Vendler Classes and the Russian Aspectual System

Abstract

This paper considers the relevance of Vendlerian lexical aspectual classification of verbs in Russian. We focus on the lexical classes of accomplishments and activities, and argue that the classification of verbs into activities and accomplishments cuts across the classification into perfective and imperfective verbs. Accomplishments display incremental structure and occur as perfectives and imperfectives. Activities do not display incremental structure, and also occur in the perfective and imperfective aspect. The distinction between activities and accomplishments is expressed through their interactions with what we call incremental modifiers, modifiers which are sensitive to the incremental structure of the verb meaning; these modifiers include *postepenno,* 'gradually' and "X-by-X" modifiers, such as *stranica za stranicoj*, 'page by page' and *etaž za etažom,* 'floor by floor'. Imperfective activities do not occur with either *postepenno* or the 'X-by-X' modifiers, and neither do the verb forms which Paducheva 1996 calls "delimited activities" (*delimitivs*). Accomplishments in both the imperfective and perfective aspects occur with *postepenno,* while the "X-by-X" modifiers point to the existence of two dialects in Russian. Both dialects allow "X-by-X" modifiers with imperfective accomplishments, but differ as to whether they occur naturally with perfective accomplishments. We show that the behaviour of these modifiers generally follows if we assign accomplishments the incremental structure posited in Rothstein 2004, and treat the modifiers as directly modifying the incremental structure.

1. Introduction

The aim of this paper is to shed some light on the interaction between grammatical and a lexical aspect in Russian; in particular, the interaction between perfective and imperfective aspectual categories and the Vendlerian classes of lexical verbs (Vendler, 1967).   The central question is whether the Vendlerian classification of verbs into states, activities, achievements, and accomplishments has any grammatical relevance in Russian, or whether it is made redundant by the grammatical distinction between perfective and imperfective verbs. The Vendlerian four-way classification of verbs into states, activities, achievements and accomplishments has proved relevant in other languages, in particular English, because grammatical operations such as adverbial modification and the progressive operator are sensitive to the distinctions made by this classification. In Russian and other Slavic languages, unlike in English and other Germanic languages, verbs are classified into perfective and imperfectives. The question is then, whether the Vendler classification has any relevance in languages with this kind of verbal system. The classification of verbs into states, activities, achievements and accomplishments reflects the properties of the events in the denotations of the verbs (see Dowty 1979, Smith 1991, Rothstein 2004), for example dynamic vs. static, telic vs. atelic. If the classification reflects universal properties of events, then one might prima facie expect it to be relevant cross-linguistically. However, this is not a matter of logic, but an empirical issue: the Vendlerian classification is relevant in a particular language, if and only if certain linguistic operations in that language are sensitive to the distinctions that the Vendlerian classification makes.

When we ask what the relevance of the Vendler classes is in Russian, there are three

possible answers. First, mapping verbs in Russian into the Vendler lexical classes is not relevant, since linguistic operations make reference only to the perfective/ imperfective distinction. A second possibility is that the Vendlerian classification in Russian is subsumed under the perfective/ imperfective distinction, in which case the distinctions are relevant only to the degree to which they subdivide the perfective/ imperfective distinction. This is a traditional approach to the issue of lexical aspect in Russian, manifested by Brecht 1985, who, among many others, argues that the perfective aspect is reserved for the lexical classes of accomplishments and achievements, while the imperfective aspect coincides with the lexical classes of activities and states. Brecht's account is reviewed in more detail in the next section. The third possibility is that the semantics of the lexical classes is fully exploited in Russian, and that lexical classes cut across the perfective/imperfective distinction (Kucera, 1983; Eckert, 1985; Filip, 1999; Paducheva 1996). Paducheva 1996, for instance, makes explicit use of the Vendlerian classification as a part of her own analysis of the lexical classes of verbs in Russian. If this is the case, then there should be some linguistic operation, which is sensitive to the distinction in lexical class, which provides empirical evidence that lexical classes cut across the perfective/ imperfective distinction.

In this paper, we will argue against the first and the second possibilities and defend the third alternative. We will provide empirical evidence that accomplishment verbs can be realized in both perfective and imperfective aspect in Russian. We will also suggest that activities have perfective and imperfective realizations.

2. Vendlerian Classes in Russian – some background

The issue of the lexical aspect in Russian and its interaction with the grammatical aspect; namely, perfectivity and imperfectivity, has been a subject of intense debate in the linguistic literature (Bulygina, 1982; Forsyth, 1970; Mehlig, 1985, Filip 1999). Here we focus on two accounts: Brecht 1985 and Paducheva 1996. Both works discuss the compatibility of the Vendlerian classification with the Russian verbal system and represent two different views on this topic. We summarize the relevant parts of their approaches below before proceeding to our own account.

2.1 Brecht's (1985) account

In his discussion of the interaction between the grammatical aspect and the Vendlerian lexical classes of verbs in Russian, Brecht 1985 argues that perfective verbs denote the telic lexical classes of accomplishments and achievements, while imperfective verbs coincide with the atelic lexical classes of activities and states[1]. He explains this correlation via the assumption that the semantics of perfective aspect is associated with telic situations, while the semantics of the imperfective aspect is compatible with the incomplete ones. Brecht claims that some unprefixed imperfective verbs belonging to the lexical classes of activities and states can be shifted into accomplishments and achievements by verbal prefixes. Following this shift, the aspectual status of an imperfective verb is automatically changed into a perfective one. Thus, verbal prefixes in Russian serve as lexical operators that transform atelic activities and states into telic accomplishments and achievements. Under such an account, the unprefixed imperfective

---

[1] Brecht uses the term *culminations* instead of accomplishments. We, however, retain the original Vendlerian terminology throughout this paper.

verb *stroit'* ^{IMPERF} 'to build' is an atelic activity (example (1a)) that is shifted into the telic accomplishment *postroit'* ^{PERF} by the addition of the perfectivizing prefix *po-*, as shown in (1b).

(1) a. Ivan   stroil ^{IMPERF}   dom.   [Activity]
       Ivan   built   house
        'Ivan built a house.'
    b. Ivan   postroil ^{PERF}   dom.   [Accomplishment]
       Ivan   built   house
        'Ivan built a house.'

The opposite process of shifting unprefixed perfective accomplishments and achievements into imperfective activities and states is achieved by the imperfectivizing suffixes *-a/ja* and *-(i)va*. While perfectivization is a lexical process (see also Filip 2000, who claims that perfectivizing prefixes are derivational affixes), the imperfectivizing suffixes are grammatical operators that change the aspectual status of a verb without affecting its lexical meaning. The process of turning a perfective accomplishment verb into an imperfective activity is illustrated in the following example (2).

(2) a. Ivan obezvredil ^{PERF} minnoe pole.   [Accomplishment]
       Ivan defused   minefield
        'Ivan defused a minefield.'
    b. Ivan obezvrezhival ^{IMPERF} minnoe pole.   [Activity]
       Ivan   defused   minefield
        'Ivan defused a minefield.'

It follows from the Brecht's account that there is a homomorphism between lexical and grammatical aspects in Russian: Activities and states will be realized as imperfectives, and accomplishments and achievements as perfectives. Hence, examples (3a)-(3b) are activities, while (4a)-(4b) are accomplishments.

(3) a. Ivan   čital ^{IMPERF}   knigu.   [Activity]
       Ivan   read   book
        'Ivan read a book.'
    b. Ivan guljal ^{IMPERF}.   [Activity]
       Ivan walked
        'Ivan walked'.
(4) a. Ivan pročel ^{PERF} knigu.   [Accomplishment]
       Ivan read   book
        'Ivan read a book.'
    b. Ivan poguljal ^{PERF}.   [Accomplishment]
       Ivan walked
        'Ivan walked for some time.'

2.2 Paducheva's 1996 account

Paducheva 1996 incorporates the four Vendlerian classes in her analysis of the lexical classes of verbs in Russian. Similarly to Brecht, she states that the Vendlerian lexical categories of activities and states are manifested by imperfective verbs, while

achievements are expressed by perfective ones. Contrary to Brecht, however, Paducheva notes that the lexical class of accomplishments is realized by both perfective and imperfective verbs. These accomplishments form aspectual pairs that she defines as *predel'nye pary* 'bounded pairs' (Paducheva 1996: 91-94). A perfective member of the bounded pair denotes a process that pursued a certain goal and was completed after reaching its inherent limit, resulting in a change in the direct object. An imperfective member describes an ongoing process that aims towards reaching its inherent limit, but has not reached it yet. In Paducheva's terminology, agentive perfective accomplishments are *dejstvija obyčnye* 'regular actions', and agentive imperfective accomplishments are *dejstvija v razvitii* 'actions in progress'.[2] Having classified both *dejstvija obyčnye* and *dejstvija v razvitii* as accomplishments, Paducheva, however, points out that the original Vendlerian classification, being based on the English data, does not have a lexical class analogous to the imperfective accomplishments (*dejstvija v razvitii*) in Russian. Furthermore, the Vendlerian classification fails to account for the cases of attenuative procedurals (Forsyth, 1970: 21): perfective verbs that are derived from unprefixed imperfective activities by the delimitative prefix *po-* and assign to these activities a meaning of duration for some time (after which an activity was completed). These perfective verbs fall under the lexical category of *Delimitiv* 'delimitated activities' which constitute a new lexical class, absent from the Vendlerian system. It is important to mention, however, that perfective delimitated activities do not form aspectual pairs with the imperfective verbs they are derived from, due to the fact that they denote a different lexical meaning than original imperfective verbs. An example of delimitated activity is the verb *poguljat'* [PERF] 'to walk for some time' in the example (4b).

Applying Paducheva's classification to our initial examples in (3)-(4), we get the following taxonomy, with the names of the lexical classes given in both Paducheva's and Vendler's terms. Note that the delimited activity in the example (6b) is not a part of Vendlerian classification.

(5) a. Ivan čital [IMPERF] knigu.   [*Dejstivie v razvitii* /
      Ivan read book   Accomplishment]
       'Ivan read a book.'

   b. Ivan guljal [IMPERF].   [*Dejatel'nost'* / Activity]
     Ivan walked
      'Ivan walked'.

(6) a. Ivan pročel [PERF] knigu.   [*Dejstivie obyčnoe* /
     Ivan read book   Accomplishment]
      'Ivan read a book.'

   b. Ivan poguljal [PERF].   [*Delimitatif*]
     Ivan walked
      'Ivan walked for some time.'

Paducheva's analysis leads to the following conclusions. First, the lexical class of accomplishments is expressed by both perfective and imperfective verbs that stand in the aspectual pair relation with each other. Paducheva suggests that the imperfective accomplishments in Russian are similar to the progressive accomplishments in English (Paducheva 106). The main point is that the imperfective verbs are not limited to

---

[2] Paducheva also discusses non-agentive perfective and imperfective accomplishments (*predel'nye processy* 'bounded processes' and *processy v razvitii* 'processes in progress') in her work. An example of non-agentive perfective accomplishment is *Sneg rastajal* 'Snow melted'. Its imperfective correlate is *Sneg tajal* 'Snow was melting'. We will focus on agentive accomplishments in our discussion.

activities and states only in their denotation, but can denote the lexical class of accomplishments as well.

The question is, what exactly is the relation between the Vendlerian classification and the Russian data, or in other words, what *is* an imperfective accomplishment or a perfective activity? The status of imperfective accomplishments might be resolved by proposing an analogy with progressive forms of lexical accomplishments in English, but such lexical categories as delimitated activities pose a more serious problem for an efficient employment of Vendlerian system in Russian.

We argue here that the class of imperfective verbs in Russian includes both activities and accomplishments, and in the following section, we will present empirical evidence to back up this claim. In section 3 we will make some more general observations about the relation between the Vendlerian classification and the perfective/imperfective classification. We show that the interaction between grammatical and lexical aspect predicts exactly such 'strange beasts' as imperfective accomplishments and delimited activities, and that rather than being 'new' Vendler classes, they result from the interaction between grammatical and lexical aspect.

3. Incremental modifiers

3.1 Preliminary Data

According to Paducheva 1996, the verbs in examples (5a) – (5b) and
(6a) – (6b), respectively, belong to different lexical categories. *Čitat'* and *pročitat'* are accomplishments, *guljat'* is an activity and *poguljat'* is delimited. For the moment we will call verbs like *pogujat'* 'delimited activities', and justify this use of terminology later. *čitat'* and *guljat'* are imperfective, *pročitat'* and *pogujat'* are perfective.

If *čitat'* and *pročitat'* are both accomplishments, despite the difference in grammatical aspect, then we expect them to pattern together with respect to some linguistic operation and to contrast with the activities, whether perfective or imperfective. These patterns occur with what we call *incremental modifiers*. There are two kinds of such modifiers; the lexical item *postepenno* corresponding to the English 'gradually' and modifiers of the form *X za X, 'X by X'*. Example (7) shows that *postepenno* occurs with *čitat'* and *pročitat'*, but not with either of the hypothesized activities. (8) shows that *X za X* occurs with *čitat'*, the hypothesized imperfective accomplishment, but not with the imperfective and perfective activities. As for the occurrence of *X by X* with perfective accomplishments, some Russian speakers (including the first author of this paper) do not accept (8b), while others do. We conclude, therefore, that there are two dialects in Russian – one that allows *X by X* with perfective accomplishments, and one that disallows it. We will provide an explanation for this 'dialectal split' later in the paper.

(7) a. Ivan čital ^{IMPERF} knigu postepenno.
       Ivan   read   book   gradually
         'Ivan read a book gradually.'
    b. Ivan pročel ^{PERF} knigu postepenno.
         Ivan read   book gradually
         'Ivan read a book gradually'.
    c. *Ivan guljal ^{IMPERF} postepenno.
         Ivan walked   gradually
    d. *Ivan poguljal ^{PERF} postepenno.
         Ivan walked   gradually

(8) a. Ivan čital ^{IMPERF} knigu stranica za stranicoj.
      Ivan read   book   page by page
       'Ivan read a book page-by-page'.
  b. (*) Ivan pročel ^{PERF} knigu stranica za stranicoj[3].
      Ivan read   book page   by page
  c. *Ivan guljal ^{IMPERF} šag za šagom.
      Ivan walked   step by step
  d. *Ivan poguljal ^{PERF} šag za šagom.
      Ivan walked   step by step

The examples in (7) show that *postepenno* is compatible with *čitat'* and *pročitat'* , which superficially correspond to the English accomplishment *read*, but do not occur with either imperfective or perfective forms which correspond to the English activity *walk*, providing prima facie evidence that both imperfective *čitat'* and perfective *pročitat'* are accomplishments. Example (8) shows that the *X by X* modifiers, occur with the imperfective form of the hypothesized accomplishment, but not with the imperfective activity *guljat',* showing that *čitat'* cannot be assumed to be an imperfective activity. *X by X* occurrence with perfective accomplishments seems to be dialect-dependent. This interaction with modifiers generalizes to verbs classified by Paducheva as accomplishments and activities respectively (with the exception of directed motion activities which behave as a class by themselves). It thus looks as if modifiers of this type will provide a means for distinguishing between accomplishment and activity verbs in Russian.
      We now need to explain why these modifiers behave the way they do, and show that their distribution hinges on the difference in structures between accomplishments and activities. We turn to this in the following sections.

3.2 Vendler Classes in the (Neo)-Davidsonian Framework

We begin by giving a brief background to Vendler classes and the neo-Davidsonian framework.
      The Vendlerian classification system divides verbs in English into four lexical classes: activities, states, accomplishments and achievements. This division is based on the way these verbs interact with time adverbials, tenses and logical entailments, as shown in Dowty 1979, pp. 55 – 60, who discusses the various diagnostic tests that distinguish between the four classes. Dowty uses an interval-based semantic framework in which verbs do not introduce event arguments. More recent works (Krifka 1998, Rothstein 2004) are based in a neo-Davidsonian theory of events (Parsons 1990; Landman 2000) that utilizes modification of an event argument to capture the aspectual differences. In this framework, verbs denote sets of events or event types, and thematic roles denote functions from events to their participants. Lexical classes are distinguished by the different properties that the events in their denotations have, and the set of lexical classes may be seen as a disjunction of constraints on the possible event types that can be denotations of verbal heads. Rothstein 2004 discusses how Vendler's classification can be expressed in a neo-Davidsonian framework. She argues that the diagnostic tests indicate that Vendler's four classes can be seen as instantiations of two features, whether or not a verb denotes an event of change, and whether or not it denotes an event which

---

[3] As noted already, the grammaticality of (8b) depends on a dialect. Some Russian speakers find it acceptable, while others treat it as grammatically odd. We will return to this below.

can be analyzed as having distinguishable stages, in the sense of Landman 1992.

With respect to stages, an event e' is a *stage* of e if the following hold:

(9) e' is a stage of e iff:
    (i) e' $\sqsubseteq_e$ e; i.e. e' is a temporal part of e
    (ii) e and e' have the same temporal starting point;
    (iii) e is a development of e'; i.e. e and e' are qualitatively distinguishable, they
        have different properties.

Activities and accomplishments have stages, (which is why they naturally occur with the progressive), while states and achievements do not. States do not have stages because they are entirely static, and any subevent of a state e is indistinguishable from any other subevent in the relevant respects. Achievements do not have stages because they are too short, since they are analysed as essentially instantaneous changes from ¬φ to φ. They, therefore, hold at two adjacent instants, the last moment that ¬φ is true and the first moment that φ is true (see Dowty 1979).

With respect to change, achievements and accomplishments are analyzed as events of change, while states and activities are not. Since a change has a natural culmination or end point, the point when the change has 'happened', this explains the fact that achievements and accomplishments are naturally telic. In English, the activity *John ran* is atelic, since we do not know when the process of running was over, while the accomplishment *John drew a picture* is telic, since the given event was over when the painting of the picture was completed. Rothstein (2004, chapter 8) shows that the analysis of the four verb classes in terms of these two features can be summed up in the following way:

Table 1: Features of Lexical Classes

Lexical Class	[$\pm$ stages]	[$\pm$ event of change]
States	-	-
Activities	+	-
Achievements	-	+
Accomplishments	+	+

3.3 The Structure of Accomplishments

It has become accepted in much of the literature on aspect (Dowty 1979, Krifka 1992, Tenny 1994 and others) that accomplishments are complex events which involve some kind of measure function, and they are frequently analyzed explicitly or implicitly as consisting of activity events which are measured out. Rothstein 2004 proposes that accomplishment verbs denote complex events consisting of an activity subevent and event of change, and that the process of change is used to 'measure' or plot the progress of the activity event. In particular, the culmination point of the change of state, i.e. the point at which the change is achieved, determines the culmination or end point of the event as a whole. More precisely, an accomplishment event is a singular event formed out of the sum of an activity event and a temporally extended BECOME event, which are linked in an **incremental relation**, in such a way that the incremental structure of the BECOME event is imposed on the activity, and determines the incremental structure of the event as a whole. Informally, an incremental relation assumes a contextually determined incremental chain, C(e_2), imposed on the event of change, via the *stage of*

relation holding between its subevents (where stage is defined as in (9) above). This essentially assigns to the BECOME event a division into its contextually relevant parts. A function, call it μ, maps the elements of the incremental chain onto the activity event in such a way that each element of e_2 is mapped onto that part of e_1 which shares its running time. Thus, the structure captures the generally accepted intuition (Dowty 1991, Krifka 1992, Tenny 1994, and others) that the change of state 'measures out' or marks the progress of the activity and thus of the event as a whole.

An incremental chain is defined as in (10):

(10) Incremental Chain
        Let e be a BECOME event:
        An incremental chain C(e) is a set of stages of e such that:
            (i)   the smallest event in C(e) is the initial bound of e
            (ii) for every e_1, e_2 in C(e), $e_1 < e_2$ or $e_2 < e_1$
            (iii) e ε C(e)

So an incremental chain divides a BECOME event into a set of temporally ordered stages, which start with its beginning and plot its growth into the complete event. This is represented graphically in (11), where the initial bound of e is the starting point of e, and the upper bound of an event e is its final point or culmination.

(11) **An incremental chain C(e)**

initial bound(e)   ub(e_1)   ub(e_2) ub(e_3) ub(e)
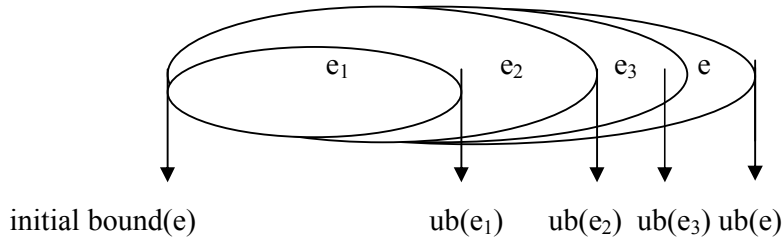
In an accomplishment event, the incremental chain, or division into ordered stages, is mapped by a one-to-one function onto the activity event, via the incremental relation in (12) (where τ(e) maps an event onto its running time):

(12) **Incremental relations:**
   Let e_1 be an activity, e_2 be a BECOME event, and C(e_2) be an incremental chain defined on e_2.
        INCR(e_1,e_2,C(e_2)) (e_1 is incrementally related to e_2 with respect to the chain C(e_2)) iff:
            there is a one-one function μ from C(e_2) into PART(e_1) (the set of parts of e_1) such that:
            for every e ∈ C(e_2): τ(e) = τ(μ(e)).

So the incremental relation maps the salient incremental parts of e_2, the BECOME event, onto those parts of e_1, the activity event, that have the same running time. Thus, while the incremental chain C(e_2) imposes an incremental structure on the BECOME event, the incremental relation imposes this structure on to the event as a whole, as illustrated graphically in (13), where e_1 is the activity event and e_2 is the BECOME event.

(13) Accomplishment event structure:
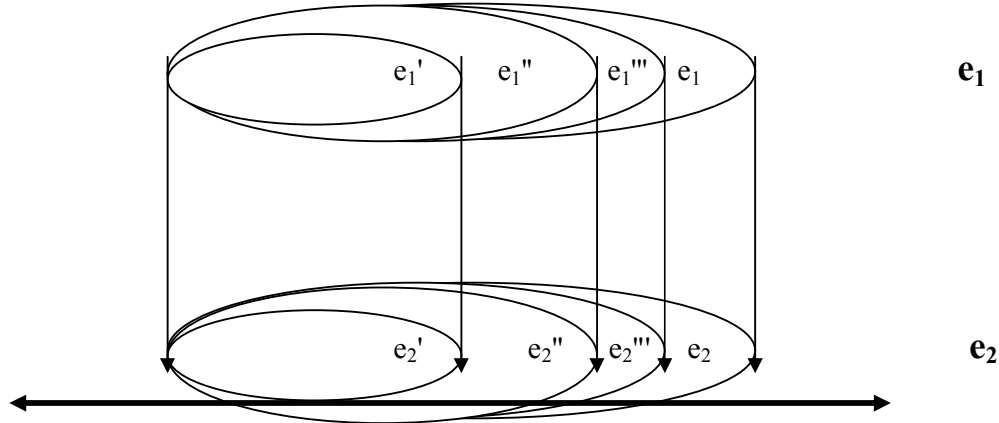
The template for Accomplishment verbs that expresses this structure, is given in (14):

(14) Accomplishment Template
$$\lambda e \lambda x. \exists e_1, e_2[\ e =^S (e_1 \sqcup e_2) \wedge \text{ACTIVITY}(e_1) \wedge \text{Th}(e_1) = x$$
$$\wedge \text{BECOME}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1)$$
$$\wedge \text{INCR}(e_1, e_2, C(e_2))]$$

An accomplishment verb thus denotes a complex event with an activity subevent e_1 and a BECOME subevent e_2, where the argument of the BECOME event is the theme of the activity (i.e. the incremental theme) and where the $\text{INCR}(e_1, e_2, C(e_2))$ relation holds, that is where e_1 and e_2 are incrementally related by means of an incremental chain $C(e_2)$ built on e_2.

The crucial point is that the are obviously many incremental chains which can be constructed on the BECOME event, since there are many possible ways of picking out parts of e_2 which fit the definition in (10), and it is context which determines what is an appropriate division into a relevant stage structure. For example, the relevant stages of a book reading event will depend on how long the book is, how fast a reader is, what purpose the book is being read for, what kind of book it is, and so on. Thus the incremental relation is contextually determined, depending on the contextually determined choice of part structure which itself determines the structure of the incremental chain.

3.4 *X by X* Modifiers

Against this background, the function of modifiers such as *page by page, step by step* and so on, can very naturally be seen as constraints on the elements of the incremental chain, i.e. on the domain of the μ function, and thus as constraints on the incremental structure of the event. *'X-by-X'* modifiers determine what is the domain of the 'stage-of' relation that determines the incremental chain, i.e. what are the contextually relevant stages, which chart the progress of the event. Consider the examples in (15):

(15) a. On stroil $^{\text{IMPERF}}$ dom etaž za   etažom.
     He built   house floor after floor
       'He was building a house floor-by-floor'.

b. Ivan el ^{IMPERF} cornflakes ložka za   ložkoj.
   Ivan ate   cornflakes spoon after spoon
      'Ivan ate cornflakes spoon by spoon'.

Example (15a) is true if there was an event of building the house and the relevant stages, which marked the progress of the building event, are stages that are measured in terms of the building of floors. (15b) is true if there was an event of eating cornflakes whose salient parts are the events of eating spoonfuls.

   In fact, the precise semantics for these *X by X* modifiers is stricter: not only are the salient stages of the event of change which are in $C(e_2)$ measured in terms of X, but all event stages of "V-ing an X" must be in $C(e_2)$. So if Ivan built a house floor by floor, then each and every event of accomplishing another floor is relevant, and if Ivan ate his cornflakes spoonful by spoonful, then each "mini" accomplishment of eating another spoonful is relevant.   We define the meaning of *X by X* modifiers generally in the following way. First we assume a generally available measure function $MEAS_S$ (relevant for any grading operation) which assigns to an entity (individual or event) a pair consisting of a cardinality and a standard of measure relative to a particular scale S (Landman 2004). If John is six feet tall, then $MEAS_{HEIGHT}(j)$ has the value <6, FOOT> and if he is six feet wide, then $MEAS_{WIDTH}(j) = $ <6, FOOT>. $MEAS_S$ can apply to events: if an event e takes two hours, then $MEAS_{TIME}(e) = $ <2, HOUR>. We call the set of ordered pairs consisting of the natural numbers and the standard of measure R_M. Since we will be concerned only with measuring the duration of events, we will leave out the subscript on MEAS.

   The MEAS function is generally available in the grammar (since it is used by comparative constructions), and *X-by-X* modifiers make use of it too. *X-by-X* modifiers constrain the members of the incremental chain $C(e_2)$ to be all and only those events, which are part of e_2, which can be measured in terms of numbers of Xs, where X is floors, spoonfuls and etc. In other words, if a verb V is modified by *X-by-X,* then salient stages of V becoming the case will be those events of V-ing an X. *Stroil ^{IMPERF} dom etaž za etažom*, "build a house floor by floor", gives the salient incremental stages of the house being built as floor-building stages. *El ^{IMPERF} cornflakes ložka za ložkoj*, "eat cornflakes spoon by spoon ", determines that the perceptually salient stages of the cornflakes being eaten are stages in which one spoon of cornflakes is eaten at a time.

   This is given formally in (16):
(16), where N is the set of natural numbers.

(16) $\lambda P \lambda x \lambda e . P(e) \wedge Th(e) = x \wedge X$ by $X(e) =$
   $\lambda P \lambda x \lambda e . \exists e_1, e_2 [\; e = {}^S(e_1 \sqcup e_2) \wedge P_{ACTIVITY}(e_1) \wedge Th(e_1) = x$
   $\wedge$ BECOME-P-ed $(e_2) \wedge Arg(e_2) = Th(e_1)$
   $\wedge$ INCR$(e_1, e_2, C(e_2))$
   $\wedge \forall e \; \varepsilon \; C(e_2) : e \; \varepsilon \; P \wedge MEAS(e) \; \varepsilon \; R_X$
   $\wedge MEAS(e_2) = $ <n, X> $\rightarrow \forall n' < n : \exists e \; \varepsilon \; C(e_2) : MEAS(e) = $ <n', X>]

λP.λe. P(e) ∧ X by X(e) denotes a set of events in P which consist of an activity e_1 and a BECOME event e_2, where e_2 is incrementally related to e_1 via an incremental chain. The incremental chain is a linearly ordered set of events which are stages of e_2 and which are

in the denotation of P, whose duration can be measured in terms of the measure determined by X, and which includes an event marking each X-stage of the development of e_2. Example (15b), *Ivan el cornflakes ložka za ložkoj* is interpreted in (17):

(17) $\exists e, e_1, e_2[\ e =^S (e_1 \sqcup e_2) \wedge EAT(e_1) \wedge Ag(e_1) = IVAN \wedge Th(e_1) = THE\ CORNFLAKES$
$\wedge\ BECOME\ EATEN\ (e_2) \wedge Arg(e_2) = Th(e_1)$
$\wedge\ INCR(e_1, e_2, C(e_2))$
$\wedge\ \forall e\ \varepsilon\ C(e_2): e\ \varepsilon\ EAT \wedge MEAS(e)\ \varepsilon\ R_{SPOONFUL}$
$\wedge\ MEAS(e_2) = <n, SPOON> \rightarrow \forall n' < n: \exists e\ \varepsilon\ C(e_2): MEAS(e) = <n', SPOON>]$

"There is an event which has a activity subevent of eating cornflakes with Ivan as agent, and a change subevent in which the cornflakes become eaten, and these two events are incrementally related by an incremental chain on the event of change, and the stages of the event of change are eating events, and the measure of each of these eating events is in terms of eating n spoons of cornflakes, and if the event of change is an event of eating n spoonfuls, then for every n' smaller than n, the incremental chain includes an event on eating n' spoons of cornflakes".

     The modifier, which determines what the salient parts of the BECOME event are, interacting with pragmatic considerations and the semantic restrictions on incremental chains, influences our perception of the rate at which the event took place. Compare (15b) with (18):

(18) On el ^{IMPERF} cornflakes   xlopinka za xlopinkoj.
     He ate   cornflakes   flake by flake
       'He ate cornflakes cornflake by cornflake'

The modifier picks out as salient events in which one cornflake was eaten. This of course imposes incremental chain, which is very much more fine-grained than the chain used in the interpretation of (15b). Since the semantic constraints on incremental chains requires the stage of relation to linearly order the set, and every natural number smaller than the maximal measure has to be represented in the chain, there will be many more elements in the chain if the measure of events stages is how many cornflake have been eaten, rather than if it is how many spoonfuls of cornflakes have been eaten.

     We can now see why *X-by-X* modifiers can only modify accomplishments. Since these modifiers constrain the incremental relation, they can only occur with verbs whose meaning includes reference to an incremental relation.

     An interesting point is raised by the example in (19a), which seems highly unnatural, and this despite the fact that *činil* is clearly incremental, since it can be modifier by *postepenno,* as in (19b)*:*

(19) a. # Ivan činil ^{IMPERF} computer, [proverjaja] detal' za detal'u.
       Ivan repaired   computer [checking]   part after part
       'Ivan repaired a computer [by checking] part by part'.
    b. Ivan postepenno činil ^{IMPERF} computer.
       Ivan gradually   repaired   computer
       'Ivan repaired a computer step-by-step'.

The infelicity of (19a) is predicted by the rule in (16), and in particular by the condition in line 5, which requires all elements of the incremental chain to be events in the denotation

of the V itself. The events in the incremental chain of *el cornflakes ložka za ložkoj/ eat cornflakes spoon by spoon* are themselves in *eat* and the events in the incremental chain of *stroil dom etaž za etažom/ build a house floor by floor* are themselves events in *stroil/build*. However, if Ivan repairs a computer by checking part by part, the stages which make up the incremental chain are not in themselves *repair* stages, since the repairing only happens at the final stage when Ivan finds what the problem is. We can see that this is a pragmatic matter, and not a property of *činit'*, since the verb is compatible with an *X-by-X* modifier in a context in which the condition in line 5 of (16) is met straightforwardly. (19) is better if asserted in a situation where the computer has a number of things wrong with it, and each stage of the repairing-the-computer process is itself an event of repairing a part, until finally all parts are repaired and the computer is thus repaired. In a context such as (20), *činit'* occurs unproblematically with an *X-by-X* modifier, as we would expect.

(20) Ivan činil $^{\text{IMPERF}}$ cep' zveno za zvenom.
      Ivan repaired   chain link after link.
      'Ivan repaired a chain link-by-link'.

So far, we have only discussed modification of imperfective accomplishments, where agreement about the felicity of *X-by-X* modification is universal. When we look at modification of perfectives, there are apparently two different dialects: for some speakers, (8b), repeated here as (21) and other sentences of the same form are ungrammatical, for others these sentences are perfectly acceptable.

(21) Ivan pročel $^{\text{PERF}}$ knigu stranica za stranicoj.
      Ivan read   book page   by page
       'Ivan read the book page-by-page'.

The rule in (16) predicts the dialect in which (21) is not acceptable (which is the dialect of the first author of this paper). To explain why we need briefly to look at the semantics associated with perfectivity.
        We assume following Filip 2000 and Filip and Rothstein (2005), that the perfective/imperfective distinction is a non-privative distinction, with both aspects introduce grammatical operators. Perfectivity is the expression of a maximalisation operator applying to a verbal head. Crucially, if a predicate P denotes a set of maximal elements, then if x is in the denotation of P, no parts of x can also be in the denotation of P (i.e. MAX(P), the output of a maximalisation operation, is a quantized predicate, in Krifka's (1992, 1998) terms. *Pročel*, as a perfective verb, denotes a set of maximal reading events (where what counts as maximal is contextually determined):

(22) *Pročel*$^{\text{PERF}}$: MAX(λxλe.READ(e) $\wedge$ Th(e)= x)
        = λxλe.READ(e) $\wedge$ Th(e)= x $\wedge$ $\forall$e'[e' $\leq$ e $\wedge$ READ(e') $\rightarrow$ e'=e]

The verb *pročel* is an accomplishment, and thus has the internal structure given in (14), that is it can be analyzed as being constructed from an activity subpart and a BECOME event, ordered by the contextually determined stage relation into an incremental chain. However, since the verb V denotes a set of maximal events MAX(V), the stages of an event e in MAX(V) cannot themselves be in MAX(V). A maximal event can have incremental stages, and perfective accomplishments do have incremental stages

constituting an incremental chain, but the stages of e are not of the same type as e itself. Now, line 5 of the rule in (16) specifies that for the V to be modified by an *X-by-X* modifier, the events in the incremental chain must also be in the denotation of V. However, if V denotes only maximal events, this condition cannot be met and *X-by-X* modification is not possible. In the imperfective, where there is no maximality condition, there is no difficulty in meeting this condition.

For dialects which do allow modification by *X-by-X* in the perfective, we assume that this condition has been dropped from the modification rule. This means that line (5) of (16) reads as in (23):

(23) $\wedge \forall e \, \varepsilon \, C(e_2): \text{MEAS}(e) \, \varepsilon \, R_X$

In other words, the stages in the incremental chain are measured in terms of the measure specified in the *X-by-X* modifier, but there is no condition that they are in the denotation of V.

One final point. For reasons, which we do not as yet understand, *X-by-X* modifiers are less acceptable when the standard of measure is a 'canonical' measure, such *hour-by-hour* or *meter-by-meter*. The construction clearly prefers standards of measures determined by the content of the lexical content of the V. So (24) is less natural than the other examples, but still grammatical.

(24)   On čital $^{\text{IMPERF}}$ knigu   čas za časom
       He read   the book hour by hour

3.5 *Postepenno*

 The data in (25), repeated from (7) show the distribution of *postepenno*.

(25)   a. Ivan čital $^{\text{IMPERF}}$ knigu postepenno.
          Ivan read   book   gradually
           'Ivan read a book gradually.'
       b. Ivan pročel $^{\text{PERF}}$ knigu postepenno.
          Ivan read   book gradually
           'Ivan read a book gradually'.
       c. *Ivan guljal $^{\text{IMPERF}}$ postepenno.
          Ivan walked   gradually
       d. *Ivan poguljal $^{\text{PERF}}$ postepenno.
          Ivan walked   gradually

Here we see that *postpenno* occurs with what seem to be accomplishment verbs, in both the perfective and imperfective aspects. Based on the discussion of *X-by-X* modifiers, we hypothesize that *postepenno* also constrains the incremental chain in some way.
Let us assume that if an event is gradual, then it has to have enough salient, identifiable stages so that it doesn't happen 'in one go' or in a rush'. These parts don't have to be homogeneous. I can build a house gradually over a period of several years, beginning by digging the basement and then pausing for a while, and then carrying on with working stages and pause stages of different and unpredictable durations and types. But in order to ensure that the event is gradual, it has to be assigned a structure consisting of a large enough number of salient subevents. The fact that gradual events tend to be slow follows

from the fact that in order to have a large enough set of salient subevents, a gradual event needs to last 'long enough' for the subevents to be noticed. Taking as our model the interpretation assigned to *X-by-X* we propose an interpretation as in (26):

(26) $\lambda P.\lambda e.\ P(e) \wedge \text{GRADUAL }(e) =$
$\quad \lambda P.\lambda e.\exists e_1,e_2[\ e=^S(e_1 \sqcup e_2) \wedge \text{ACTIVITY}(e_1) \wedge \text{BECOME }(e_2)$
$\quad \wedge \text{INCR}(e_1, e_2, C(e_2))$
$\quad \wedge \mid C(e_2) \mid = \text{BIG}]$

where a cardinality is in BIG if it is sufficiently above the norm, where of course the norm, and thus the denotation of BIG, is context dependent. Crucially, as we said above, the elements of the incremental chain do not need to be homogeneous, and thus (26) does not contain the constraint that the elements of $C(e_2)$ need to be P events.
(7a), *Ivan čital*$^{\text{IMPERF}}$ *knigu postepenno* will have the interpretation in (27)

(27) $\exists e, e_1,e_2[\ e=^S(e_1 \sqcup e_2) \wedge \text{READ}(e_1) \wedge \text{Ag}(e_1)= \text{IVAN} \ \wedge \text{Th}(e_1) = \text{THE BOOK}$
$\quad \wedge \text{ BECOME READ}(e_2) \wedge \text{Arg}(e_2)= \text{Th}(e_1)$
$\quad \wedge \text{ INCR}(e_{1,} e_2, C(e_2))$
$\quad \wedge \mid C(e_2) \mid = \text{BIG}]$

Note that *postepenno* occur with both perfective and imperfective accomplishment verbs, in all dialects. This is because although it is an incremental modifier, it does not constrain the properties of the individual stages of events, but looks only at the cardinality of the incremental chain. It can thus apply to maximal i.e. perfective, as well as imperfective verbs.

4. Delimited activities

This account allows us to make some interesting general points about the aspectual system in Russian, and the comparison between the Russian/English systems.

First, we have identified a class of incremental modifiers, which apply to verbs with incremental structure in both perfective and imperfective aspects. These allow us in turn to identify a class of accomplishment verbs, which occur in the perfective and imperfective, and which are characterized not by inherent telicity, but by their incremental structure, as expressed in (14). Understanding the Vendler classification as a characterization of the kinds of events which can be the denotation of verbal predicates in natural language, we can see that the two classes of verbs that Paducheva identifies as *dejstvija obyčnye* and *dejstvija v razvitii* show up as the result of the interaction of the system of lexical aspect described by Vendler with the grammatical system of perfectivity and imperfectivity which is part of Russian grammar. This results in a more flexible exploitation of the lexical aspectual classification, and of accomplishments, in Russian than is possible in English.

We hypothesis that the same approach can account for the relation between the other two classes that Paducheva 1996 discusses: imperfective activities and *Delimitiv* that are perfective. We follow Paducheva in assuming that *Delimitiv* are essentially delimited activities: they are verbs that are derived from unprefixed imperfective activities, and have the meaning of 'do the activity for some time' (after which an activity was completed). These perfective verbs fall under the lexical category of *Delimitiv* 'delimitated activities'. However, rather than assuming that *Delimitiv* form a different lexical class from activities, we suggest that they result from the interaction of the lexical

semantics of activities, the semantics of the prefixes and the semantics of perfective aspect.

As above, we assume following Filip and Rothstein 2005, that perfectivity is the grammatical expression of a maximalisation operator, and that there is an intimate relation between the semantics of this operator and the semantics of telicity. As argued in Rothstein 2004: a predicate is telic if it has atomic entities or pluralities of atomic entities in its denotation, where atomic entities are maximal non-overlapping elements, which can be counted. Maximality operates at the V level in Slavic, resulting in a lexicalised distinction between perfective verbs, which denote maximal sets, and imperfective verbs, which do not. Perfective V predicates in Russian, since they denote maximal events, naturally head telic VPs. Crucially, the maximalisation operator picks out temporally maximal events relative to a partial order usually induced by the prefix. Thus while a prefix like *po* is not itself a perfectivizer, in its attenuative use it introduces the quantity condition, and induces a partial order of events in its denotation, relative to which the maximalisation operator works.

Activity predicates in Russian, such as *guljat'*, are non-atomic and homogeneous, as they are in English, and thus imperfective. However, while *guljat'* $^{\text{IMPERF}}$ is an imperfective activity, prefixing it with *po* gives a 'measured predicate', that is a predicate with a quantity condition on events in its denotation, and induces a partial order relative to which the perfectivizer, i.e. the maximality operator can apply. In the derivation below, *SHORT* can be taken as a variable over sets of measure pairs $<n, X>$ where n is smaller than a contextually determined value.

(28) *guljat':* $\lambda e.\text{WALK}(e)$
      poguljat': $\lambda e.\text{WALK}(e) \wedge \text{MEAS}(e) = \text{SHORT}$
      poguljat' $^{\text{PERF}}$: $\text{MAX}(\lambda e. \text{WALK}(e) \wedge \text{MEAS}(e) = \text{SHORT}) =$
            $\lambda e. \text{WALK}(e) \wedge \text{MEAS}(e) = \text{SHORT} \wedge$
            $\forall e' [e' \leq e \wedge \text{WALK}(e') \wedge \text{MEAS}(e') = \text{SHORT} \rightarrow e'=e]$

The lexical head *poguljat'*, or *walk-a-bit* is not strictly quantized, since it can have parts which are also events of walking a bit, but it is a predicate to which the maximalisation operator can apply giving the predicate *poguljat'* $^{\text{PERF}}$ which denotes only maximal non-overlapping events. The predicate *poguljat'* $^{\text{PERF}}$ is thus atomic. If an event e is in the denotation of *poguljat'* $^{\text{PERF}}$, then no parts of e can be in its denotation relative to that particular context of use.

If we make use of the table in (1), *guljat'* $^{\text{IMPERF}}$ and *poguljat'* $^{\text{PERF}}$ should both classified as activities, since they both denote sets of events which are dynamic and do not involve change. The difference between them follows from the constraints of the system of grammatical aspect, namely that perfective predicate is delimited and atomic. Note that the perfective predicate *poguljat'* $^{\text{PERF}}$, while it is telic is not an accomplishment, since it does not have the incremental structure of an accomplishment. And, as we have seen, since *postepenno* is an incremental modifier, it will not occur with delimited activities[4].

---

[4] Note that the accumulative prefix *na-* with an activity *begat'* $^{\text{IMPERF}}$ (to run) forms a perfective accomplishment: *John postepenno nabegal* ^{PERF} *100 km* (John gradually accumulated 100 km by running). We can explain this data by either assuming that *na-* is a shift-operator from activity into accomplishment, or by suggesting that the motion verbs in some cases exhibit accomplishment-like behavior due to having their own incremental structure, albeit different from the incremental structure of accomplishments.

If we treat Vendler classes as constraints on what kinds of meanings verbs may have, or what kind of events they may have in their denotations, then *guljat'* and *poguljat'* are essentially the same kind of verb. They both denote dynamic events, which do not involve change. The difference between them follows from the fact that *poguljat'* denotes a set of maximal events of this kind relative to a particular measure, while *guljat'* does not. This subdivision of activities into delimited and non-delimited, expressed by perfective and non-perfective verb forms, respectively, is made possible by two facts: first, that Russian has a rich set of derivational prefixes expressing measures, and second, that maximalisation applies at the verbal level in Slavic. In Germanic, where the maximalisation operator applies at the VP level, and where the effect of *po-* prefixation can be achieved only by use of the phrasal modifier *for a while*, the contrast between *guljat'* [IMPERF] and *poguljat'* [PERF] is not lexicalised, but is expressed in the contrast between the verbal *run* and the phrasal *run for a little while*.

Since a delimited activity is an activity, it can be modified by *for x time*, which is not the case with perfective accomplishments, and of course, it cannot be modified by *postepenno*:

(27) a. Ivan poguljal [PERF]   čas.
         Ivan walked   hour.
            'Ivan walked for an hour.'
    b. * Ivan pročel [PERF]   knigu čas
         Ivan read   book hour
            'Ivan read a book for an hour'.

(28)   * John postepenno poguljal [PERF].
         John gradually   walked

Our conclusion is, therefore, that the basic division of lexical classes into states, activities, accomplishments and achievements is relevant both in English and in Russian, and that it cuts across the perfective/imperfective distinction. The Vendlerian classification reflects the basic characterizing features of event predicates: whether or not they denote inherently extended events, (i.e. can be analysed as having stages) and whether or not they are events of change. While both activities and accomplishments are extended and thus have stages, the interaction between the part structure and the [+change] features is such that accomplishments have an incremental structure, to which incremental modifiers are sensitive, while activities do not. There are apparently more verb classes in Russian than in English, since we can distinguish between activities and delimited activities, and between *dejstvija obyčnye* and *dejstvija v razvitii*, but this is an epiphenomenon, resulting from the interaction of lexical aspect with the semantics of the perfective/imperfective distinction.

One final point. The distribution of *X-by-X* modifiers and *gradually* in English cannot be predicted on the basis of the Russian data, and is too complicated to discuss here. Judgments about the data are much less clear-cut, and since the aspectual system is very different, the modifiers behave differently too. We mention only one fact, namely that *X-by-X* modifiers can modify telic accomplishments in English:

(29)   a. John built the house floor by floor.
       b. Mary read the book poem by poem.

Our account rules out modification of atomic predicates by *X-by-X* modifier in Russian

(in at least one dialect) because its semantics conflicted with the atomicity of the verb. Filip and Rothstein 2005 argue that the atomicity/telicity operator in English is a VP operator, while in Russian it operates at the level of the V. We assume that incremental modifier is added lower than the telicity operator and is thus under its scope, that there is no conflict between the semantics of the modifier and the maximality operator. This will account for the contrast with the Russian data.

References

Brecht, Richard D. (1985) "The form and function of aspect in Russian". Michael S. Flier and Richard D. Brecht, eds. Issues in Russian morphosyntax. Columbus, OH: Slavica, 9-34.

Bulygina, T.V. (1982) "K postroeniju tipologii predikatov v russkom jazyke" [Towards building a typology of predicates in Russian]. Seliverstova O.N., ed. Semanticheskie tipy predikatov [Semantic types of predicates]. Moscow: Nauka, 7-85.

Dowty, David R. (1979) Word meaning and Montague grammar: The semantics of verbs and times in generative semantics and in Montague's PTQ. Dordrecht: Reidel.

Eckert, E. (1985) "Aspect in Repetitive Contexts in Russian and Czech". Michael S. Flier and Alan Timberlake, eds. The scope of Slavic aspect. Columbus, OH: Slavica, 169-179.

Filip, Hana. (1999) Aspect, Eventuality Types and Nominal Reference. New York: Garland Publishing. Outstanding dissertations in linguistics.

Filip, Hana. (2000) "The quantization puzzle". James Pustievsky and Carol Tenny, eds. Events as grammatical objects, from the combined perspectives of lexical semantics, logical semantics and syntax. Stanford: CSLI Press, 3-60

Filip, Hana. (2004) "Prefixes and the Delimitation of Events". Journal of Slavic Linguistics 11(1): 55-101.

Filip, Hana and S. Rothstein. (2005) "Telicity as a Semantic Parameter". Talk delivered at FASL 14, Princeton.

Forsyth, J. (1970) A grammar of aspect: Usage and meaning in the Russian verb. Cambridge: Cambridge University Press.

Krifka, Manfred. (1992) "Thematic relations as links between nominal reference and temporal constitution". I. Sag and A. Szabolsci, eds. Lexical Matters, CSLI Publications.

Krifka, Manfred. (1998) "The origins of telicity". Susan Rothstein, ed. Events and Grammar. Dordecht/Boston/London: Kluwer Academic Publishers, 197-235.

Kucera, H. (1985) "A Semantic Model of Verbal Aspect". Michael S. Flier, ed., American Contributions to the Ninth International Congress of Slavists. Columbus, OH: Slavica, 171-184.

Landman, Fred. (1992) "The progressive". Natural Language Semantics 1: 1-32.

Landman, Fred. (2000) Events and plurality. Dordrecht: Kluwer Academic Publishers.

Landman, Fred (2004) "The almost but not quite naïve theory of measures". Ms Tel Aviv University.

Mehlig, H.R. (1985) "Semantika predlozhenija i semantika vida v russkom jazyke" [Semantics of sentence and semantics of aspect in Russian]. Bulygina, T.V. and A.E. Kubrik, eds. Novoe v zarubezhnoj linguistike [New in foreign linguistics]. Moscow: Progress, 227-249.

Paducheva, E.V. (1996) Semantichiskie issledovaniya [Semantic Researches]. Moscow: Yaziky Russkoi Kultury.

Parsons, Terence. (1990) Events in the semantics of English: A study in subatomic semantics. Cambridge, Mass.: The MIT Press

Rothstein, Susan (2004) Structuring events: A study in the semantics of lexical aspect. Oxford: Blacckwell's.

Smith, Carlota S. (1991) The parameter of aspect. Dordecht: Kluwer Academic Publishers.

Vendler, Zeno. (1967) Linguistics in philosophy. Ithaca, New York: Cornell University Press, 97-121