New Insights into Linguistic Communicative Behaviour

Edited by

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Cambridge
Scholars
Publishing

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This book first published 2022

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

CHAPTER SEVEN

ON TEMPORAL ADJUNCTS AND THE IMPERFECTIVE ASPECT IN ROMANIAN

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We discuss the constraints on temporal modifiers of the event time (ET, as opposed to "reference time", RT) with the imperfective, in Romanian, arguing that they are problematic for one of the most widespread semantic analyses of the imperfective aspect, the inclusion view (in which the imperfective is very similar to the perfective, differing only by the direction of the inclusion relation: $RT \subseteq ET$). We support instead, the incompleteness view, according to which the imperfective only asserts a part of the event, up to RT, while the continuation after RT is under a modal operator (an intensional semantics similar to Dowty's (1979) analysis of the English progressive). Thus, single-event imperfectives do not allow ET modifiers that localize the event, specify its extent or its right-boundary. In multiple-event imperfectives, these constraints do not apply to the individual events in the scope of the pluractional operator, but hold of the whole series of events. We propose a compositional account for these facts.

Keywords: aspect, imperfective, temporal adjuncts, habituals, event time

1. Introduction

Most of the semantic literature agrees that viewpoint Aspect expresses a relation between the time interval of the event and a further time interval variously called Reference Time (Reichenbach 1947), Topic Time (Klein 1994) or Assertion Time (Demirdache & Uribe-Etxebarria 2004), whose relation to the Utterance Time will be further specified by Tense[1]. In this article we will use the terms Event Time (ET) and Reference Time (RT) for the time intervals related by Aspect. In compositional terms, Asp

existentially binds the time of the event and introduces a property of times that will become an argument of Tense. For the imperfective Aspect, there are two main types of analyses in the literature:

(i) **the *inclusion view***, according to which the imperfective simply states that RT is included in ET (see (1); for other variants of this formula, see Klein 1994, Pancheva 2003, Paslawska & von Stechow 2003, Demirdache & Uribe-Etxebarria 2004, 2014):

(1) Imperfective: $\lambda P_{<i,<s,t>>} \lambda t_i \, \lambda w_s \, \exists e \, (t \subseteq time(e) \, \& \, P(e)(w)=1)$

(Kratzer 1998)

In contrast, for the perfective the inclusion relation is reversed (ET $\subseteq$ RT; see Kratzer 1998, Pancheva 2003, Paslawska & von Stechow 2003).

(ii) **the *incompleteness view***, according to which the imperfective has an intensional semantics similar to that of the English progressive in Dowty-style analyses (see Dowty 1979): while in the perfective a completed event is asserted, in the imperfective only a part of the event, from its beginning up to RT, is asserted in the current world of evaluation, and its continuation is in the scope of a modal, taking place only under normal circumstances (in what Dowty calls "inertia worlds"). In this view, the inclusion relation RT $\subseteq$ ET is correct, but does not exhaust the semantics of the imperfective, it is only a consequence of its general denotation.

In this article, we will show that the interaction of temporal modifiers with the imperfective, in Romanian, supports (ii) over (i). The main differences between the imperfective and the perfective can be summarized in the following generalization, whose connection with the incompleteness view is clear:

(2) For the imperfective aspect, only the asserted part of the event in the immediate scope of the Asp operator, from its left boundary (LB) up to RT, is visible for temporal modification, whereas for the perfective, the whole event interval is involved in temporal modification.

The data concerning ET modification with the imperfective and perfective aspect is presented in section 2. Most of the empirical generalizations we will present have already been pointed out by Crăiniceanu (1995, 2002). Similar facts have been noticed for other Romance languages: French and Italian (de Swart 1998, Giorgi & Pianesi 2004, Arosio 2003, 2010, 2019), Spanish (Arche 2014; see also Squartini 1998 for Romance in general). However, these studies did not make the connection with the debate between the intensional and the extensional

analyses of the imperfective. We will make this connection in section 3, where we will present the Dowty-style analyses of the imperfective (§3.1) and then develop a compositional account of the observed generalizations, where the constraints on ET-modification with the imperfective follow from the semantic types of the various temporal modifiers and their interaction with aspectual operators (§§3.2-3.6). Because previous analyses proposed a third, homogeneity-based account (De Swart 1998, followed by Crăiniceanu 2002, Arosio 2003, 2010, 2019), we will present some problems of this account in an Appendix of this article.

2. The data

In Romanian, the imperfective vs. perfective opposition is overtly expressed in the past, where the imperfect tense instantiates the past imperfective and the compound perfect instantiates the past perfective. This is illustrated in (3), where we use an RT modifier – recall that the inclusion of RT in ET holds in both accounts of the imperfective:

(3) a. La ora   trei,   a   vorbit cu Maria.
        at hour-the three has talked with Maria
        "At 3 o'clock, (s)he talked to Maria."
        = the interval of the event "he talked to Mary" is improperly
        included in a brief interval surrounding the time "three o'clock"

   b. La ora   trei, vorbea   cu Maria.
        at hour-the three talk.IMPF.3SG with Maria
        "At 3 o'clock, (s)he was talking to Maria"
        = the interval of the event "he talked to Mary" includes
        the brief interval surrounding the time "three o'clock"

In certain regional varieties and in the narrative style of the written register, the past perfective can also be realized by the simple past (e.g. *Atunci vorbi cu Maria* 'then talk.PST.3SG with Maria'), but as this form is no longer in use in present-day spoken standard Romanian, we will not use it as an illustration of the past perfective in this article. As the aspectual opposition is overtly marked in the past, we will mainly rely on examples with the past tense in our investigation of ET modification with the two aspects.

2.1 Single-event contexts

When describing a single event, the imperfect rules out ET-temporal
modifiers (i) that localize the event (see *dimineața* "in the morning" in
(4)), (ii) that refer to its right boundary (RB) (see *până la plecarea mea*
"until my departure" in (4)) or to both boundaries (see *de la 3 la 6* "from 3
to 6" in (4)), or (iii) that specify the extent of the whole event (see *(timp
de) 3 ore* "for 3 hours" in (4); the ET-modifiers are boldfaced in the
examples; the sentence-initial temporal adjunct is an RT-modifier):

(4) Când am   ajuns, Maria scria   / stătea   în fotoliu
    when have.1 arrived Maria wrote.IMPF sat.IMPF in armchair
    {**dimineața** /**până la plecarea   mea** /**de la 3 la 6**
     morning-the until   departure-the my   from 3 to 6
    /**timp de trei ore** }.
     for   three hours
    "When I arrived, Maria was writing/ sitting in the armchair {*in
    the morning / *until my departure / *from 3 to 6 / *for 3 hours}"".

    But ET-modifiers are not ruled out completely. Those involving only the
left boundary (LB) of the event are allowed: (iv) LB localizers (see *de la ora
trei* "since 3 o'clock" in (5)) and (v) modifiers measuring the extent from LB
to RT (see *de trei ore* in (5), corresponding to Engl. *for 3 hours* + the perfect):

(5) Când am   ajuns, Maria scria/   stătea în fotoliu
    when have.1 arrived Maria wrote.IMPF sat.IMPF in armchair
    {**de   la ora   trei** /**de trei   ore**}.
    from   at hour-the three   from three hours
    "When I arrived, Maria had been writing/ sitting in the
    armchair {since 3 o'clock / for 3 hours}."

    The modifiers of types (i)-(iv) are compatible with the perfective past:

(6) Ieri,   Maria a {scris/   stat în fotoliu} {**dimineața**
    yesterday Maria has written/ sat in armchair   morning-the
    /**până la plecarea   mea** / **de la 3 la 6** / **timp de trei ore**   /
    until   departure-the my   from 3 to 6   for   three hours
    de   la ora   trei.}
    from   at hour-the three
    "Yesterday, Maria {wrote/sat in the armchair} {in the
    morning/ until my departure / from 3 to 6 / for 3 hours / from
    3 o'clock."

Modifiers of type (v), which indicate the extent from LB to RT, are incompatible with the perfective:

(7) *Ieri,   Maria a {scris / stat în fotoliu} **de   3 ore**.
    yesterday Maria has written / sat in armchair of/from 3 hours

The impossibility of modifiers that involve the RB is also found with the present tense, when it refers to events ongoing at speech time:[2]

(8) Sunt la Braşov. *Stau   aici **de ieri   până mâine**.
    am   at Braşov   stay.1SG here from yesterday until tomorrow
    "I'm in Braşov. *I'm staying here from yesterday until tomorrow."

The data presented so far are summarized in Table I.

Table I

	Single-event imperfective	Perfective
(i) Temporal localizers (*dimineaţa* "in the morning")	*	✓
(ii) RB-localizers (*până la 3* "until 3 o'clock"), LB+RB localizers (*de la 3 la 6* "from 3 to 6")	*	✓
(iii) Total extent (*timp de 3 ore* "for 3 hours")	*	✓
(iv) LB-localizers (*de la 3* "from/since 3 o'clock")	✓	✓
(v) LB-RT extent (*de 3 ore* "for 3 hours + perfect")	✓	*

2.2 Habituals and other pluractional environments

In contrast to single-event imperfectives, habitual imperfectives do allow ET modifiers of types (i)-(iii), on condition that they apply to the individual events in the series (see the boldfaced phrases in (9); the sentence-initial adverbial is an RT modifier):

(9) Anul   trecut stăteam   în fotoliu   / scriam
    year-the past   sat.IMPF.1SG in armchair / write.IMPF.1SG
    dimineaţa / **până seara**   / **de la 3 la 6**
    morning-the until evening-the   from 3 to 6
    / **timp de trei ore** }.
     for   three hours
    "Last year I used to {sit in the armchair/write} {in the morning /
    until the evening / from 3 to 6 / for 3 hours}" =
    "There is a past stretch of time including the last year in which
    there is a plurality of events *e* such that *e* is an event of the
    Speaker's {staying in the armchair / writing} and *e* takes place
    in the morning / lasts until the evening/ stretches from 3 to 6 / lasts for
    3 hours."

The temporal modifiers embedded under the pluractional (referring to
the individual events in the series) clearly show that ET is accessible to
temporal adjuncts (on the assumption that there is a single RT per clause)[3].
    The restrictions on ET modification observed in the previous sub-
section still hold, but they apply to the whole series of events. Thus, we
cannot specify the RB or the extent of the period during which the pattern
of repeated events holds:

(10)   Când am   cunoscut-o, Maria mergea   vara   la Paris
        when have.1   met-her   Maria go.IMPF.3SG summer-the to Paris
        {***din 1989   până în 1995 / *timp de 6 ani**}.
         from 1989 until   1995   for   6 years
        "When I met her, Maria used to go to Paris in summer {*from
        1989 until 1995 / *for 6 years}"

As with single-event imperfectives, modifiers accessing the LB of the
series are allowed:

(11)   a. Pe atunci, [[mă întâlneam   cu el   seara]
           by then   REFL met.IMPF.1SG with him evening-the
           deja   de 2 ani].
           already from 2 years
           "Around that time, I had been meeting him in the evening for
           2 years already."

b. [[Se   scula   la 7 dimineaţa] **din 2014, de**
        REFL wake-up.IMPF.3SG at 7 morning-the from 2014 from
când îşi   găsise   job tocmai în Berceni].
when REFL.3SG.DAT had-found job right   in Berceni
"He had been waking up at 7 o'clock in the morning ever
  since 2014, when he had found a job as far as Berceni."

The examples above point to the existence of two layers of temporal modification in habituals: the layer of the single events in the scope of the habitual operator HAB (see *seara* "in the evening" in (11)a, *vara* "in the summer" in (10), *timp de 3 ore* "for 3 hours" in (9), etc.) and a higher layer above HAB, referring to the whole series. If we view this series itself as an eventuality (derived from basic eventualities by the use of HAB; see Boneh & Doron 2011), the behavior of temporal modification in single-event and habitual context can be unified: in both cases, the event in the immediate scope of the imperfective Aspect does not allow modifiers of types (i)-(iii).

Summing up, ET-modifiers are sensitive to whether the event is presented as "completed", "terminated" or "bounded" (the term "terminated" is used by Giorgi & Pianesi 2004, the term "bounded" is used by Iatridou et al. 2001):

(12)   a. Localizing modifiers and modifiers involving RB or both boundaries (LB and RB), including total extent modifiers, require a bounded event (see ex. (6)) – we will call them *bounded event modifiers*;

        b. Extent modifiers measuring the LB-RT interval require an unbounded event (see (5) vs. (7))

        c. LB- localizing modifiers are compatible with both +/-bounded (see ex. (5)-(6))

In imperfective habituals, the events in the scope of HAB are bounded, but HAB creates an unbounded eventuality which will become the argument of the imperfective aspect operator:

(13) Asp_{impf} [Hab [+bounded]]$_{-bounded}$

Thus, the imperfective is actually consistent in both single-event and habitual uses in taking unbounded eventualities.

The eventuality created by HAB can also combine with the perfective Aspect, in which case the event is bounded, allowing modifiers that involve the RB (see the boldfaced phrases in (14)):

(14)   a. [[Am   mers la bazin dimineaţa] {**timp de trei ani**   /
           have.1 gone to pool morning-the for   three years
           între   2000 şi 2003}].
           between 2002 and 2003
            "I went/used to go to the pool in the morning for three years /
            between 2001 and 2003."

        b. [[Am   lucrat între   6 şi 9 dimineaţa] {**timp de trei**
           have.1 worked between 6 and 9 morning-the for   three
           ani   / între   2000 şi 2003}].
            years /between 2000 and 2003
          "I used to work between 6 and 9 in the morning for three years
           / between 2001 and 2003"

        c. [**Din 1993 până în 1999** [Maria a   studiat la pian **câte trei**
          from 1993 until   1999 Maria has studied at piano DISTR 3
          ore   zilnic]].
          hours daily
           "From 1993 to 1999 Maria studied the piano 3 hours per day"

(15) Asp_{pfv} [Hab [+bounded]]$_{+bounded}$

Note furthermore that Asp_{impf} can take pluractionals that do not rely on HAB, but contain a quantificational adverbial (see the boldfaced phrases in (16)); in (16)a-b *la 7* "at seven" is a localizer of the bounded events in the scope of the Q-adverb; in (16)c, *de 3 ani* is a RB-RT extent modifier applying to the plural eventuality:

(16)   a. Anul   trecut mă trezeam   **adesea / uneori**   la 7.
           year-the past   REFL wake-up.IMPF.1SG often / sometimes   at 7
            "Last year I {rarely/often/sometimes} woke up at 7."

        b. Anul   trecut nu mă   trezeam   **niciodată** la 7.
           year-the past   not REFL woke-up.IMPF.1SG never   at 7
            "Last year I {rarely/often/sometimes} woke up at 7."

c. De 3 ani încoace mă duc   **rar**   pe la ea.
   from 3 years hitherto REFL go.PRS.1SG rarely by at her
   "For the last 3 years I haven't been visiting her so often."

The fact that pluractional eventualities that combine with Asp$_{impf}$ are unbounded also explains why they do not allow modifiers introducing a specific number of occurrences:[4]

(17)   * Luna   trecută mă   trezeam   de 20 de ori la 6.
    last-the month REFL wake-up.IMPF.1SG of 20 of times at 6
    "*Last month I used to wake up at 6 20 times."

3. Accounting for the observed generalizations

The observed generalizations are problematic for the inclusion view of the imperfective, which treats this aspect in a very similar way to the perfective (see (1) above as well as other similar formulations in (18)):

(18)   a. TT INCL TSit: IMPERFECTIVE
        TT AT TSit: PERFECTIVE   (Klein 1994, 108)

        b. ⟦UNBOUNDED⟧ = λP λi ∃e [i⊆τ(e) & P(e)]
        ⟦BOUNDED⟧ = λP λi ∃e [τ(e)⊂i & P(e)] (Pancheva 2003)

        c. Progressive: AST-T WITHIN EV-T
        Simple tenses: AST-T binds EV-T
         (Demirdache & Uribe-Etxebarria 2004)

        d. INCLUDES = λP$_{<v,t>}$λt∃e.τ(e)⊆t & P(e) ("perfective")
        INCLUDED = λP$_{<v,t>}$λt∃e.t⊆τ(e) & P(e) ("imperfective")
                (Paslawska and von Stechow 2003, 322)

Under these analyses, it is not clear why ET modification is so constrained for imperfectives, as opposed to perfectives: note that the event interval (TSit in (18)a, τ(e) in (18)b,d, EV-T in (18)c) occurs in the formulae of both aspects. Since this interval, with its two boundaries, is accessible for modification in the perfective, we expect it to be accessible for modification in the imperfective as well.

Under the incompleteness view, the restrictions on ET modification can be accounted for by a single general principle:

(19)   Temporal modification cannot access the continuation of the event
        in inertia worlds. Only the asserted part of the event is available
        for temporal modification

    This principle immediately explains the impossibility of modifiers
involving RB – RB localizers and total extent modifiers. As for temporal
localizers (type (i): *dimineaţa* "in the morning", etc.), their impossibility
follows once we assume that they involve the localization of the *entire*
event.

3.1 Imperfective Aspect and incompleteness

The idea that the continuation of the event beyond RT is in the scope of a
modal, taking place under normal circumstances, was first proposed by
Dowty (1979) for the English progressive and further developed by
Kearns (1991), Landman (1992), Portner (1998). This type of analysis
was extended to the imperfective in general by several authors (Bary
2009, Deo 2009, Altshuler 2014, Ferreira 2016).
    The existence of an intensional component is visible in progressives
built on telic predicates:

(20)   a. Mary was building a house, but she never finished it.

        b. Mary was crossing the street when she was hit by a truck.

    Dowty (1979:148) proposed that the event continues in *inertia* worlds,
defined as "worlds which are exactly like the given world up to the time in
question and in which the future course of events after this time develops
in ways most compatible with the past course of events". Based on this
notion, he gives the following semantics for the progressive, where
Inr(<I,w>) is a notation for the inertia worlds for w, at I:

(21)   [PROG ϕ] is true at <I, w> iff for some interval I´ such that I⊂I´
        and I is not a final subinterval for I´ and for all w´ such that
        w´∈Inr (<I, w>), ϕ is true at <I´, w´> (Dowty 1979, 149)

    Landman (1992) proposed an amendment of this analysis: because of
examples such as (20)b, the definition of what counts as a normal course
of events should not take into account the entire world of evaluation
(otherwise, in no inertia world would Mary get to the other side of the

street), but should instead focus on the event at hand. Thus, he proposed a notion of inertia world that is dependent on the event:

(22)   "Mary is crossing the street is true in w at i iff some process of crossing by Mary, e, is going on in w at i and in every inertia world for w and e at i, i.e., in every world where e is allowed to follow its normal course, there is an interval surrounding i where *Mary cross the street* is true." (Landman 1992, 11)

The worlds where the continuation of e is considered are based on a notion of event-relativized normality:

(23)   A world v is a reasonable option of e in w (notated R(e,w)) "iff there is a reasonable chance on the basis of what is internal to e in w that e continues in w as far as it does in v." (Landman 1992, 25)

The worlds which are reasonable options of e in w, together with e, form the continuation branch of e in w, which is recursively built as follows (starting with w itself): each time an interruption occurs in a world v, the search for a more developed event moves to the closest world that is in the set of reasonable chances of e in w, until all such worlds are exhausted. Based on the notion of continuation branch, Landman defines the progressive as a relation between an event and a property of events: PROG (e, P) is true in w iff there is an event f and a world v such that the pair $\langle f,v \rangle$ is in the continuation branch of e in w and f is a P-event:

(24) $[\![PROG(e,P)]\!]_{w,g} = 1$ iff $\exists f \exists v:\langle f,v \rangle \in CON(g(e),w)$ and

$[\![P]\!]_{v,g} (f) = 1$,
where CON(g(e),w) is the continuation branch of g(e) in w
(Landman 1992, 27)

Portner (1998) realizes that the absence of interruptions, which is crucial in the definition of continuation branches, can be seen as an *ordering source* within Kratzer's (1977, 1981, 1991) semantics of modality. Thus, the worlds where the continuation of the event is checked are chosen among a circumstantial modal base, Circ(e), comprising the circumstances relevant to whether e is completed. The ordering source is the set of propositions which assert that e does not get interrupted, notated NI(e). Portner further argues that Circ must also take into account a property of events, the way in which e is described (otherwise, *Mary was*

crossing the street and *Mary was walking into the path of an oncoming bus*, which are alternative descriptions for one and the same event, would be indistinguishable). The set of worlds where the continuation of the event is checked is obtained by choosing, among the worlds of the modal base Circ(e), those that are closest to the non-interruption ideal NI, see (25)a; based on this, the semantics of PROG is defined as in (25)b:

(25) a. Best(Circ, NI, e, P) = the set of worlds w′ in ∩Circ(e, P) such that there is no w′′ in ∩Circ(e, P) where $w''<_{NI,e}w'$.

  b. PROG(e, P) is true at a world w iff for all worlds w′ in Best(Circ, NI, e, P), there is an event e′ which includes e as a nonfinal subpart, such that P(w′)(e′) is true.

(Portner 1998,782, (46))

An extension of Portner's semantics of the progressive to imperfectives in general can be found in Ferreira (2016). Other Dowty-style analyses of the imperfective can be found in Bary (2009) for Ancient Greek and in Deo (2009) for the imperfective in general.[5]

3.2 Towards an account

As already announced, we relate the constraints on ET modifiers with the imperfective to the fact that the imperfective introduces an *incomplete* event, which continues in inertia worlds (we use this term as a shortcut for the more precise characterizations developed by Landman 1992 and Portner 1998). We propose that the imperfective of Romanian (and arguably the other Romance languages, where similar restrictions on ET modification are attested, see §1) has the semantics of the English progressive, differing from it by not being restricted to dynamic events – it can combine with all types of eventualities, including states and the pluractional eventualities discussed in §2.2, which can be viewed as a type of state. This characterization of the imperfective does not carry over to all categories called "imperfective" in languages of the world – in particular, it does not hold for Slavic.[6]

Adopting this view, we formulated the generalization that temporal modification cannot access the continuation of the event in inertia worlds (see (19)). One may wonder whether this constraint can be made to follow from the theory of inertia worlds – e.g., one might claim that there is no unique time interval of the completed event across inertia worlds. We do not regard this as a promising approach. Contexts may be imagined where

the temporal interval of the event is the same in all inertia worlds; yet, ET modifiers that access the completed event, such as extent modifiers, are still impossible (although the VP can contain descriptive content that only characterizes the complete event – see telic predicates: *was creating a unicorn, was drawing a circle, was crossing the street*):

(26)   ?? Sonda   călătorea   spre   Lună în 88 ore (când
           spacecraft-the travel.IMPF towards Moon in 88 hours when
           un meteorit a   lovit-o).
           a meteorite has hit-it
           "*The spacecraft was travelling to the Moon in 88 hours (when
            a meteorite hit it)."

   We are thus led to conclude that the impossibility of accessing the time interval of the whole event is encoded in the grammatical system. We will develop an analysis in which the incompatibility of certain temporal modifiers with the imperfective follows from semantic type mismatches. The main idea is that bounded event modifiers either produce or require a property of times (are either $\langle v,t \rangle \langle i,t \rangle$ or $\langle i,t \rangle \langle i,t \rangle$), whereas Asp_{impf} needs to combine with a property of events ($\langle v,t \rangle$).

3.3 Temporal location modifiers

Temporal location modifiers are usually considered to modify properties of time intervals – see Dowty (1979), Abusch (1998), von Stechow (2002a), Rathaert (2012), Arosio (2019). This is supported by the fact that they can apply to the RT – see the various sentence-initial temporal adjuncts in the examples in §2 (ex. (3)-(6), (9), (10), (11)a, (16)a-b). Since the RT is not associated to a distinct event, but it is related to the time of the event described by the vP via viewpoint Aspect, a natural assumption is that above the aspectual operator that introduces RT, the denotation is no longer of type $\langle v,t \rangle$ (property of events) but becomes $\langle i,t \rangle$ (property of times), a property that will be saturated by the RT introduced at the T level. This is the general view in the inclusion analysis, see (1), (18)b,d, but it is not incompatible with the incompleteness analysis – Ferreira (2016) modifies Portner's (1998) formula of the progressive such as to obtain a property of times, making Asp_{impf} of type $\langle\langle v,st \rangle\langle t,st \rangle\rangle$, a move that we will also adopt.

   If temporal localizers are of type $\langle it,it \rangle$ and the complement of Asp_{impf} is of type $\langle v,t \rangle$, the impossibility of applying localizers to the event taken as an argument by Asp_{impf} follows immediately, from a type mismatch –

see (27), where we boldfaced the types that do not match (we omit the world argument, for simplicity):

(27) $\text{Asp}_{<vt><it>}$ [Temp-localizer$_{<it,it>}$ XP$_{<it>}$]$_{<i,t>}$

But if temporal location modifiers are $<it,it>$, how can they ever specify the ET? We have seen in §2 that the perfective allows ET-localizers (see ex. (6)) and arguably the same happens with the perfect aspect (see the ET modifiers with the pluperfect in fn. 2). We propose that ET-localizing modifiers (type (i) in §2) do not directly apply to a $<v,t>$ constituent, but require the previous application of an operator BOUNDED of type $<vt,it>$ that binds the e variable and returns a property of its temporal trace:

(28)   [Temp-localizer [BOUNDED [vP]]]

(29) $[\![\text{BOUNDED}]\!] = \lambda P_{<v,t>} \lambda t \exists e(P(e) \wedge t=\tau(e))$

Here is an example of semantic composition involving the ET-localizer *at noon*:

(30) $[\![\text{rain at noon}]\!] = [\![$ [BOUNDED rain] [at noon]$]\!]$
        $[\![\text{at noon}]\!] = \lambda P_{<i,t>} \lambda t (P(t) \wedge AT(t,12AM))$
        $[\![$ [BOUNDED rain] [at noon]$]\!] = \lambda t \exists e(rain(e) \wedge t=\tau(e))$
        $[\![\text{rain at noon}]\!] = \lambda t \exists e(rain(e) \wedge t=\tau(e)) \wedge AT(t,12AM)$

In order to further combine this expression with perfective Asp, we need to assume that the Asp_{pfv} takes an $<i,t>$ argument; as for Tense, we assume the pronominal analysis (PAST is an indexed pronoun restricted to intervals before Utterance Time; see Partee 1973, Enç 1986, Heim 1994, Kratzer 1998):
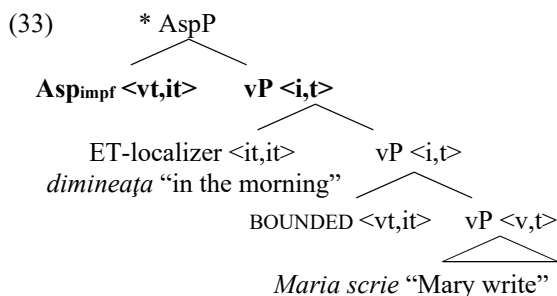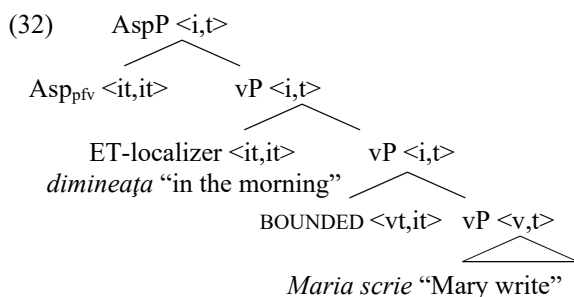
(31) $[\![\text{It rained at noon}]\!] = \text{PAST}_1 ([\![\text{PFV}]\!] ([\![\text{rain at noon}]\!]))$
        $[\![\text{PFV}]\!] ([\![\text{rain at noon}]\!]) = \lambda t \exists t' (t' \subseteq t \wedge \exists e(rain(e) \wedge t'=\tau(e))$
        $\wedge AT(t',12AM))$
        $[\![\text{It rained at noon}]\!] = \exists t' (t' \subseteq \text{PAST}_1 \wedge \exists e(rain(e) \wedge t'=\tau(e)) \wedge$
        $AT(t',12AM))$

The BOUNDED operator in (29) can be seen as reflecting a (lower) aspectual head. Although it looks very similar to the perfective Aspect, we

keep it distinct because, as we have seen in §2.2, bounded events are also possible in the scope of HAB, and HAB itself occurs in the scope of viewpoint Aspect.

The behavior of ET-localizers with perfective and imperfective Asp is summarized in the trees below (as we do not include the Tense-layer, we give the uninflected form of the verb in the trees, under vP; in (33) we boldfaced the configuration that gives rise to a type mismatch):

(32)   AspP $\langle i,t \rangle$

Asp$_{pfv}$ $\langle it,it \rangle$ vP $\langle i,t \rangle$

ET-localizer $\langle it,it \rangle$ vP $\langle i,t \rangle$
dimineaţa "in the morning"

BOUNDED $\langle vt,it \rangle$ vP $\langle v,t \rangle$

Maria scrie "Mary write"

(33)   * AspP

Asp$_{impf}$ $\langle vt,it \rangle$ vP $\langle i,t \rangle$

ET-localizer $\langle it,it \rangle$ vP $\langle i,t \rangle$
dimineaţa "in the morning"

BOUNDED $\langle vt,it \rangle$ vP $\langle v,t \rangle$

Maria scrie "Mary write"

3.4 ET-extent modifiers and RB-localizing modifiers

Modifiers of type (ii) and (iii) in §1 include RB-modifiers ("durative" *until,* see Giannakidou 2003 and references therein), LB-RB modifiers (*from 3 to 6*) and phrases that specify the extent of the whole event (*for/in 3 hours*). As such modifiers are sensitive to telicity, it seems reasonable to assume that they apply to event predicates. The idea that these modifiers do not combine with properties of times is further supported by the fact that they cannot specify the RT – see (34), on the single event reading: since in this reading modifiers of types (ii)-(iii) cannot apply to ET (see section 1), in the position in (34) they could only refer to RT, but, as we can see, this is not possible (note that the *between*-phrase *între 3 şi*

3 şi un sfert is possible, indicating that it is a localizing modifier – type (i)
– which is <i,t><i,t> see 3.3):
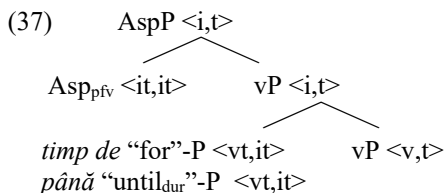
(34)   a. {Între   3 şi   3 şi   un sfert / *Timp de un sfert   de oră /
            between 3 and 3 and a   half   for   a   quarter of hour
          *Până la 3 şi   un sfert}   citea. (on the single-event reading)
           until   3 and a   quarter read.IMPF.3SG
           "{Between 3 and a quarter past 3 / *For a quarter of an
           hour/*Until a quarter past 3} (s)he was reading"

       b. A citit {timp de un sfert   de oră / până la 3 şi un sfert}.
          has read for   a   quarter of hour   until   3 and a quarter
          "(S)he read {for a quarter of an hour / until a quarter past 3}."

    ET-extent and RB-localizing modifiers introduce boundedness of the
event, disallowing further combination with Asp$_{impf}$. Therefore, we
propose that such modifiers are similar to the operator BOUNDED: they map
properties of events onto properties of times (they are <vt,it>). As a
consequence, they do not provide the <v,t> type required by Asp$_{impf}$: In
(35) we illustrate some denotations of these types of modifiers; the
sensitivity to telicity is formalized as a definedness condition which uses
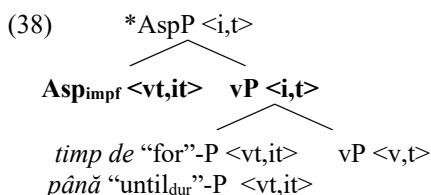the property of being quantized, defined as in (36), following Krifka
(1989):

(35)   a. ⟦for 10 minutes⟧ = λP$_{<v,t>}$:P is not quantized. λt.∃e(P(e) ∧
                              length(τ(e)) = 10′ ∧ t=τ(e))

       b. ⟦in 10 minutes⟧ = λP$_{<v,t>}$:P is quantized. λt.∃e(P(e) ∧
                              length(τ(e)) = 10′ ∧ t=τ(e))

       c. ⟦until$_{dur}$ 3⟧ = λP$_{<v,t>}$:P is not quantized. λt.∃e(P(e) ∧
                              t=τ(e) ∧ RB(t, 3o'clock))

(36)   A property P is quantized iff for all e, e′ if P(e) and e′ ⊏ e then
       ¬P(e′) (Krifka 1989)

    As Asp$_{pfv}$ takes an <i,t> complement, the combination of these
modifiers with the perfective is unproblematic:

(37)   AspP $\langle i,t \rangle$

　　　Asp$_{pfv}$ $\langle it,it \rangle$　　　　vP $\langle i,t \rangle$

　　timp de "for"-P $\langle vt,it \rangle$　　　vP $\langle v,t \rangle$
　　până "until$_{dur}$"-P $\langle vt,it \rangle$

A type-mismatch arises in single-event imperfectives, as shown in (38) (see the boldfaced level of the tree):

(38)   *AspP $\langle i,t \rangle$

　　Asp$_{impf}$ $\langle vt,it \rangle$　vP $\langle i,t \rangle$

　　　timp de "for"-P $\langle vt,it \rangle$　　vP $\langle v,t \rangle$
　　până "until$_{dur}$"-P $\langle vt,it \rangle$

Phrases of the type *from..to*, which indicate both boundaries, probably belong here. In Romanian, *de la* "from" can appear alone for indicating LB, but *la* "to" can only indicate RB when preceded by a *de la* "from"-PP. This points out to the existence of a complex PP "from..to". It appears that these complex phrases cannot modify the RT, so they are not $\langle it,it \rangle$ (like localizers) but rather $\langle vt,it \rangle$ (compare (39)a, which does not allow a single-event reading, with (39)b, which has a bona fide localizer):

(39)   a. (* Ieri,)   de la 3 la 5, citea. (* single event, ✓ habitual)
　　　　　yesterday from 3 to 5 read.IMPF.3SG
　　　　　"*Yesterday, from 3 to 5 (s)he was reading."

　　　b. Ieri,　　între　　3 şi 5, citea.
　　　　yesterday between 3 and 5 read.IMPF.3
　　　　　"Yesterday, between 3 and 5, (s)he was reading."

The $\langle vt,it \rangle$ denotation we propose for *from..to* phrases is given in (40) (where LB "left boundary" stands for initial subinterval and RB "right boundary" stands for final subinterval):

(40) $[\![$ from t_1 to t_2 $]\!]$ $= \lambda P_{<v,t>} \, \lambda t. \exists e(P(e) \wedge t=\tau(e) \wedge LB(t, t_1) \wedge$
$$RB(t, t_2))$$

As the *la* "to"-P indicates the RB, the complex "from..to" phrase can be subsumed under the RB-localizer type.

3.5 LB-oriented temporal modifiers with the imperfective

Our proposal is based on the idea that no temporal modifiers may characterize the set of events taken as an argument by Asp_{impf}. However, we have seen that the *incomplete* event introduced by Asp_{impf} can be further modified by certain temporal adjuncts – see (5), resumed under (41) below; note that English disallows this type of modifiers with the imperfective, using instead the universal perfect:

(41)   Când am   ajuns, Maria scria/   stătea în fotoliu
          when have.1 arrived Maria wrote.IMPF sat.IMPF in armchair
          {de   la ora   trei /de trei   ore}.
          from at hour-the three   from three hours
          "When I arrived, Maria had been writing/ sitting in the
          armchair {since 3 o'clock / for 3 hours}."

There are two possible ways of capturing the use of LB-oriented modifiers with the imperfective. If these modifiers are really event-modifiers (type <vt,vt>), we have to assume that imperfectives contain two operators, a lower one of type <v,t> that introduces the incomplete event, and a higher one that maps the <v,t> property into the <i,t> property required by Tense. Alternatively, we can follow von Stechow (2002b) in assuming that LB-oriented modifiers do not modify the incomplete event directly, but are rather <i,t><i,t> modifiers that apply to the output of Asp_{impf}, selecting a final subinterval, and the impression that what they specify is the very beginning of the event arises via an implicature.

For the progressive, a <v,t> output is implicit in the analyses of Landman (1992) and Portner (1998) reviewed in §3.1 above, which describe the progressive as a relation between events and event properties (see (24) and (25)b). Thus, based on (25)b, the denotation of PROG can be written as follows:[7]

(42) $[\![$ PROG $]\!]$ $= \lambda P_{<s,vt>} \lambda e. \; \forall w' \in BEST(Circ,NI,e,P) \; \exists e' \; (e \subset e' \wedge$
$$\exists t \; (t > \tau(e) \wedge t \subset \tau(e')) \wedge P(w')(e'))$$

If the structure of imperfectives contains a <vt,vt>-type PROG, one may assume that LB-oriented modifiers apply to the partial event, being of type <vt,vt>:

(43)   [LB-oriented modifiers [PROG [VP]]]

The whole constituent will be turned into a property of times by a higher aspectual operator – call it IMPF –, which introduces the time argument that will be bound by Tense; this time is the final subinterval of the partial event:

(44) $\llbracket \text{IMPF} \rrbracket = \lambda P_{<v,t>} \lambda t. \exists e [P(e) \wedge t \subseteq \tau(e) \wedge \neg \exists t' (t' > t \wedge t' \subseteq \tau(e))]$

(45)   [IMPF [LB-oriented modifiers [PROG [vP]]]]

This hypothesis raises the following problem: if the result of applying PROG to vP is of type <v,t>, why can't it combine with BOUNDED, extent modifiers and *until*-phrases? If such a combination were allowed, we would obtain a progressive embedded under a perfective. But such a combination, with a lower ProgP-level indicated by LB-modifiers, and a higher BOUNDED layer indicated by a localizing modifier and the perfective aspect, is impossible:

(46)   * Ieri,   [[Maria a   vorbit de   o oră] dimineața]
        yesterday   Maria has spoken from an hour morning-the
        Intended: "Yesterday, Maria had been talking for an hour in
        the morning"

One would be forced to assume that IMPF and PROG always come together, due to syntactic selection: Asp$_{\text{impf}}$ would select PROG whereas Asp$_{\text{pfv}}$ and pluractional operators (see §3.6 below) would select BOUNDED. However, we do find Asp$_{\text{pfv}}$ selecting what looks as a progressive in Spanish (see (47)a)[8], and yet LB-oriented modifiers of the incomplete event are ruled out – see (47)b, which indicates that the structure in (47)c is not available (we test with LB-to-RT extent modifiers, because LB-localizing modifiers are compatible with both aspects):

(47)   a. Marta estuvo   coloreando un castillo durante diez minutos,
           Marta was.PFV.3SG coloring a   castle for   10   minutes
           peró no lo termino
           but not it finished. PFV.3SG

"Marta was coloring a castle (for ten minutes), but she did not finish it."   (Arche 2014, 802)

b. Hacía   3 horas que {estaba   / *estuvo   }
   made.IMPF.3 3 hours that was.IMPF.3SG was.PFV.3SG
   coloreando un castillo
    coloring   a   castle

c. *hacia 3 horas que$_i$ [Asp$_{pfv}$ [t$_i$ PROG [colorea- un castillo]]]

In the alternative analysis, LB-RT extent modifiers are treated as <it,it> (see von Stechow 2002b). In this analysis we do not need two aspectual operators. A single Asp$_{impf}$, placed below the LB-RT extent modifiers, suffices. This Asp existentially binds the partial event and introduces RT as a time whose RB coincides with the RB of the partial event:

(48) $\llbracket$Asp$_{impf}\rrbracket$ = λP$_{<v,st>}$ λt ∃e (t⊆τ(e) ∧ ¬∃t′(t′>t ∧ t′⊆τ(e)) ∧
            ∀w′ ∈ Best(Circ, NI, e, P)) ∃e′ (P(e′)(w′))

In other words, Asp$_{impf}$(P)(t)(w) is true if there is an event e such as t is included in the temporal trace of e and t is a final subinterval of the temporal trace of e and in all worlds in the circumstantial base of w which are ordered higher than w wrt. the non-interruption ideal (of an event of type P), e develops into an event of type P.

According to von Stechow (2002b), LB-oriented extent modifiers (of the German *seit*-type, which are similar to Ro. *de*-phrases) take as arguments homogeneous properties of times – see (49), where XN "extended now" is defined as in (50):

(49) $\llbracket$ de x-time$\rrbracket$ = λP$_{<i,t>}$:P is homogeneous. λt ∃t′(XN(t′,t) ∧
            length(t′) = x ∧ P(t′))

(50)   XN(t′,t) = t is a final subinterval of t′

The modifier *de 3 ore* "from/since 3 hours" will combine with the imperfective *Maria scria* "Maria was writing" as follows:

(51)   [Maria [$_{TP}$ scria [de 3 ore [Asp$_{impf}$ [t$_{Maria}$ t$_{scrie}$]]]]]
         $\llbracket$de 3 ore [Asp$_{impf}$ [t$_{Maria}$ t$_{scrie}$]]$\rrbracket$ = λt ∃t′(XN(t′, t) ∧
         length(t′)=3h ∧ ∃e (t′⊆τ(e) ∧ RB(t′)=RB(τ(e)) ∧

$\forall w' \in Best(Circ, NI, e, P)) \exists'write(e',Maria)(w))$
"the event of Maria's writing is ongoing throughout an interval
that begins three hours before the RT and ends at RT"

(52)   AspP $<i,t>$

de 3 ore $<it,it>$ Asp$'$ $<i,t>$

Asp$_{impf}$ $<vt,it>$ vP $<v,t>$

Maria scrie
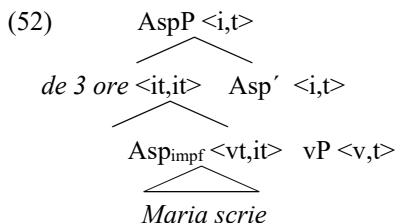
The requirement that P is homogeneous is needed in order to rule out
bounded events with *de-x-time*:

(53)   * Ieri,   Maria a   dormit de   3 ore.
          yesterday Maria has slept   from 3 hours

Note indeed that the operator BOUNDED(e) creates the property
$\lambda t.t=\tau(e)$, which is non-homogeneous: no subinterval of $\tau(e)$ can be equal
to $\tau(e)$.

Note that this semantics does not imply that the event does not extend
before the LB expressed by the modifiers. The fact that we normally get
this interpretation is accounted for by a conversational implicature (cf.
Arosio 2019).

Turning now to Romanian-type LB-localizers (*de la 3* "from 3" +impf.
= Engl. "since 3" + perfect), they can be analyzed like the LB-oriented
extent modifiers in (49) above, as in von Stechow's analysis, but also as
$<v,t><v,t>$ modifiers – note indeed that they can combine with both
aspects:

(54)   Ieri,   Maria {lucra   / a   lucrat} de   la 5.
        yesterday Maria   worked.IMPF /has worked from at 5
        "Yesterday, Maria had been working since 5 / began to work at
        5."

An analysis as $<vt,vt>$ modifiers is suggested in (55):

(55)   [de la 5] = $\lambda P_{<v,t>}$. λe. LB(e) = 5 o'clock

3.6 Configurations with habituals
and quantificational adverbials

At the heart of our account is the idea that Asp_{impf} takes a $<v,t>$ argument (property of event(ualitie)s). But, as we have seen in §2.2, HAB and Q-adverbs can be embedded under $Asp_{impf.}$. We are thus led to conclude that HAB and Q-adverbs yield properties of events. We have also seen, in §2.2, that bound event modifiers are allowed in the scope of HAB and Q-adverbs:

(56)   Mă   sculam   la ora   7.
        REFL wake-up.IMPF.1SG at hour-the 7
        "I used to wake up at 7."

(57)   Anul   trecut mă   trezeam   {rareori / adesea } la 7.
        year-the past   REFL wake-up.IMPF .1 seldom / often   at 7
        "Last year I {rarely/often/sometimes} woke up at 7."

   In our account, this implies that the sister of HAB and Q-adverbs has an $<i,t>$ denotation. Examples with ET-localizers such as (56)-(57) contain a BOUNDED operator below the adverbial, see the structure in (58):

(58) Asp_{imp} [HAB/Q-Adv [at 7 o'clock [BOUNDED [I wake up]]]]

   We conclude that HAB and Q-adverbs are of type $<i,t><v,t>$, introducing an eventuality characterized by a certain pattern of bounded events, accessed via their temporal traces. We may represent HAB as a generic quantifier whose restriction may be provided by overt material, as in (59); the restriction consists of a set of time intervals, which are related to the time intervals that represent the temporal traces of the event introduced by the vP (this relation, represented by a variable R contextually set, may be overlap, close succession/precedence, inclusion; in (59), it is close succession):

(59)   Mă sculam   la ora   7 când plecam   în
        REFL got-up.IMPF.1SG at hour-the 7 when leave.IMPF.1SG in
        excursie.
        trip
        "I used to get up at seven when I went on a trip."
        λe GEN t $(\exists e'.(\text{go-on-a-trip}(e', \text{Speaker}) \wedge t=\tau(e')) \wedge t \subseteq \tau(e))$
        $[\exists t' ((\exists e'' (\text{wake-up}(e'', \text{Speaker}) \wedge t'=\tau(e'')) \wedge \text{AT}$

(t′, 7 o'clock) ∧ R(t,t′)]
"e is an event such as the subintervals of e when the Speaker
goes on a trip stand in a temporal relation (here: close
succession) with the time of an event of the Speaker's waking up
at 7"

(60) $\llbracket$HAB$\rrbracket$ = λP$_{<i,t>}$ λQ$_{<i,t>}$ λe. GEN t (Q(t) ∧ t⊆ τ(e)) [∃t′
(P(t′)∧ R(t′, t))]

When an overt restriction is absent, a covert contextual variable C is
assumed; for (56), this will be a set of days, as the event of waking up is
normally daily:

(61) $\llbracket$[at 7 o'clock [BOUNDED [I wake up]]]$\rrbracket$ = λt.∃e(wake-
up(e,Speaker) ∧ t=τ(e) ∧ AT(t,7-o'clock))
$\llbracket$HAB [[at 7 o'clock [BOUNDED [I wake up]]]]$\rrbracket$ =
λe. GEN t ((t∈C ∧ t⊆ τ(e)) [∃t′ ∃e′(wake-up(e,Speaker) ∧
t′=τ(e′)) ∧ AT(t′,7-o'clock) ∧ R(t′,t)]
"e is an event such as the relevant subintervals of e (here: days)
generally stand in a temporal relation (here: inclusion) with the
time of an event of the Speaker's waking up at 7"

According to Ferreira (2005: 59-70), habituals may also be of a simpler
sort, with no binary quantifier – this explains why, without further material
that may introduce a restriction, a singular indefinite cannot be distributed:

(62)   Mary smokes {cigars / #a cigar}

Ferreira proposes that these simple habituals rely on the fact that plural
events are already in the lexical denotation of the verb. If this is true,
unmarked habituals of this sort may directly occur as arguments of
Asp$_{impf}$, as proposed by Deo (2009). However, the cases we are interested
in, with temporal modification referring to the individual events inside the
plurality, are not of this sort. Note that temporal modification allows
distribution of the indefinite:

(63)   a. Mary smokes a cigar after dinner.

b. Maria scria   o scrisoare în 15 minute. (Ro.)
Maria wrote.IMPF a letter   in 15 minutes
"Maria used to write a letter in 15 minutes"

We conclude that a null quantificational adverb HAB is necessary in structures with temporal modification of the individual events in the series.[9]

For overt quantificational adverbs (see (57)) we propose a similar derivation, the only difference being that the quantifier, instead of being GEN, is the one overtly indicated by the adverb – see below the composition of (57) with the Q-adverb *rareori* "seldom":

(64)   ⟦SELDOM [[at 7 o'clock [BOUNDED [I wake up]]]]⟧ = λe.
        SELDOM t $((t \in C \wedge t \subseteq \tau(e))$ $[\exists t' \exists e'(\text{wake-up}(e,\text{Speaker}) \wedge t'=\tau(e')) \wedge \text{AT}(t',7\text{-o'clock}) \wedge \text{R}(t',t)]$
        "e is an event such as the relevant subintervals of e (here: days) rarely stand in a temporal relation (here: inclusion) with the time of an event of the Speaker's waking up at 7"

Quantification over events can also be achieved by using quantified localizing temporal adverbs:

(65)   Maria mă suna   {în fiecare luni /   după fiecare ședință}.
        Maria me called.IMPF in every Monday after every meeting
        "Maria used to call me every Monday / after every meeting"

Since the quantifier creates the series of events that Asp_{impf} takes as its argument, we must assume that it scopes below Asp, see the LF in (66):

(66)   [Asp_{impf} [[every Monday] λt [Mary called on t]]]

Von Stechow (2002a) argues that the head nouns of temporal quantifiers have a time variable that may be restricted by the tense of the clause (e.g. in (65) only Mondays included in the RT are considered) and the quantifier phrase raises by QR leaving the temporal preposition in situ at LF.

In our system, the possibility of creating a series of events bound by Asp_{impf} leads to the conclusion that quantified localizing temporal adverbs introduce events, on a par with Q-adverbs. This proposal has already been made by Ferreira (2016), who builds on Kratzer's (2003) analysis of *every* in examples of the type in (67), in the reading indicated below:

(67)   Three copy editors caught every mistake in the manuscript.
        Possible reading: each copy editor caught mistakes in the
        manuscript and every mistake was caught by at least one of the
        copy editors

For this reading, Kratzer proposes that the quantifier introduces a plural event (the agent is not represented, Kratzer assuming that it is introduced by a higher Voice head):

(68)   ⟦ every mistake⟧ $= \lambda P.\lambda E.\forall x[\text{mistake}(x) \rightarrow \exists e'[e' < E \wedge$
$P(x)(e')] \wedge \exists X [\text{mistakes}(X) \& P(X)(E)]]$

Following this type of analysis, we may assign *every Monday* an <it><vt> analysis (we depart here from Ferreira (2005, 2016), who treats temporal modifiers as intersective modifiers of events):

(69)   ⟦every Monday⟧ $= \lambda P_{<i,t>} \lambda E \,\forall t'(\text{Monday}(t') \wedge t' \subseteq \tau(E)) \rightarrow$
$P(t'))$
⟦Mary called on t_1⟧ $= \exists e (\text{call}(e,\text{Mary}) \wedge \text{in}(\tau(e),t_1))$
⟦[every Monday] [λt_1[Mary called on t_1] ⟧ $=$
$\lambda E \,(\forall t'(\text{Monday}(t') \wedge t' \subseteq \tau(E)) \rightarrow \exists e(\text{call}(e,\text{Mary}) \wedge \text{in}(\tau(e),t'))$

The result obtained in (69) is a property of eventualities, hence it can combine with Asp_{impf} as well as with temporal extent adverbials:

(70)   a. [[Maria called me every Monday] for three months].

b. Maria [suna [Asp_{impf} [[t_{Maria} t_V] în fiecare luni]]]
Maria called.IMPF   in every   Monday
"Maria used to call every Monday."

c. Maria [a [Asp_{pfv} sunat [[BOUNDED [[[t_{Maria} t_V] în fiecare luni]
Maria has   called   in every Monday
timp de 3 luni]
for   3 months
"Maria called me every Monday for 3 months."

The fact that the restriction of quantificational temporal PPs is relativized to the time of the clause (the RT) no longer has to be stipulated, as in von Stechow (2002a), but follows from the inclusion of the times quantified over in the plural event (see "$t' \subseteq \tau(E)$" in (69)).

Note now that among modifiers that trigger pluractionality, bounded iteratives (e.g. *three times*) cannot be embedded under the imperfective (see (17)). Therefore, they may be analyzed as <i,t><i,t> functions – see (71), where "$\exists!t (P(t)$" notates "there is a maximal interval t such that $P(t)$":

(71) $\llbracket$three times$\rrbracket$ = $\lambda P_{<i,t>}$ λt $\exists R(\text{Partition}(R,t) \wedge \forall t'[t' \in R \rightarrow$
         $\exists!t''(t'' \subseteq t' \wedge P(t''))] \wedge |R|=3)$
         Partition(R,t) = a set of non-overlapping convex subintervals of
         t whose sum is t

In other words, *3 times(P)* introduces the property of being a time that can be partitioned into 3 subintervals whose members contain a maximal interval characterized by P.

4. Conclusions on aspect and ET modification

We have argued that the constraints on ET modification with the imperfective Aspect in Romanian support the incompleteness analysis of the imperfective, according to which Asp$_{impf}$ asserts the existence of an event only up to RT in the world of evaluation, assigning the completion of the event to inertia worlds. Under this approach, the various constraints on ET modification boil down to the fact that the time interval of the complete event is invisible for modification.

We have proposed a compositional account, according to which Asp$_{impf}$ is <vt,it>, while Asp$_{pfv}$ is <it,it>. The ET-modifiers disallowed by Asp$_{impf}$ are those that create an <i,t> denotation for the complement of Asp, which is incompatible with the <v,t> type of the first argument of Asp$_{impf}$.

We have distinguished two types of ET-modifiers: (i) modifiers of bounded events, that either rely on a previous boundedness operator (ET localizers, type <it,it>) or introduce boundedness themselves (total extent modifiers, RB-localizers, type <vt,it>), where boundedness involves mapping from <v,t> onto <i,t>; (ii) modifiers of unbounded events, the only ones possible with the imperfective, being LB-oriented, comprising LB-localizers and LB-RT extent. At least the LB-RT extent modifiers probably rely on the XN procedure: they specify a larger interval over which the event is ongoing, whose final subinterval is RT.

We have seen that habituals and structures with Q-adverbs and quantified temporal localizers involve two layers of temporal modification. We propose that HAB, Q-adverbs and quantified temporal localizers create complex eventualities based on bounded events, accessed via their temporal traces (hence they are <it,vt>). This allows them to occur in the scope of Asp$_{impf}$ and explains why the imperfective is compatible with bound event modifiers of the individual events inside the series, but not with bound event modifiers of the whole series.

5. Appendix: Comparison with the homogeneity-based account

De Swart (1998) proposed that Romance past tenses do not immediately reflect viewpoint Aspect, but are tense operators that check the homogeneity of their complement. This idea has been used as an explanation of the constraints on ET modification with the imperfective by Crăniceanu (2002) and Arosio (2003, 2010, 2019). We will present some reasons for which we did not adopt this approach, concentrating on its best developed version, the one proposed in Arosio's work.

Building on Kamp & Rohrer (1983), De Swart (1998) proposed that the past tenses of French (which are very similar to those of Romanian) are tense operators that check the homogeneity of their complement: the imperfect is a past T^0 that selects for homogeneous eventualities, whereas the simple past is a past T^0 that selects for non-homogeneous eventualities (de Swart does not discuss the compound perfect, which raises additional problems due to an ambiguity between (perfective) past and present perfect). This idea is developed by Arosio (2003, 2010, 2019), who replaces eventualities with properties of times (type $<i,t>$) as the complement of T.

It is indeed true that total extent modifiers and modifiers involving both boundaries create a non-homogeneous property – if lasting three hours or lasting from 3 to 6 are properties of an interval I (or an event e, in de Swart's formulation), they cannot be true of a proper part of I (or e).

However, localizing modifiers with homogeneous predicates are expected to be allowed with the imperfective, because they do not disrupt homogeneity: if *yesterday* is true of an interval I / event e included in the day before the speech time, then it will be true of any sub-interval / sub-event. This predicts that (72)a and (72)b should be equally unmarked:

(72) a. Maria cânta   ieri.
          Maria sang.IMPF yesterday
          "Maria was singing yesterday"

      b. Maria a   cântat ieri.
          Maria has sung yesterday
          "Maria sung yesterday"

But speakers tend to interpret the adverb in (72)a as topical (see the different placement of nuclear stress), whereas (72)b can be neutral:

(72)′   a. Maria CÂNTA ieri.
            "Maria was SINGING yesterday"

        b. Maria a cântat IERI
            "Maria sung YESTERDAY"

This receives a natural explanation in our system, which distinguishes RT from ET localizers. The adverbial in (72)a is an RT-localizer. As the RT normally belongs to the contextually given, topic part of the clause (see Klein's 1994 label "Topic Time"), it is expected to be deaccented.

With a neutral intonation, involving nuclear stress on *ieri* (*Maria cânta IERI*), (72)a is acceptable with a different reading, which has not been discussed in this article: "Maria *was supposed (at a contextually given past time) to sing yesterday*". This is a modal reading which is also found with the English progressive (see Dowty 1979, Crăiniceanu 1995, 181, Giorgi & Pianesi 1995, 2004); the adverb modifies the planned event, which is posterior to the RT. Another possible reading of the stress pattern *Maria cânta IERI* involves corrective focus on the adverbial, being possible in a context where a situation involving the speaker and hearer is under discussion and this situation contains an ongoing event of Maria's singing; the speaker may correct the hearer on the time of this situation. Again, the necessity of this complex contextual setting indicates that we are dealing with a RT modifier.

A problem of the homogeneity account is that the use of the past perfective with states requires coercion from a state to a quantized eventuality (for de Swart) or to a non-homogeneous time property (for Arosio), implying that (73)a is more complex than (73)b:

(73)   a. Maria a   fost bolnavă.
            Maria has been ill

        b. Maria era   bolnavă.
            Maria was.IMPF ill

This leads one to expect that (73)a should be more marked. But speakers have the opposite intuition: it is rather (73)b that is not neutral, requiring, in addition, a situation under discussion, which provides a RT that is included in the time span of Maria's illness (see Giorgi & Pianesi's (1995) "anaphoric" interpretation of the imperfect).

A further problem which appears with habituals is the way in which the homogeneity requirement of the imperfect can be checked. Arosio

(2019, 82) claims that habits are temporally homogeneous, but this cannot hold all the way down to all sub-intervals – otherwise, (74) would be fine:[10]

(74)   *În ziua   aceea, Marius mergea   adesea în provincie
            in day-the that   Marius went.IMPF often   outside-the-capital

In Arosio's system, states denote properties of times and hence can immediately combine with T, but for other types of eventualities, operators are needed that map properties of events onto properties of times. These operators are called Asp, but have nothing to do with the imperfect or perfect of Romance, which are just tenses. For these operators, he assumes the standard inclusion-based semantics:

(75)   a. Perfective := $\lambda P \, \lambda t \, \exists e. \, (\tau(e) \subseteq t \, \& \, P(e))$ (Arosio 2019,100)[11]

        b. Imperfective: $= \lambda P \, \lambda t \, \exists e. \, (t \subset \tau(e) \, \& \, P(e))$

A special problem for Arosio's system comes from the assumption that extent modifiers attach above Asp, being <it,it>:

(76)   For x time:= $\lambda P \, \lambda t \, (\delta_{TIME}(t) = x \, \& \, \forall t' \, (t' \subseteq t \rightarrow P(t')))$ (Arosio 2019,89)

As such modifiers introduce boundedness, we predict that (77) should be structurally ambiguous between a and b, each with a distinct reading:

(77)   Maria a   cântat timp de două ore.
        Maria has sung for   two   hours
        "Maria sang for 2 hours"
        a. [for 2 hours [Asp$_{pfv}$ [Maria sing]]]
            $\lambda t \, ((\delta_{TIME}(t) = 2 \text{ hours} \, \& \, \forall t' \, (t' \subseteq t \rightarrow \exists e \, (\tau(e) \subseteq t' \wedge$
            $sing(e,Maria))))$
            "Any sub-interval of the 2 hours period contains an event of Maria's singing"

        b. [for 2 hours [Asp$_{impf}$ [Maria sing]]]
            $\lambda t \, ((\delta_{TIME}(t) = 2 \text{ hours} \, \& \, \forall t' \, (t' \subseteq t \rightarrow \exists e \, (t' \subset \tau(e) \wedge$
            $sing(e,Maria))))$
            "Any subinterval of the 2 hours interval is included in the time of an event of Maria's singing"

The intuitive interpretation "there is an event of singing by Maria that lasted 2 hours" is not directly reflected in these readings; it may at best be inferred from (77)a, but it is clearly not what is meant by (77)b, where the event of singing may last longer than 2 hours.

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Notes

[1] The term "Assertion Time" refers to the fact that this is the temporal interval for which the claim made in the clause is checked. This interval can be described as the interval *about which* something is said, hence the label "Topic Time". For instance, a past tense sentence such as *He shut the window* is not checked against

the whole time that precedes ST, but only against a contextually established past interval, in which the event must occur (due to the import of perfective Asp); the reply *No, he didn't* is true in case no shutting event occurred during this interval; he may have shut the window on other occasions, but this is irrelevant. Likewise, *he had shut the window* is predicated on a specific past moment, requiring the event to have occurred inside some interval that ends at that past moment (due to the import of perfect Asp).

[2] The futurate present allows modifiers of types (i)-(iv). This indicates that the futurate present may be perfective (as also observed by von Stechow 2002b).

[3] The same can be shown with ET modifiers with the perfect aspect (see also Klein 1994, von Stechow 2002a):

(i) Ion era deja   acolo. Venise   **la 3.**
    Ion was already there   had-come.3SG at 3
    "Ion was already there. He had come at 3 o'clock."

[4] Modifiers indicating the number of occurrences are allowed if they are embedded under a temporal quantifier that distributes them over parts of an unbounded series:

(i) Anul   trecut mă   spălam   pe dinți de 2 ori pe zi.
    last-the year   REFL washed.IMPF.1SG on teeth twice   per day
    "Last year I used to wash my teeth twice a day.»

[5] Deo (2009) proposes that the imperfective takes a property of eventualities or intervals and requires it to distribute over a partition of an interval that continues, after the RT, in the inertia worlds. In this way, habituality is derived without a HAB operator. In single-event (continuous/progressive) imperfectives, the partition-measure is set to an infinitesimally small length.

[6] The Slavic imperfective is compatible with bounded events; Paslawska & von Stechow (2003) argue that the Russian past imperfective is compatible with any relation between RT and ET, standing in a privative opposition with the perfective, which has marked features. Altshuler (2014), using Landman's (1992) notion of stage of an event, proposes that, while the English progressive introduces a proper stage (which explains why achievements are coerced into accomplishments), the Russian imperfective, on a par with the Hindi simple perfective, introduces a stage that can also coincide with the completed event (therefore achievements are not coerced).

[7] An explicit <v,t><v,t> denotation for PROG can be found in Altshuler (2014, 754, formula 53).

[8] Note however that the -*ndo* form might not be a progressive, but rather a marker of situation aspect (see Squartini 1998).

[9] The existence of an Asp layer embedded under the imperfective, in habituals, was also proposed by Arche (2014), but she identifies this Asp as perfective and she places it *above* holistic temporal modifiers, rather than below, as we do. She does not provide any semantic composition.

[10] Cf. Mari *et al.* (2011, 51): ?On that day at 4 pm Mary used to smoke Marlboros.

[11] We replaced the unusual formulations "$\tau(e) \supset t$" and "$t \supseteq \tau(e)$", in Arosio's formulae, with the standard versions relying on "$\subset$" and "$\subseteq$".