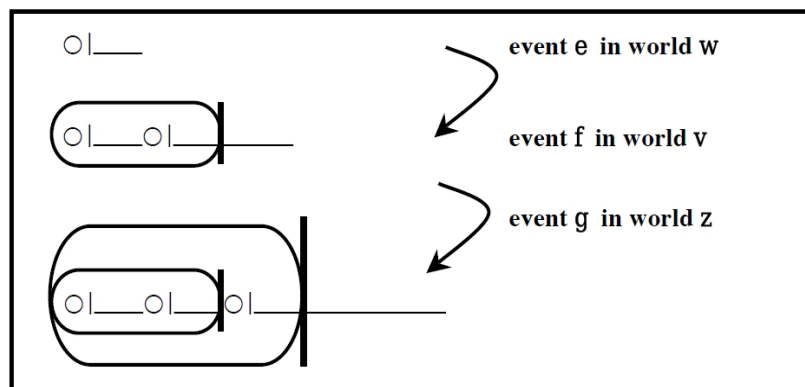

Figure 7: Continuation branch (final version)

   In turn, I propose in the spirit of Webber 1988 that IPF requires that a consequent state of a VP-event stage contain a TOPIC STATE, i.e. a salient consequent state previously mentioned in the discourse. The idea is, then, that the discourse properties of the Russian imperfective follow from relating two consequent states: one described by IPF and one supplied by the discourse context. For example, we would say that IPF in (16b) combines with *darit' cvety* ('give flowers') and requires that a consequent state of a flower-giving event stage contain a TOPIC STATE, which refers to the consequent state of the kissing event described in (16a).

As illustrated below in Fig. 8, the flower-giving event precedes the kissing event because the consequent state of the kissing event is contained within the consequent state of the flowering giving event stage.
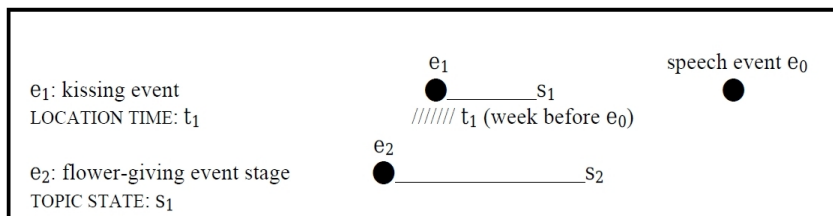

Figure 8: τ(TOPIC STATE) $\subseteq$ τ(consequent state of VP-event stage)

This prediction is captured by the imperfective operator in (17), where the s argument is intended to serve as the TOPIC STATE. Moreover, note that CONS is a function from an event to the consequent state of that event.

(17)   UNIRELATIONAL IMPERFECTIVE OPERATOR (2ND VERSION)
       IPF $\rightsquigarrow$ $\lambda P \lambda s.[w, e', e \mid \tau(s) \subseteq \tau(\text{CONS}(e')), <e, w> \in \text{CONT}(e', w_0)]$; $P(e, w)$

When the imperfective operator in (17), is combined with the imperfective operator proposed in (13), we get the *birelational* imperfective operator in (18).

(18)   BIRELATIONAL IMPERFECTIVE OPERATOR (FINAL VERSION)
       IPF $\rightsquigarrow$ $\lambda P \lambda s \lambda t.[w, e', e \mid \tau(e') \subseteq t, \tau(s) \subseteq \tau(\text{CONS}(e')),$
                    $<e, w> \in \text{CONT}(e', w_0)]$; $P(e, w)$

The imperfective operator above is birelational because in addition to requiring a VP-event stage to be contained within a LOCATION TIME t, it requires a consequent state of a VP-event stage to contain a TOPIC STATE s. In this way, IPF involves both temporal information and information about discourse connectivity.

A question that comes up is how (18) accounts for the well-known generalization in (19):

(19)   GENERALIZATION ABOUT SUBSEQUENT DISCOURSE
       The Russian imperfective does not trigger narrative progression.

This generalization is motivated for the aforementioned observation that there is no order that the events described in (20b) and (20c) are understood to have occurred in.

(20)   a.   *Nedelju nazad Marija po-celova-l-a   Dudkina.*
            Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin   **PFV**
            'A week ago, Maria kissed Dudkin.'

       b.   *Za   nedelju do togo on **dari-l**   ej   cvety*
            From week   to that he give_IPF-PST.3s her flowers   **IPF**
            'A week before that he had given her flowers

       c.   *i   **priglaša-l**   ee v teatr.*
            and invite_IPF-PST.3s her to theater   **IPF**
            and (then) had invited her to the theater.'

The IPF in (18) accounts for this observation as follows. Even though the operator makes reference to the consequent state of a VP-event stage—viz. $\tau(\text{Cons}(e'))$—this state is not introduced into the universe of the DRS. This means that the consequent state of a VP-event stage cannot serve as an antecedent for subsequent discourse. Therefore, when searching for a TOPIC STATE in (20c), the consequent state of the flower-giving event cannot be chosen. The only possible antecedent is the consequent state of the kissing event described in (20a), which I assume is made salient by the perfective aspect. From this it follows that the flower-giving and the theater-inviting events are located with respect to the same TOPIC STATE. Since both events contain this TOPIC STATE, there is no order that the events described in (20b) and (20c) are understood to have occurred.

Another question regarding IPF in (18) concerns how it accounts for discourses like (21), where the salient interpretation is one in which the event of the speaker coming in overlaps the event of Dudkin reading a *War and Peace*.

(21) a. *Včera   ja vo-še-l   v svoju komnatu.*
          Yesterday   I PFV-came.in-PST.1s in self   room
          'Yesterday, I came into my room.'

    b. *Dudkin tam **čita-l**   Vojnu i   mir.*
        Dudkin there read_IPF-PST.3s War   and Peace
        'Dudkin was there reading *War and Peace*.'

As illustrated below in Fig. 9, this event ordering is compatible with IPF, and in particular, with the relation $\tau(s) \subseteq \tau(\text{Cons}(e'))$. Here we see the consequent state of the coming in event being co-temporal with the consequent state of the reading event stage. From this, it follows that the reading event stage overlaps the coming in event as desired.
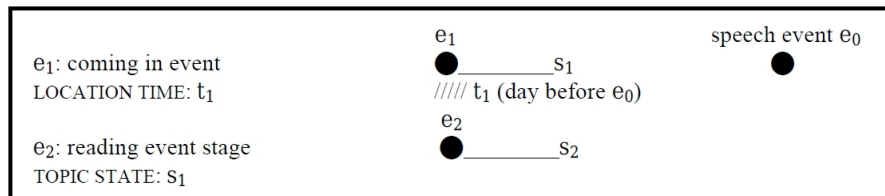

Figure 9: $\tau(\text{TOPIC STATE}) \subseteq \tau(\text{consequent state of VP-event stage})$

The question that comes up, of course, is why (21) does not have an interpretation parallel to (16), i.e. that the reading event described in (21b) took place *prior* to the coming in event described in (21a). After all, the proposed meaning of IPF allows this interpretation as well. Conversely, why doesn't (16) have the interpretation parallel to (21), i.e. that the flower-giving event described in (16b) overlaps the coming in event described in (16a)? The view advocated here is that there are, in fact, two possible event orderings that make (16) and (21) true. However, one of the possibilities is ruled out by world knowledge. With regard to (16), it seems rather unlikely that one kisses someone as they are receiving flowers. Instead, one typically (i) chooses to give flowers as a consequence of being kissed or (ii) kisses someone as a consequence of receiving flowers. The former option corresponds to Kehler's (2002) OCCASION defined below in (22), while the latter corresponds to Kehler's EXPLANATION relation, defined below in (23). The idea is that the semantics of IPF rules out the relation in (22), but is compatible with the relation in (23), which is inferred given world knowledge.

(22)   OCCASION$(S_1, S_2) \rightarrow E_1 <_t E_2$
(where the event described by S_2 explains, or is caused by, the event described by S_1)

(23)   EXPLANATION$(S_1, S_2) \rightarrow E_1 >_t E_2$
(where the event described by S_1 explains, or is caused by, the event described by S_2)

With regard to (21), the overlapping reading is derived as follows: the OCCASION relation in (22) is ruled out by the semantics of IPF and world knowledge rules out the EXPLANATION relation in (23), i.e. it would be odd to think that the coming in and the reading are somehow causally linked.[6] The only remaining relations that are compatible with the meaning of IPF are provided in (24) and (25). The ELABORATION relation in (24) is ruled out because (21a) and (21b) do not describe the same event. The BACKGROUND relation in (25), on the other hand, fits perfectly.

(24)   ELABORATION$(S_1, S_2) \rightarrow E_1 =_t E_2$
(where S_1 and S_2 describe the same event)

(25)   BACKGROUND$(S_1, S_2) \rightarrow E_1 \, O_t \, E_2$
(where S_2 describes the backdrop for the event described by S_2)

Let us now consider an imperfective sentence where the ELABORATION relation is chosen. An example of this sort is provided in (26).

(26)   a. *V ètoj porternoj ja na-pisal   pervoe ljubovnoe pis'mo k Vere*
In this tavern   I PFV-write-PST.1S first   love   letter to Vera
'In this tavern, I wrote my first love letter to Vera.'

        b. *Pisa-l   karandašom.*
Write.IPF-PST.1S   pencil
'I wrote it in pencil' (Forsyth 1970, pp. 86).

The ELABORATION relation is inferred here because (26a) and (26b) describe the same event. Note that this relation is compatible with (18) because IPF allows the consequent state of the letter-writing event described in (26a) to be co-temporal with the consequent state of the letter-writing event described in (26b) and, therefore, the two events may be identical.

In sum, the birelational meaning of IPF in (18) accounts for the generalization in (27), which has received very little attention in the literature in comparison to the generalization in (19), but which is nevertheless a core property of the imperfective aspect that any proper analysis must account for.[7]

(27)   GENERALIZATION ABOUT PRECEDING DISCOURSE
The Russian imperfective leads to an entailment that the described event *does not follow* a salient event previously mentioned in the discourse.

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6   One could, of course, imagine a situation in which e.g. the speaker is a detective and comes into his own room to figure out whether Dudkin was there earlier. In such a context, however, the event ordering in (21) would be on a par with (16).

7   The notion of 'salience' is meant to rule out cases in which the imperfective is not used in in narrative discourses of the type considered here.

It follows from (27) that there are two situations that make an imperfective sentence true. I argued that world knowledge determines whether a VP-event stage *overlaps* or *precedes* a previously mentioned discourse event. The latter typically involves an inference in which two events are causally related, invoking the Explanation relation, while the former typically does not involve a causal relation, invoking the Elaboration or the Background relation.

I end this section by raising the following question that comes up for the birelational analysis proposed here: Are all aspectual operators birelational or do they have different semantic types? Rather than addressing this question explicitly, I would like to show what a birelational analysis of English progressive is like. Consider the proposed meaning of the English progressive operator in (28):

(28)   Birelational progressive operator
$$\text{IPF} \rightsquigarrow \lambda P \lambda s \lambda t.[w, e', e \mid \tau(e') \subseteq t, \tau(s) = \tau(\text{Cons}(e')),$$
$$\langle e, w \rangle \in \text{Cont*}(e', w_0)] \; ; P(e, w)$$

There are two crucial differences between the progressive operator in (28) and the imperfective operator in (18). The first has to do with the predicate Cont* in (28) versus Cont in (18). This difference was discussed in the previous subsection and I will not say anything more here. The other difference concerns how the consequent state of the VP-event stage is related to the state argument. Whereas the imperfective encodes a subset relation— allowing for two possible temporal orderings of events, viz. Fig. 8 and 9—the progressive encodes an identity relation, thereby allowing for only one possible temporal ordering. For example consider the discourse below, in (29). Applied to the VP in (29b), the birelational progressive operator would require that the consequent state of letter writing event stage be co-temporal with the state argument. Assuming this argument serves as the consequent state the coming home event in (29a), it is correctly predicted that the letter writing and the coming home events overlap; see Fig. 10 below.

(29)   a.   Heloise came home at 2 in the morning.
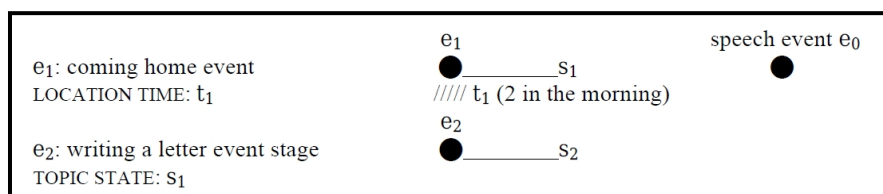   b.   Abelard was writing a letter to her uncle, the Canon.

Figure 10: $\tau(\text{topic state}) = \tau(\text{consequent state of VP-event stage})$

4   Conclusion

In the previous section I proposed a *birelational* analysis in which an aspectual operator requires two inputs. I assumed that the value of one of these inputs is a time denoted by an adverbial expression (viz. Kamp and Reyle's location time) and the value of the other input is a salient consequent state previously mentioned in a discourse (viz. Webber's consequent state-as-a reference point). Given these assumptions, I showed how we can account for the discourse connectivity puzzle motivated in §2. I end this paper by discussing a non-trivial

issue concerning how the inputs required by IPF are supplied.

Reconsider (30) and (31) and the proposed analysis of these discourses diagramed in Fig. 11 and Fig. 12 respectively.

(30)   a.   *Nedelju nazad Marija po-celova-l-a   Dudkina.*
              Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin
              'A week ago, Maria kissed Dudkin.'

        b.   *Za   nedelju do togo on **dari-l**   ej   cvety...*
              From week   to that   he give$_{IPF}$-PST.3s her flowers
              'A week before that he had given her flowers...'
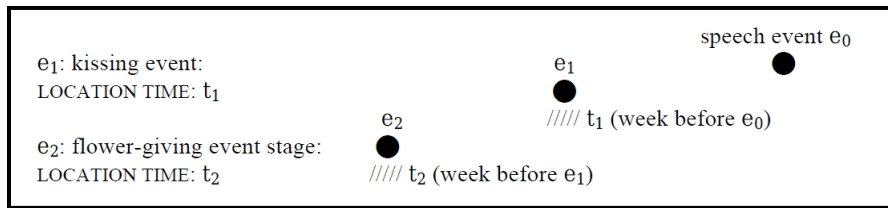

Figure 11: Locating a VP-event stage within the LOCATION TIME

(31)   a.   *Nedelju nazad Marija po-celova-l-a   Dudkina.*
              Week   ago   Maria PFV-kissed-PST.3s-FEM Dudkin
              'A week ago, Maria kissed Dudkin.'

        b.   *On **dari-l**   ej   cvety...*
              He give$_{IPF}$-PST.3s her flowers
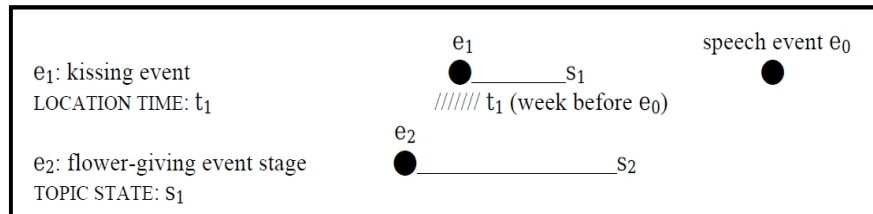   'A week before that he had given her flowers...'

Figure 12: τ(TOPIC STATE) $\subseteq \tau$(consequent state of VP-event stage)

The following question comes up for the analysis of (30) in Fig. 11: Where is the TOPIC STATE and what role does it play? Conversely, the following question comes up for the analysis of (31) in Fig. 12: Where is the LOCATION TIME for e_2 and what role does it play? A possible answer to these questions, pursued in Altshuler 2010, is that the s input required by IPF is supplied by temporal location adverbs. Certain adverbs require that the value of s be determined by the discourse context, while other adverbs leave the value of s unspecified. In examples such as (30b), the adverb *za nedelju do togo* ('a week before that') leaves s unspecified; the condition $\tau(s) \subseteq \tau(\text{CONS}(e'))$ amounts to the weak (and harmless) claim that the run time of some state is contained within the consequent state of a VP-event stage. In examples like (31b), however, a covert adverbial that resembles the narrative marker *then* requires that s be identified with a salient antecedent, i.e. a TOPIC STATE (cf. Bäuerle's 1979 silent 'once'). Therefore, the condition $\tau(s) \subseteq \tau(\text{CONS}(e'))$ amounts to saying that a the run time of a previously mentioned consequent state is contained within a VP-event stage. With regard to the t input required by IPF, a reasonable hypothesis is that it is supplied by the

tense, though its value is constrained (sometimes completely determined) by temporal location adverbs. In cases where no adverb is present syntactically, viz. (31b), t is supplied by the tense but left unspecified by a covert adverbial; the condition $\tau(e') \subseteq t$ amounts to the weak (and harmless) claim that a VP-event stage is contained within some time.

Acknowledgements

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