

Vendlerian Classes and the Russian Aspectual System

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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 *postепенно*, 'gradually', and 'X-by-X' modifiers, such as *stranica za stranicej*, 'page by page' and *etaž za etažom*, 'floor by floor'. Imperfective activities do not occur with either *postепенно* or the 'X-by-X' modifiers, and neither do the verb forms which Paducheva 1996 calls "delimited activities" (*delimitativ*). Accomplishments in both the imperfective and the perfective aspects occur with *postепенно* and the 'X-by-X' modifiers (although some Russian speakers find some examples of perfective accomplishments with 'X-by-X' modifiers unnatural due to what we consider to be pragmatic reasons). We show that the behavior 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 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. We begin with some background about the Vendlerian classes in general, and then address how these have been treated in the discussion of Russian aspect.

1.1. Vendlerian classes in English oriented linguistic studies.

The Vendlerian classification is a four-way classification of verbs into states, activities, achievements and accomplishments, depending on the properties of the events in their denotation; for example, dynamic vs. static, telic vs. atelic (see e.g. Vendler 1967,

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Dowty 1979, Smith 1991, Rothstein 2004). It has proved relevant in many languages, in particular English, because grammatical operations such as adverbial modification and the progressive operator are sensitive to the distinctions made by this classification. For example, in English modifiers of the form *in α time* naturally occur with accomplishment and achievement verbs, but not with activities or states, while *for α time* naturally modifies a state or an activity, but not an achievement or an accomplishment, as in (1):

- (1) a. John grew up in a short time/*for a short time. (accomplishment)
 b. John arrived in a short time/*for a short time. (achievement)
 c. John ran for a short time/*in a short time. (activity)
 d. John lived for a short time/*in a short time. (state)

However, there has been some confusion and disagreement in the literature as to what exactly the Vendlerian classification is supposed to be classifying. On the one hand, it seems to apply to verbs, so that *love* is classified as a state, *arrive* as an achievement, *run* as an activity and *build* as an accomplishment. Since verbs are taken to denote events (either entities, as in the (neo)-Davidsonian framework, or as relations of certain kind, as Dowty has argued), and Vendlerian classes classify according to properties of events, this is very plausible. On the other hand, as Dowty 1979 pointed out, we might take the classification to apply at the VP level, since choice of verbal complement affects the linguistic behavior of the VP as a whole. The data in (1) doesn't support either position, since in these examples the VP and the V contain exactly the same material. But with a transitive accomplishment like *build*, the effects of the direct object become clear: *build the house* seems to have accomplishment properties, since it appears with *in α time*, but *build houses* looks more like an activity. Similarly, *run a mile* or *ran to the store* behave like accomplishments, although *run* has activity properties:

- (2) a. John built the house in a day/*for a day.
 b. John built houses for some years/*in some years.
 c. John ran a mile in an hour/*for an hour.
 d. John ran to the store in an hour/for an hour.

Although some linguists have taken the data in (2) as evidence that Vendlerian classes apply to VPs, a more insightful analysis has emerged especially from the work of Krifka 1989, 1992, 1998. Krifka gave an analysis of verb phrase meanings which shows what the relation between verb and VP meaning is. He argued that the *in α time/for α time* adverbials distinguish between two kinds of VPs, telic and atelic. A telic VP, according to Krifka 1998, is essentially a VP denoting an event holding at a specified temporal interval. So *build the house* in (2a) is telic, since the determined NP in direct object position allows one to specify an interval at which the event took place: an interval which is big enough to build the house in question. *Build houses* in (2b) is not telic, since the bare plural does not allow one to pick out a specific interval. Krifka went on to argue that verbs differ in how they contribute to determining the telicity of the VP which they head. *Build* is a verb with an incremental theme argument, and this is why the direct object, expressing the theme, contributes to the determination of the telicity of the VP. By contrast, *push* does not have an incremental theme argument, and thus the properties of the arguments do not determine the telicity of the VP:

- (3) a. John pushed the cart for an hour/* in an hour.
 b. John pushed carts for an hour/* in an hour.

Krifka's work made it possible to clarify what the Vendlerian classification of event structures applies to. VPs are telic or atelic, depending on whether they denote events holding at a specifiable time interval or not. Verbs belong to different Vendlerian classes, since they contribute to determining the telicity of the VPs they head in different ways. An accomplishment denotes an inherently incremental event type, with a theme incrementally related to the event, and thus the properties of the theme determine whether or not the VP it heads is telic. An activity is not incremental, and thus the theme cannot determine the length of an event, and a non-modified activity headed VP is atelic. But activities naturally allow themselves to be measured by a variety of modifiers, and thus the examples in (2c/d) contain telic VPs. Achievements denote instantaneous changes, and thus normally head telic VPs, since the dimensions of the change determine the interval at which the event holds (Rothstein 2004), and states are not inherently measurable, and thus do not head telic VPs (unless they have undergone shifts in meaning).

This approach has led to the conclusion that the Vendlerian classification is best seen as part of the study of lexical aspect, that part of aspect which is determined by the property of verbal heads. The classification of verbs into states, activities, achievements and accomplishments reflects the properties of the events in the denotations of the verbs, and the VP properties demonstrated in (2) follow from the fact that verbs belonging to different lexical classes and denoting different kinds of event-types, interact with direct objects and modifiers in different ways (see also the discussion in Rothstein 2004). This approach is proving fruitful, because it makes it possible to ask in what kinds of ways VPs may be telic, since verbs of different kinds will allow the time intervals at which they hold to be specified differently, and may thus be telic for different reasons.

Almost all the discussion of Vendlerian classes has focused on English, but an obvious question is how the Vendlerian classification is relevant in languages with very different verbal systems, such as the Slavic family. If Vendler classes are universal constraints on what kind of meanings verbs can have and what kind of events they can denote, then one might *prima facie* expect them to be relevant in all languages. However, the question as we have just phrased it is a philosophical one. The empirical issue, which is relevant for linguists, is different. The Vendlerian classification is linguistically 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.

In Russian and other Slavic languages, unlike in English and other Germanic languages, verbs are classified into perfective and imperfective aspects. The obvious question is whether the Vendlerian classification has any relevance in languages with this kind of verbal system, or whether it is made redundant by the grammatical aspectual system. There are three possible answers. One possibility is that mapping verbs in Slavic into the Vendlerian lexical classes is not relevant, since linguistic operations make reference only to the perfective/ imperfective distinction. As far as we know, this position has not been explicitly argued by anyone. A second possibility is that the Vendlerian classification in Russian is subsumed under the perfective /imperfective distinction, in which case the Vendler 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. This is the approach taken in 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 approach is the correct one, then there should be some linguistic operation which is sensitive to the distinction in lexical class and 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 position. We will provide empirical evidence that accomplishment verbs can be realized in both perfective and imperfective aspects in Russian, thus supporting the position of Paducheva 1996, and provide a lexical categorization of verb classes which builds on Paducheva's analysis. We will also suggest that activities have perfective and imperfective realizations. This means that on our interpretation of what Vendlerian classes are, the class of activities, as well as that of accomplishments, cuts across the imperfective/perfective distinction.

2. Vendlerian Classes in Russian – some background

The issue of the lexical aspect in Russian and its interaction with the grammatical aspects of 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 analysis of incremental modifiers.

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 states¹. 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 unprefixated 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 unprefixated imperfective verb *stroit*^{IMPERF} (to build) is an atelic activity (example (4a)) that is

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

shifted into the telic accomplishment *postroit*'^{PERF} by the addition of the perfectivizing prefix *po-*, as shown in (4b).

- (4) a. Ivan stroil^{IMPERF} dom. [Activity]
 Ivan built house
 'Ivan built a / the house.'
- b. Ivan postroit^{PERF} dom. [Accomplishment]
 Ivan built house
 'Ivan built the house.'

The opposite process of shifting unprefixated perfective accomplishments and achievements into imperfective activities and states is achieved by the imperfectivizing suffix *-(i)va*. While perfectivization is a lexical process (see also Filip 2000, who claims that perfectivizing prefixes are derivational affixes), the imperfectivizing suffix is grammatical operator (inflectional affix) that changes the aspectual status of a verb without changing the meaning of the lexical head. The process of turning a perfective accomplishment verb into an imperfective activity is illustrated in the following example (5).

- (5) a. Ivan obezvredil^{PERF} minnoe pole. [Accomplishment]
 Ivan defused minefield
 'Ivan defused the minefield.'
- b. Ivan obezvrežival^{IMPERF} minnoe pole. [Activity]
 Ivan defused minefield
 'Ivan defused a / the minefield.'

It follows from the Brecht's account that there is a homomorphism from lexical to grammatical aspects in Russian: activities and states will be realized as imperfectives, and accomplishments and achievements as perfectives. Hence, examples (6a)-(6b) are activities, while (7a)-(7b) are accomplishments.

- (6) a. Ivan čital^{IMPERF} knigu. [Activity]
 Ivan read book
 'Ivan read a / the book.'
- b. Ivan guljal^{IMPERF}. [Activity]
 Ivan walked
 'Ivan walked.'
- (7) a. Ivan pročital^{PERF} knigu. [Accomplishment]
 Ivan read book
 'Ivan read the book.'
- b. Ivan poguljal^{PERF}. [Accomplishment]
 Ivan walked
 'Ivan walked for a while.'

2.2 Paduceva's 1996 account

Paduceva 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, Paduceva argues that the lexical class of accomplishments is realized by both perfective and imperfective verbs. These accomplishments form aspectual pairs which she calls *predel'nye pary* 'bounded pairs' (Paduceva 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 Paduceva'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, Paduceva 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 unprefixated imperfective activities by the delimitative prefix *po-* and assign to these activities a meaning of duration for some time (after which an activity process stopped). These perfective verbs fall under the lexical category of *delimitativ* 'delimited activities' which constitute a new lexical class, absent from the Vendlerian system. It is important to mention that for Paduceva perfective delimited 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 from the original imperfective verbs. An example of delimited activity is the verb *poguljat'*^{PERF} 'to walk for some time' in the example (7b).

Applying Paduceva's classification to our initial examples in (6)-(7), we get the following taxonomy, with the names of the lexical classes given in both Paduceva's and Vendler's terms. Note that the delimited activity in the example (9b) does not have a correlate in the Vendlerian classification.

- | | | | |
|--------|-------------------------------|--------|----------------------------------------------------|
| (8) a. | Ivan čital ^{IMPERF} | knigu. | [<i>Dejstvie v razvitii</i> /
Accomplishment] |
| | Ivan read | book | |
| | 'Ivan read a book.' | | |
| b. | Ivan guljal ^{IMPERF} | | [<i>Dejatel'nost'</i> / Activity] |
| | Ivan walked | | |
| | 'Ivan walked.' | | |
| (9) a. | Ivan pročital ^{PERF} | knigu. | [<i>Dejstvie obyčnoe</i> /
Accomplishment] |
| | Ivan read | book | |
| | 'Ivan read a book.' | | |
| b. | Ivan poguljal ^{PERF} | | [<i>Delimitativ</i>] |
| | Ivan walked for a while | | |
| | 'Ivan walked for a while.' | | |

² Paduceva 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*^{PERF} 'Snow melted'. Its imperfective correlate is *Sneg tajal*^{IMPERF} 'Snow was melting'. While we focus mainly on agentive accomplishments in our discussion, we will show that both agentive and non-agentive accomplishments behave in the same way in respect to the incremental modification that we employ, so that the agentive/non-agentive distinction is irrelevant for our purposes.

Paduceva's analysis leads to the following conclusions. First, the lexical class of accomplishments is expressed in both perfective and imperfective aspects by pairs of verbs that stand in the aspectual pair relation with each other. Paduceva suggests that the imperfective accomplishments in Russian are similar to the progressive accomplishments in English (Paduceva 1996: 106). This means that there must be something to the semantics of accomplishments which cuts across the imperfective/perfective divide. The second point is that the imperfective aspect is not limited to verbs denoting activities and states, but can include 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 delimited activity. We concentrate here on the lexical semantics of accomplishments, and suggest that accomplishments denote inherently incremental events, both in English and in Russian, and that it is this semantics feature which crosses the perfective/imperfective divide. We show that the modifier *postепенно* 'gradually', and modifiers of the form *X za X*, 'X by X', modify only accomplishment verbs, and that this is because they are inherently incremental and make reference in their semantics to the incrementality of the accomplishment verb.

In what follows, we will present evidence to support this claim about the distribution of incremental modifiers, and will suggest a semantics which explains this distribution (section 3). In section 4, we will make some more general observations about the Vendlerian classification and the perfective/imperfective classification, and suggest that the interaction between grammatical and lexical aspect in Slavic predicts exactly such 'strange beasts' as imperfective accomplishments and delimited activities.

3. Distribution of Incremental modifiers

If *čitat'* and *pročitat'* (to read) 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*. We will examine the distribution of these modifiers with aspectual pairs like *čitat'* and *pročitat'*, as well as with verbs like *guljat'*, an activity, and *poguljat'*, the delimited activity which is the nearest it has to a perfective counterpart.

We will examine two kinds of incremental modifiers, *postепенно*, corresponding more or less to the English 'gradually', and modifiers of the form *X za X*, 'X by X'. Example (10) shows the distribution of *postепенно*, and example (11) shows the distribution of the *X za X* modifier. (For some people, including the first author of this paper and some of his informants, the *X za X* modifiers are somewhat degraded in the perfective. We will discuss this later on).

- (10) a. Ivan *postепенно* čital^{IMPERF} knigu.
 Ivan gradually read book
 'Ivan gradually read a / the book.'
- b. Ivan *postепенно* pročit^{PERF} knigu.
 Ivan gradually read book
 'Ivan gradually read the book.'
- c. * Ivan *postепенно* guljal^{IMPERF}.
 Ivan gradually walked

- d. * Ivan *postepenno poguljal*^{PERF}.
Ivan gradually walked for a while

- (11) a. Ivan *čital*^{IMPERF} knigu stranica za stranicej.
Ivan read book page by page
'Ivan read a / the book page-by-page.'
b. Ivan *pročitao*^{PERF} knigu stranica za stranicej.
Ivan read book page by page
'Ivan read the 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 for a while step by step

The examples in (10) show that *postepenno* can modify both *čitao*' and *pročitao*', which both superficially correspond to the English accomplishment *read*, but do not occur with either imperfective or perfective forms which correspond to the English activity *walk*. This means that they occur with the verbs which Paduceva takes to be accomplishments, but not with those that she takes to be activities or delimited activities. Example (11) shows that the *X by X* modifiers too occur with the hypothesized accomplishment, but not with the imperfective activity *guljao*' or the delimited activity *poguljao*'.

This ability to be modified by incremental modifiers generalizes to all verbs classified by Paduceva as accomplishments, while activities cannot be so modified (with the exception of directed motion activities such as *bežao*^{IMPERF} (to run), *plivao*^{IMPERF} (to swim) which behave as a class by themselves. See the discussion later in the paper.) Thus, we have further examples of accomplishments that are acceptable with incremental modifiers: *postepenno pisao*^{IMPERF} / *napisao*^{PERF} knigu "to write book gradually" and *pisao*^{IMPERF} / *napisao*^{PERF} knigu stranica za stranicej "to write book page-by-page"; *postepenno risovao*^{IMPERF} / *narisovao*^{PERF} kartinu "to paint painting gradually" and *risovao*^{IMPERF} / *narisovao*^{PERF} kartinu mazok za mazkom "to paint painting brushstroke-by-brushstroke". Conversely, we have further examples of activities which cannot be so modified: * *postepenno prygao*^{IMPERF} "to jump gradually" / * *postepenno poprygao*^{PERF} "to jump for a while gradually" and * *prygao*^{IMPERF} kamen' za kamnom "to jump stone-by-stone" / * *poprygao*^{PERF} kamen' za kamnom "to jump for a while stone-by-stone" and * *postepenno smežatsja*^{IMPERF} "to laugh gradually" / * *postepenno posmežatsja*^{PERF} "to laugh for a while gradually"; * *smežatsja*^{IMPERF} smešok za smeškom "to laugh laughter-by-laughter" and * *posmežatsja*^{PERF} smešok za smeškom "to laugh for a while laughter-by-laughter". Note also that most perfective procedurals which are derived from accomplishments can also be modified by these incremental modifiers, as can the secondary imperfectives derived from them, although not, of course, the delimited procedurals derived via *po*-prefixation and meaning *V for a while*, or procedurals that undergo a shift from accomplishments into achievements.³ For instance, imperfective accomplishments *stroit*^{IMPERF} (to build) and *čitao*^{IMPERF} (to read) can have a wide number of perfective

³ For example, *nedočitat'* "not to complete reading", and the inchoative *začitao*' "to begin reading" cannot be modified by incremental modifiers, nor can *počitao*' 'to read for a while'. Mehlig 2006 argues that *počitao*' is derived from a non-incremental use of the verb *čitao*'.

procedurals derived from them (some of which can undergo a secondary imperfectivization). Some examples are *nadstroit'*^{PERF} / *nadstraivat'*^{IMPERF} (to build on top/ add construction), *zastroit'*^{PERF} / *zastraivat'*^{IMPERF} (to fill a site with buildings), *perestroit'*^{PERF} / *perestraivat'*^{IMPERF} (to rebuild), *perečitat'*^{PERF} / *perečityvat'*^{IMPERF} (to reread) and *dočitat'*^{PERF} / *dočityvat'*^{IMPERF} (to finish reading). All these procedurals are compatible with the incremental modifiers, as follows: *postepenno nadstroit'*^{PERF} / *nadstraivat'*^{IMPERF} *etaž* (to gradually add a floor) and *nadstroit'*^{PERF} / *nadstraivat'*^{IMPERF} *etaz komnata za komnatoj* (to add a floor room-by-room); *postepenno zastroit'*^{PERF} / *zastraivat'*^{IMPERF} *učastok* (to gradually build up a site) and *zastroit'*^{PERF} / *zastraivat'*^{IMPERF} *učastok domami dom za domom* (to fill a site with houses house-by-house); *postepenno perestroit'*^{PERF} / *perestraivat'*^{IMPERF} *dom* (to gradually rebuild a house) and *perestroit'*^{PERF} / *perestraivat'*^{IMPERF} *dom komnata za komnatoj* (to rebuild a house room-by-room); *postepenno perečitat'*^{PERF} / *perečityvat'*^{IMPERF} *knigu* (to gradually reread a book) and *perečitat'*^{PERF} / *perečityvat'*^{IMPERF} *knigu stranica za stranicej* (to reread a book page-by-page); *postepenno dočitat'*^{PERF} / *dočityvat'*^{IMPERF} *knigu* (to gradually finish reading a book) and *dočitat'*^{PERF} / *dočityvat'*^{IMPERF} *knigu stroka za strokoj* (to finish reading a book line-by-line).

On the assumption that incremental modifiers modify incremental verbs, these data indicate (i) that the class of incremental verbs (= accomplishments) has both perfective and imperfective instantiations, and (ii) that non-stative imperfective verbs denoting events with duration can be divided into those which are incremental (by hypothesis, accomplishments) and those which are not (uncontroversially, activities). The data in (10)-(11) thus provides support for Paducheva's position rather than Brecht's. One might suggest that the Brecht's analysis could still be defended by claiming that (8a) and (9a) are transitive activities and (8b) and (9b) are intransitive ones, and that what the incremental modifiers react to is the transitive vs. intransitive status of activity verbs. However, the examples in (12) - (15) show that the distinction between activities and accomplishments with respect to the incremental modification is maintained even when accomplishments are intransitive, and the activities are transitive.

- (12) a. Cvetok postepenno ros^{IMPERF}.
 Plant gradually grew
 'A plant gradually grew.'
 b. Cvetok postepenno vyros^{PERF}.
 Plant gradually grew up
 'A plant gradually grew up.'
 c. * Ivan postepenno iskal^{IMPERF} knigu.
 Ivan gradually looked for book
 d. * Ivan postepenno poiskal^{PERF} knigu.
 Ivan gradually looked for a while for book
- (13) a. Cvetok ros^{IMPERF} meter za metrom.
 Plant grew meter by meter
 'A plant grew meter-by-meter.'
 b. Cvetok vyros^{PERF} meter za metrom.
 Plant grew up meter by meter.
 'A plant grew up meter-by-meter.'
 c. * Ivan iskal^{IMPERF} knigu komnata za komnatoj.

- Ivan looked for book room by room
- d. * Ivan poiskal^{PERF} knigu komnata za komnatoj.
Ivan looked for a while for book room by room
- (14) a. Dinozavry postepenno ischezali^{IMPERF} s lica zemli.
Dinosaurs gradually disappeared from face of earth
'Dinosaurs gradually disappeared from the face of the earth.'
- b. Dinozavry postepenno ischezli^{PERF} s lica zemli.
Dinosaurs gradually disappeared from face of earth
'Dinosaurs gradually disappeared from the face of the earth.'
- c. * Deti postepenno maxali^{IMPERF} rukami.
Children gradually waved hands
- d. * Deti postepenno pomaxali^{PERF} rukami.
Children gradually waved for a while hands
- (15) a. Dinozavry isčezali^{IMPERF} s lica zemli vid za vidom.
Dinosaurs disappeared from face of earth species by species
'Dinosaurs disappeared from the face of the earth species-by-species.'
- b. Dinozavry isčezli^{PERF} s lica zemli vid za vidom.
Dinosaurs disappeared from face of earth species by species
'Dinosaurs disappeared from the face of the earth species-by-species.'
- c. * Deti maxali^{IMPERF} rukami dviženie za dviženiem.
Children waved hands movement by movement
- d. * Deti pomaxali^{PERF} rukami dviženie za dviženiem.
Children waved hands movement by movement

Other examples which support this are *postepenno taljat'*^{IMPERF} /*rastajat'*^{PERF} "to melt gradually" and *tajat'*^{IMPERF} /*rastajat'*^{PERF} *sloj za slojem* "to melt layer by layer; *postepenno ostyvat'*^{IMPERF} /*ostyt'*^{PERF} "to cool gradually" and *ostyvat'*^{IMPERF} /*ostyt'*^{PERF} *gradus za gradusom* "to cool degree-by-degree", all of which are acceptable, as opposed to **postepenno tanzevat'*^{IMPERF} *tango* "to gradually dance a tango" / **postepenno potanzevat'*^{PERF} *tango* "to gradually dance a tango for a while"; **tanzevat'*^{IMPERF} *tango šag za šagom* / "to dance a tango step by step" / **potanzevat'*^{PERF} *tango šag za šagom* "to dance a tango for a while step by step; **postepenno xlopat'*^{IMPERF} *kryl'jami* "to gradually flap wings" / **postepenno poxlopat'*^{PERF} *kryl'jami* "to gradually flap wings for a while" and **xlopat'*^{IMPERF} *kryl'jami ryvok za ryvkom* "to flap wings swing-by-swing" / **poxlopat'*^{PERF} *kryl'jami ryvok za ryvkom* "to flap wings for a while swing-by-swing"

An important question to ask⁴ is whether all imperfective verbs can be modified by these modifiers, independent of their interpretation. In the examples given above, the most natural interpretation of the imperfective accomplishments is that they denote partially completed events, or events in progress. However, imperfective verbs in Russian can be interpreted in four different ways: progressive, durative, iterative or habitual, and perfect. As we show below, incremental modifiers occur in all four readings, indicating that the incrementality of the verbal element is a lexical property of the verbal head, and not derived from the particular choice of imperfective reading imposed on it.

The four interpretations are illustrated in (16). A progressive focalized-processual interpretation describes a situation occurring at the moment of observation,

⁴ We thank an anonymous reviewer for pointing out the importance of this question to us.

as in (16a). A durative-processual interpretation denotes a situation that holds at a time interval, but which is located before some point of reference, as in (16b). This is the most natural reading for the examples which have been used up to now. The iterative reading in (16c), also referred to as the habitual, denotes an iteration of a certain situation. Finally, a perfect reading in (16d) denotes a completed situation with some relevance for the present.

- (16) a. V 12:00, Ivan čital^{IMPERF} knigu.
 At 12:00, Ivan read book.
 'Ivan was reading a / the book at 12:00.'
- b. Ivan dva časa čital^{IMPERF} knigu pered tem kak ja prishel^{PERF}.
 Ivan two hours read book before I came in.
 'Ivan was reading a / the book for two hours before I came in.'
- c. Ivan čital^{IMPERF} žournal 'Time' po subbotam.
 Ivan read magazine Time on Saturdays.
 'Ivan used to read a 'Time' magazine on Saturdays'.
- d. Ivan uže čital^{IMPERF} 'Vojnu i Mir' za dve nedeli.
 Ivan already read War and Peace in two weeks
 'Ivan has already read 'War and Peace' in two weeks.'

As we see in the following examples, incremental modifiers are compatible with all four interpretations, though some readings require contextual support. Note also that these readings are available with both singular and plural direct objects, interpreted as definites or indefinites, indicating that the incrementality is inherent to the verb meaning and not derived from a structure imposed on a plurality or from a completive reading dependent on the definiteness of the direct object:

- (17) a. ? Kogda ja voshel, Ivan čital^{IMPERF} knigu / knigi stranica za stranicej.
 When I came in Ivan read book books page by page
 'When I came in, Ivan was reading a / the book / (the) books page by page.'
- b. ? Kogda ja voshel, Ivan postepenno čital^{IMPERF} knigu / knigi.
 When I came in Ivan gradually read book books
 'When I came in, Ivan was gradually reading / the book / (the) books.'
- (18) a. Sidja v biblioteke, Ivan čital^{IMPERF} knigu / knigi stranica za stranicej.
 Sitting in library, Ivan read book books page by page
 'Sitting in the library, Ivan read a / the book / books page-by-page.'
- b. Sidja v biblioteke, Ivan postepenno čital^{IMPERF} knigu / knigi.
 Sitting in library, Ivan gradually read book books
 'Sitting in the library, Ivan gradually read a / the book / (the) books.'
- c. Ivan dva časa čital^{IMPERF} knigu / knigi stranica za stranicej pered examenom.
 Ivan two hours read book books page by page before exam
 'Ivan read a / the book / (the) books page-by-page for two hours before exam.'
- (19) a. Po voskresenjam, Ivan čital^{IMPERF} gazety stranica za stranicej.
 On Sundays Ivan read newspapers page by page
 'On Sundays, Ivan read (the) newspapers page-by-page.'
- b. Po voskresenjam, Ivan postepenno čital^{IMPERF} gazety.
 On Sundays Ivan gradually read newspapers
 'On Sundays, Ivan gradually read (the) newspapers.'

- (20) a. Ivan uže čital^{IMPERF} 'Vojnu i Mir' stranica za stranicej.
 Ivan already read War and Peace page by page
 'Ivan has already read 'War and Peace' page-by-page.'
- b. Ivan uže postepenno čital^{IMPERF} 'Vojnu i Mir'.
 Ivan already gradually read War and Peace
 'Ivan has already gradually read 'War and Peace.'

The durative-processual reading in (18), the habitual/iterative reading in (19) and the perfect reading in (20) are compatible with the incremental modifiers *postepenno* and *bit-by-bit*. At the first sight, the incremental modifiers seem to be incompatible with the progressive focalised-processual interpretation of imperfective *čital* in (17). However, this incompatibility is explained by pragmatic reasons: a speaker is unable to ascertain that the reading process was gradual or proceeded bit-by-bit at the point of observation. Since the sentences in (17) are narrowed down to a single moment or a very short time interval, the speaker cannot judge whether the reading process is gradual or page-by-page from what he observes at this short moment. A proper contextual support seems to resolve this problem, as we can see in (21):

- (21) Ivan načal^{PERF} čitat'^{IMPERF} knigu s utra. Kogda ja uxodil^{IMPERF},
 Ivan began to read book since morning. When I left
 Ivan postepenno / stranica za stranicej čital^{IMPERF} knigu. Kogda ja vernulsja^{PERF}
 Ivan gradually page by page read book When I came back
 v 12:00, on prodolžal postepenno / stranica za stranicej čitat' etu že knigu.
 at 12:00 he continued gradually page by page to read this very book
 'Ivan began reading a book since morning. When I was leaving, Ivan was
 reading the book gradually/page-by-page. When I came back at 12:00, he
 continued to read the same book gradually/page-by-page.'

Incremental modifiers may still sound a little strange with bounded plural objects in the progressive, but as Mehlig 2006 shows, this has to do with the general incompatibility of bounded objects with imperfective accomplishments (except under simultaneous interpretation). Mehlig shows that when a possessive pronoun is added to the direct object, the relevant sentences sound better. In these cases, incremental modifiers are perfectly acceptable, and imply that the drinking happened in an ordered fashion, cup after cup:

- (22) a. Ivan postepenno pil^{IMPERF} svoi tri čaški kofe.
 Ivan gradually drank his three cups coffee
 'Ivan was gradually drinking his three cups of coffee.'
- b. Ivan pil^{IMPERF} svoi tri čaški kofe glotok za glotkom.
 Ivan drank his three cups coffee gulp-by-gulp
 'Ivan was drinking his three cups of coffee gulp-by-gulp.'

Notice that while the non-bounded direct objects of the examples using imperfectives can be interpreted as indefinite or definite (as shown in examples 17-18-19), the bare plural direct object in the paired perfective sentence must be interpreted as definite⁵:

⁵ As H.R. Mehlig points out (in personal communication), in some special contexts direct objects of perfective verbs acquire an indefinite reading. One such case is a contrastive negation: *On pročital^{PERF} ne knigu, a gazetu* (He read a newspaper, not a book).

- (23) Ivan pročit^{PERF} gazety stranica za stranicej / postepenno.
 Ivan read newspapers page by page gradually
 'Ivan read the newspapers page by page / gradually.'

This contrast is further evidence that the incrementally modified imperfective is an independent construction and not just the progressive correlate of the perfective form.

More support comes from the use of temporal modifiers. While temporal *za*-modifiers, the equivalent of *in x time*, are canonically found as modifiers of perfective verbs and *for x time* modifiers are canonically found with imperfective verbs, the *za*-modifiers can occur with perfect or completive uses of the imperfective. An example was given in (16d). If incrementality, and thus incremental modification, is dependent on the lexical properties of the head and independent of the particular interpretation given, then incremental modifiers should co-occur with both *za čas* 'in an hour' and *čas* 'for an hour'. This prediction is borne out, as the data in (24) shows: Here we see that *stranica za stranicej* can modify both atelic and telic readings of the imperfective, where use of *uže* 'already' and the definite direct object in (24b) makes the telic reading natural:

- (24) a. Ivan čas čital^{IMPERF} knigu / knigi stranica za stranicej.
 Ivan hour read book books page by page
 'Ivan read a / the book / (the) books page by page for an hour.'
 b. Ivan uže čital^{IMPERF} etu knigu / eti knigi stranica za stranicej za čas.
 Ivan already read this book these books page by page in hour
 'Ivan has already read this book / these books page-by-page in an hour.'

Note further that incremental modifiers appear with intransitives of verbs like *čitat*' only if the content of the direct object is recoverable from context. Thus (25) is acceptable only in the context of a situation where, for example, I have given Ivan an enormous pile of papers or exams to grade and I say:

- (25) Ivan čital^{IMPERF} postepenno / stranica za stranicej.
 Ivan read gradually / page by page
 'Ivan was reading gradually/page by page.'

But this result is expected, since the presence of an incremental theme (either explicit or understood from context) is essential to get an incremental reading of a verb. In English too, standard accomplishment verbs such as *write* get a non-incremental activity reading when intransitivized, as in the acceptable *he wrote for some hours*.

It thus looks as if incremental modifiers will provide a means for distinguishing between accomplishment verbs and activity verbs in Russian exactly along the lines that Paducheva's theory requires. 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.

4. The interpretation of incremental modifiers.

4.1 *Postepenno*

If incremental modifiers are indeed a test for accomplishments, then we assume that the distribution of these modifiers follows from their interpretation. We thus need an account of the semantics of *postepenno* and *X za X* which will show how they interact with the denotations of the verbs they modify and why they have the distribution they do. We begin with *postepenno*, the Russian equivalent of *gradually*.

The only serious study of the semantics of *gradually* that we know of is Piñón's 2000's study of *gradually* in English. Piñón is the first to point out that the distribution of *gradually* in English allows us to make aspectual distinctions between verbs. *Gradually* in English can occur sentence initially, preverbally or post verbally. In sentence initial position and also in preverbal position, it arguably scopes over tense and can modify the stages leading up to an event, but as a verbal modifier it applies directly to the verb itself and only with verbs denoting events of change along some kind of scale. Thus, as verbal modifier, *gradually* occurs in English with degree achievements such as *cool* and *expand*, with almost all accomplishments (with the exception of *rescue*, which is arguably an achievement anyway), but with activities and states only if some kind of scale of measurement is added explicitly.

As in English, *postepenno* in Russian can occur either sentence initially, preverbally or post verbally, as shown in (26):

- (26) a. *Postepenno*, led rastajal^{PERF}.
 Gradually ice melted.
 b. Led *postepenno* rastajal^{PERF}.
 Ice gradually melted
 c. Led rastajal^{PERF} *postepenno*.
 Ice melted gradually.
 "(The) ice melted gradually."

Preverbal position seems to be the most natural in Russian (as well as in English). As we saw in the previous section, *postepenno* naturally occurs with what we pretheoretically would consider accomplishment types and not with activities. A further look at the data indicates some more fine-grained distinctions, and indicates also that the facts about the distribution of *postepenno* in Russian do not carry over directly from the facts about *gradually*. Unlike the English data, *postepenno* never modifies states and activities, even when these have been already modified by a scalar or degree modifier. In English, as Piñón 2000 has shown, *gradually* can modify activities and states after the addition of *more and more* modification, as in (27).

- (27) a. * Children gradually ran.
 b. Children gradually ran more and more quickly.
 c. * Peter gradually loved Mary.
 d. Peter gradually loved Mary more and more.

In Russian, however, the addition of the *more and more* modifier does not affect the

incompatibility of *postepenno* with activity and state verbs, as we can see in (28). Note that there is no problem in adding a degree modifier, as in (28a/d), but crucially these degree modifiers do not license *X za X* modification:

- (28) a. Deti bežali^{IMPERF} vse bystree i bystree.
Children ran all faster and faster.
'Children ran more and more quickly.'
- b. * Deti postepenno bežali^{IMPERF}.
Children gradually ran
- c. * Deti postepenno bežali^{IMPERF} vse bystree i bystree.
Children gradually ran all faster and faster
- d. Ivan ljubil^{IMPERF} Mashu vse bol'she i bol'she.
Ivan loved Masha all more and more.
'Ivan loved Masha more and more.'
- e. * Ivan postepenno ljubil^{IMPERF} Mashu.
Ivan gradually loved Masha.
- f. * Ivan postepenno ljubil^{IMPERF} Mashu vse bol'she i bol'she.
Ivan gradually loved Masha all more and more.

In order to express the meanings in (28c/f) Russian uses the accomplishment verb *ubystrijat'*^{IMPERF} (to quicken) and the inchoative achievement *vlubljat'sja*^{IMPERF} (to come to love / to fall in love) respectively:

- (29) a. Deti postepenno ubystrijali^{IMPERF} svoj beg.
Children gradually quickened their run
'Children gradually quickened their pace'.
- b. Ivan postepenno vse bol'she i bol'she vlubljal'sja^{IMPERF} v Mashu.
Ivan gradually all more and more fell in love in Masha.
'Ivan gradually fell in love with Masha more and more.'

Predictably, achievements denoting singular events cannot be modified by *postepenno* in initial, pre- or post-verbal positions.

- (30) a. * Postepenno vozdušnyj šarik lopnul^{PERF}.
gradually air balloon popped
- b. * Vozdušnyj šarik postepenno lopnul^{PERF}.
air balloon gradually popped
- c. * Vozdušnyj šarik lopnul^{PERF} postepenno.
air balloon popped gradually
- d. * Postepenno Igor' umer^{PERF}.
gradually Igor' died
- e. * Igor' postepenno umer^{PERF}.
Igor' gradually died
- f. * Igor' umer^{PERF} postepenno.
Igor' died gradually

However, they can appear sentence initially, pre- and post verbally with achievements, on condition that the verb phrase can denote a plurality. In the following examples, *postepenno* modifies the plurality of events in the VP, and is true if the plurality of instantaneous events is spaced out gradually over an extended time period. The plural

achievements are also acceptable with one specific *X za X* type modifier, 'one-by-one'.

- (31) a. Postepenno, vozdušnye šariki lopnuli^{PERF} odin za drugim.
 Gradually air balloons popped one by another
 'Gradually, air balloons popped one-by-one'.
 b. Vozdušnye šariki postepenno lopnuli^{PERF} odin za drugim.
 air balloons gradually popped one by another
 'Air balloons gradually popped one-by-one'.
 c. Vozdušnye šariki lopnuli^{PERF} postepenno, odin za drugim.
 air balloons popped gradually one by another
 'Air balloons popped gradually, one-by-one'.
 d. Postepenno, okna v dome tresnuli^{PERF} odno za drugim.
 Gradually windows in house cracked one by another
 'Gradually, the windows in the house cracked one-by-one'.
 e. Okna v dome postepenno tresnuli^{PERF} odno za drugim.
 windows in house gradually cracked one by another
 'The windows in the house gradually cracked one-by-one'.
 f. Okna v dome tresnuli^{PERF} postepenno, odno za drugim.
 Windows in house cracked gradually one by another
 'The windows in the house cracked gradually, one-by-one'.
 g. * Okna v dome tresnuli^{PERF} postepenno, oskolok za oskolokom.
 Windows in house cracked gradually splinter by splinter
 'The windows in the house cracked gradually, splinter-by-splinter.'

Interestingly, pluralities of activities and states cannot be modified by *postepenno*. Thus, (32a/b) are unacceptable, while (32c/d) are acceptable, because the activity stem in (32a) and the state stem in (32b) have been prefixed by the prefix *za-*, plausibly shifting them into achievements in (32c-d), respectively.

- (32) a. * Postepenno, gosti kurili^{IMPERF} cigarety.
 Gradually guests smoked cigarettes
 b. * Postepenno, deti dremali^{IMPERF}.
 Gradually children slept
 c. Postepenno, gosti zakurili^{PERF} cigarety.
 Gradually guests began to smoke cigarettes
 'Gradually, the guests began to smoke cigarettes.'
 d. Postepenno, deti zadremali^{PERF}.
 Gradually children fell asleep
 'Gradually, children fell asleep.'

The position of *postepenno* in (32) can also be pre- or post- verbal in all the examples without affecting the judgments. The initial position is, nonetheless, the most natural one for *postepenno* when it modifies the plural achievement events, as in (31a-d). We conclude from that fact that *postepenno* behaves as a sentential modifier when it modifies plural achievement events. We, however, will ignore this use of *postepenno* in the rest of the paper.

One other important difference between *postepenno* and *gradually* concerns direct objects. While, in English, *gradually* is incompatible with mass or bare plural objects, as in (33a), *postepenno* does not have such a problem in Russian.

- (33) a. * Ivan gradually ate cheese.
 b. *Ivan gradually ate cakes.
- (34) a. Ivan postepenno el^{IMPERF} syr.
 Ivan gradually ate cheese
 'Ivan gradually used to eat cheese / was eating the cheese.'
 b. Ivan postepenno s'el^{PERF} syr.
 Ivan gradually ate cheese
 'Ivan gradually ate the cheese.'
- (35) a. Ivan postepenno el^{IMPERF} pirogi.
 Ivan gradually ate cakes
 'Ivan gradually ate (the) cakes.'
 b. Ivan postepenno s'el^{PERF} pirogi.
 Ivan gradually ate cakes
 'Ivan gradually ate the cakes.'
 c. Ivan el^{IMPERF} pirogi kusok za kuskom.
 Ivan ate cakes bit-by-bit
 'Ivan ate (the) cakes bit-by-bit.'
 d. Ivan s'el^{PERF} pirogi kusok za kuskom.
 Ivan ate cakes bit-by-bit
 'Ivan ate the cakes bit-by-bit.'

Note that while the English examples are ungrammatical except on the habitual reading "Ivan gradually came to eat cheese/cakes", Russian allows non-habitual readings. The example (34a) has a habitual interpretation, meaning that in general Ivan used to eat (an unknown amount of) cheese gradually, and a durative interpretation, in which the denotation of 'cheese' will be restricted to the concrete contextually defined piece of cheese. The perfective example (34b) has only a completed interpretation in which the contextually defined piece of cheese was eaten. The Russian examples in (35) have two possible non-habitual interpretations. First, Ivan ate cakes (in perfective sentences - all available cakes) gradually simultaneously, biting a piece of each cake in turn. Second, Ivan ate gradually cakes, completely finishing one cake and then starting eating another. In both cases, each individual cake was eaten gradually (or bit-by-bit).

The semantics which Piñón proposes for *gradually* in English make it a modifier of relations R between events and degrees, and "asserts that as an event e unfolds, the degree of e as determined by R steadily increases". Piñón's semantics require that *gradually* only modifies verbs that have a degree argument, and this naturally constrains its distribution. Degree achievements such as *cool* can naturally be modified by *gradually*, as in *The soup cooled gradually*, and Piñón's semantics give this the meaning that the soup cooled and the degree of its coolness steadily increases as the event continues. Verbs which can be modified by *gradually*, but which do not have an explicit degree argument require a degree argument to be introduced by a degree function. A crucial element of Piñón's analysis is that the degree function can only be added directly to a verbal meaning if the verb has an incremental argument which incrementally reflects the development of the event. Accomplishments are incremental and have an incremental theme (the direct object of a transitive verb, and subject of an intransitive (usually unaccusative) verb). This means that an implicit degree function can be added to the accomplishment verb meaning, and the resulting output can be modified by *gradually*. Activities and states can be modified by *gradually* only if an

explicit scalar modifier is added to the VP as in *love Mary more and more* and *run more and more quickly* as illustrated above.

The analysis we present in this paper shares with Piñón's account the assumption that the semantics of graduality is inherently tied up with incrementality. However, we present a simpler analysis of *postepenno* in which the modifier directly modifies an incremental event, instead of assuming a relation between the event and the degree argument and modifying that relation. Our reasons for taking this approach are based on the data above. The crucial examples are (28c/28f), repeated here, which show that, unlike the corresponding English examples, *postepenno* cannot modify an activity or a state, even if it includes an explicit expression of degree:

- (28) c. * Deti postepenno bežali^{IMPERF} vse bystree i bystree.
 Children gradually ran all faster and faster
 f. * Ivan postepenno ljubil^{IMPERF} Mashu vse bol'she i bol'she.
 Ivan gradually loved Masha all more and more.

The data in (28) show that *postepenno* modifies only a inherently incremental verb, and this implies that in Russian it is the incremental structure of the verb itself which is modified, and not a degree argument which has been added to the verbal meaning. We take this as support for the claim that it is lexical incrementality which is essential to the semantics of *postepenno*, rather than degrees⁶, and give an analysis which builds on this.

Intuitively, *postepenno* applies to verbs of incremental change, and adds the information that the change was not brought about 'in a rush' but in small steps. The meaning of adding *postepenno* to "x V-d" is not that the degree assigned to the incremental stages is constantly increasing, but that the incremental steps are small or, put differently, that there are sufficient incremental stages for the changes between each stage to be small. We show that the interpretation of the adverb presupposes that the event denoted by the V has an incremental structure, and that this adverb distinguishes between accomplishments and activities, no matter what grammatical aspect the verb appears in, precisely because an accomplishment has an incremental structure in both aspects.

In order to show how the semantics of *postepenno* works, we first need some background on a formal representation of Vendler classes and a theory of incrementality. We illustrate this using the semantics for accomplishments introduced in Rothstein 2004. Although our semantics for incremental modifiers could no doubt be instantiated in other theories of incrementality, such as Krifka 1992, 1998, Rothstein's

⁶ It is true that the examples in (31) indicate that an incremental structure can be constructed on a plural set of achievements. This clearly requires an explanation (which we are not going to attempt here), but since the phenomena is restricted to achievements, and not dependent on an explicit expression of degree, it does not affect our basic claim. Mehlig 2006 presents evidence on the basis of temporal modification which shows that plural achievement predicates can be interpreted as incremental. The fact that the achievement predicates in Russian can be modified by *odin za drugim* 'one after another', but not by other *X za X* modifiers suggests that it is a derived incrementality (rather than a lexical incrementality), derived from imposing incremental structure on a plurality of instantaneous events. Crucially, this cannot be done generally, but only with achievements, and presumably is connected to the temporal and/or lexical properties of achievements. This raises many interesting questions about achievements and plurality which we will not discuss further here. Note that the data in (31) provide evidence for characterising the lexical class of achievements. Unlike accomplishments, singular achievements cannot be modified by *postepenno*, but unlike activities and states, plural achievements can be so modified.

account is particularly suited to our analysis, since it presupposes that incrementality proceeds in discrete stages, and we will claim that it is the set of stages, or the incremental structure determined by this set of stages that both *postepenko* and *X za X* modify. We will say more about this below.

Rothstein's 2004 account is based on a reworking of the Vendlerian classification system in a neo-Davidsonian framework (see Parsons 1990, Landman 2000). 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 argues that the diagnostic tests indicate that Vendler's four classes can be seen as instantiations of two features, whether a verb denotes an event which can be analyzed as having distinguishable stages and whether it denotes an event of change. The notion of event stages was introduced in Landman 1992, and discussed further in Landman 2006. An event e' is a *stage* of e if the following hold:

(36) e' is a stage of e iff:

- (i) $e' \vee_e e$; 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 analyzed as essentially instantaneous changes from $\neg\phi$ to ϕ , which therefore hold at two adjacent instants, the last moment that $\neg\phi$ 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 naturally head telic VPs. In English, the activity headed VP in *John ran* is atelic, since we do not know when the process of running was over; while the accomplishment headed VP in *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	[<u>±</u> stages]	[<u>±</u> event of change]
States	-	-
Activities	+	-
Achievements	-	+
Accomplishments	+	+

As can be seen from Table 1, accomplishments are the most complex of these verb classes, since they have both stages, and denote events of change. Event stages are ordered temporally. However, in an accomplishment event, the stages can be ordered

not only according to the temporal size, but according to how close they bring you along the process of change to a predefined culmination point.

Rothstein thus differs from Krifka 1989, 1992, 1998 and similar proposals, who argues that accomplishments are incremental because there is a homomorphism from the part structure of the theme argument to the part structure of the event. Rothstein proposes instead that the incrementality of accomplishments is determined by the inherent ordering of event stages. She analyses accomplishment events as complex events consisting of an activity subevent and event of change, and argues that the process of change is used to ‘measure’ or plot the progress of the activity event. The process of change has contextually defined stages, and the structure of this chain of stages is imposed on the event as a whole. The culmination point of the change, i.e. the point at which the change is achieved, determines the culmination or end point of the whole event.

More precisely, an accomplishment event is a singular event formed out of the sum of an activity event and a temporally extended BECOME event. These are linked by an **incremental relation**, which works as follows. It 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 (36) above). This incremental chain assigns 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 $C(e_2)$ 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 (37):

(37) Incremental Chain

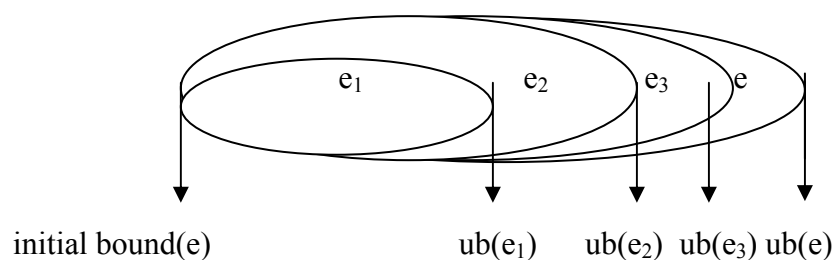
Let e be a BECOME event:

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 $C(e)$, $e_1 \vee e_2$ or $e_2 \vee e_1$
- (iii) $e \in C(e)$

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 (38), 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.

(38) An incremental chain $C(e)$



In an accomplishment event, the incremental chain, or division into ordered stages, is mapped by a one-to-one function μ onto the activity event, via the incremental relation

in (39) (where $\tau(e)$ maps an event onto its running time):

(39) **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 .

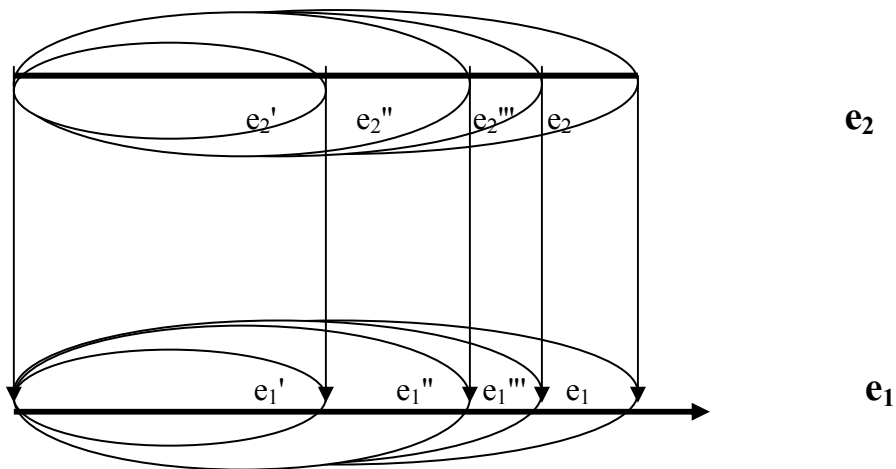
$\text{INCR}(e_1, e_2, C(e_2))$ (e_1 is incrementally related to e_2 with respect to the chain $C(e_2)$) iff:

there is a one-to-one function μ from $C(e_2)$ into $\text{PART}(e_1)$ (the set of parts of e_1) such that:

for every $e \in C(e_2)$: $\tau(e) = \tau(\mu(e))$.

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. Note that 'identity' here is identity up to bounds, since the point of the μ function is that it enables the bounded intervals in e_2 to impose a right-bound on the intervals in e_1 , which are inherently only left bounded. So, while the incremental chain $C(e_2)$ imposes an incremental structure on the BECOME event, the incremental relation imposes this structure onto the event as a whole, as illustrated graphically in (40), where e_1 is the activity event, whose temporal trace is a right open interval, and e_2 is the BECOME event which is a right-closed interval which imposes its temporal trace on the structure of the event as a whole.

(40) Accomplishment event structure:



The template for Accomplishment verbs given in (41) shows how the meaning of a lexical item 'unpacks' to express this structure.⁷ The sum operation used is the composition of the standard sum operation based on the part of relation, and an operation which takes plural entities into a singular entity: $^s(e_1 \uplus e_2)$ thus gives the singular event which is formed from the sum of e_1 and e_2 . (For justification of this operation see Rothstein 2004):

⁷ Note that in (41) the content of the activity and of the BECOME event are lexically related, while the definition in (39) leaves open the possibility that they independent. This is because (41) is the template for a basic lexical accomplishment verb, while the definition in (39) covers also derived accomplishments formed via lexical type shifting operations in, for example, resultative constructions. See Rothstein 2004 for details.

(41) Accomplishment Template

$$\lambda x \lambda e. \exists e_1, e_2 [e =^S (e_1 \uparrow e_2) \wedge P_{\text{ACTIVITY}}(e_1) \wedge \text{Th}(e_1) = x \\ \wedge \text{BECOME-P-ed}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1) \wedge \text{INCR}(e_1, e_2, C(e_2))]]$$

An accomplishment verb thus denotes a complex event with an activity subevent e_1 and a BECOME subevent e_2 in which the theme undergoes the activity expressed by P. The accomplishment READ thus denotes a set of events, each of which is the sum of an event e_1 in the denotation of $\text{READ}_{\text{ACTIVITY}}$ and an event e_2 in which the theme of $\text{READ}_{\text{ACTIVITY}}$ gets read. In the interests of brevity we will use $\lambda x \lambda e. P^*(e) \wedge \text{Th}(e) = x$ as a short form for (41), so that $\lambda x \lambda e. \text{READ}^*(e) \wedge \text{Th}(e) = x$ is the short form of the denotation of the accomplishment *read* whose long form would use the template in (41).⁸ Arg is a general function from events to their participants, and $\text{Arg}(e_2) = \text{Th}(e_1)$ specifies that the thematic argument of e_2 or participant of e_2 is the same entity as the theme argument of e_1 . The value of this function is thus the incremental theme. An $\text{INCR}(e_1, e_2, C(e_2))$ relation holds between e_1 and e_2 , requiring e_1 and e_2 to be incrementally related by means of an incremental chain $C(e_2)$ built on e_2 .

The crucial point is that there are obviously many incremental chains which can be constructed on the BECOME event, since there are many possible ways of picking out salient sets of stages for the event of change. 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 what are the salient stages of the event of change, which determines the incremental chain.

We assume that it is this choice which is constrained by *postepenno*. We look again at the data showing the distribution of *postepenno*.

- (42) a. Ivan *postepenno* čital^{IMPERF} knigu.
Ivan gradually read book
'Ivan read a / the book gradually.'
- b. Ivan *postepenno* pročit^{PERF} knigu.
Ivan gradually read book
'Ivan read the book gradually.'
- c. *Ivan *guljal*^{IMPERF} *postepenno*.
Ivan walked gradually
- d. *Ivan *poguljal*^{PERF} *postepenno*.
Ivan walked for a while gradually

Let us assume that if an event is gradual, then the change brought about is brought about in small stages and not in a rush. If (42a) is true, then Ivan read the book in small stages and not in one sitting. We assume this can be captured by the constraint that the event is analyzed as having enough salient, identifiable stages, and that this guarantees that it doesn't happen 'in one go' or 'in a rush'. If Ivan read the book gradually, then we should be able to identify enough stages in the event of reading that book, at each of

⁸ *Read* also has an activity reading as in "I read the story to the child for hours". Rothstein 2004 argues that this reading is derived from the accomplishment reading. The lexical accomplishment *read* denotes $\lambda x \lambda e. \exists e_1, e_2 [e =^S (e_1 \uparrow e_2) \wedge \text{READ}_{\text{ACTIVITY}}(e_1) \wedge \text{Th}(e_1) = x \wedge \text{BECOME-READ}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1) \wedge \text{INCR}(e_1, e_2, C(e_2))]]$, but *read* as an activity denotes $\lambda x \lambda e. \text{READ}_{\text{ACTIVITY}}(e) \wedge \text{Th}(e) = x$. As far as we can tell, the subevent $\lambda e. \text{BECOME-READ}(e)$ does not have an independent usage outside the accomplishment reading, but maybe it is the basis of the middle usage as in "This book reads easily".

which a different quantity of book had been read. These parts don't have to be homogeneous. I can read a book gradually over a period of some time, reading more and more of the book at different rates (several chapters on one sitting, another chapter over a period of weeks and so on). Similarly, I can build a house gradually over a period of time 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 an incremental structure consisting of a large enough number of salient subevents. We can call such an incremental structure 'dense'. 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.

We treat *postepenno* as a VP modifier, applying to VP meanings and returning VP meanings, i.e. an expression of type $\langle\langle e,t \rangle \langle e,t \rangle\rangle$ denoting a function from sets of events to sets of events. (Note we use 'e' here as denoting the type of event entities). It applies to VPs headed by accomplishments and returns the set of events whose incremental subevent is analysed as having a sufficiently large number of relevant stages. Thus, while, structurally, *postepenno* applies to a VP, its effect cannot be seen without 'unpacking' the meaning of the accomplishment verb, so that the structure given in (41) is visible. It is important to see that the unpacking itself is not an effect of adding the modifier: this structure is always there, but is not usually represented explicitly unless it is necessary. With incremental modifiers, it is necessary.

An accomplishment headed VP, modified by *postepenno*, will have the structure in $\lambda e.VP(e) \wedge postepenno(e)$ that will be interpreted as in (43):

$$(43) \quad \lambda e \exists e_1, e_2 [e =^S (e_1 \text{ } \bar{t} \text{ } e_2) \wedge P_{ACTIVITY}(e_1) \wedge BECOME-P-ed (e_2) \\ \wedge INCR(e_1, e_2, C(e_2)) \\ \wedge |C(e_2)| = BIG]$$

The meaning given is that a gradual event is one in which the cardinality of the chain which is the domain for the incremental relation is in BIG. 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. Thus, we have a contextually defined incremental chain which consists of more stages than expected, relative to some standard of interpretation. So *postepenno* can modify a VP whose meaning contains reference to an incremental chain, i.e. a VP headed by an accomplishment, and it adds the information that this incremental chain has many stages. This ensures that events in the denotation of the modified VP have incremental structures with enough subevents to be considered gradual. Example (42a), *Ivan čital^{IMPERF} knigu postepenno* and example (42b) *Ivan pročit^{PERF} knigu postepenno* will both have the interpretation in (44), abstracting away from the differences due to the semantic expression of perfectivity.

$$(44) \quad \exists e, e_1, e_2 [e =^S (e_1 \text{ } \bar{t} \text{ } e_2) \wedge READ(e_1) \wedge Ag(e_1) = IVAN \wedge Th(e_1) = THE BOOK \\ \wedge BECOME READ(e_2) \wedge Arg(e_2) = Th(e_1) \\ \wedge INCR(e_1, e_2, C(e_2)) \\ \wedge |C(e_2)| = BIG]$$

"There was an event of Ivan reading the book in which the book became read which had many incremental stages (and was therefore gradual)".

The semantics of degree achievements is beyond the scope of this paper, but it seems

clear that they have a naturally incremental structure (as argued in Hay, Kennedy and Levin 1999) and they are therefore predicted to occur with *postepenno*.

- (45) a. Temperatura *postepenno* podnimalas'^{IMPERF}.
 Temperature gradually rose
 '(The) temperature gradually rose.'
 b. [Nebo] *Postepenno* temnelo^{IMPERF}.
 Sky gradually darkened
 '[(The) sky] gradually darkened.'

To sum up this section, we have analyzed *postepenno* as an incremental modifier which modifies inherently incremental verbs. We have proposed treating *postepenno* as a modifier which constrains the incremental structure of the verb to have "enough" distinguishable incremental stages, where "enough" is contextually determined, and we have suggested that the intuitive understanding of what *gradually/postepenno* means follows from this. We have instantiated this analysis in Rothstein's 2004 theory of the structure of accomplishments.

It should be by now clear why we chose Rothstein's theory above more conventional ones. We analyzed *postepenno* as modifying the incremental structure of the event. Rothstein's account differs from more standard accounts such as Krifka 1992, 1998 since she argues that an accomplishment event has incremental structure consisting of a chain of contextually determined incremental stages. Since in this theory an event has an explicit incremental structure, the event structure is modifiable and can be constrained by incremental modifiers. In a Krifka-style account of incrementality, incrementality is the result of a gradual relation between the incremental argument and the event such that, for any two event stages e and e' , if e is a proper part of e' , the theme of e will be a proper part of the theme of e' . This makes incrementality a property of the relation between event and theme, and does not require an explicit choice of stages which are incrementally related, or an explicit context-dependent incremental structure. In such a theory it would not be possible to treat incremental modifiers as modifiers of incremental structure. In the next section, we give semantics for *X za X* modifiers, which provides further support for a theory of accomplishments which requires accomplishment events to be assigned an explicit incremental structure expressed by an incremental chain.

4.2 *X za X* Modifiers

The semantics of *X za X* modifiers is naturally more complicated, in part because, unlike with *postepenno*, there are a few exceptions to the general pattern of distribution. Nonetheless, the overwhelming pattern is that *X za X* modifiers appear only with accomplishments. A very natural semantics builds on the relation between the modifier and the incremental structure of the verb, and this provide further support for the claim that accomplishments, defined by their inherently incremental structure, appear in the imperfective as well as perfective aspects.

Against the background of our analysis of *postepenno*, the function of modifiers such as *page by page*, *step by step* and so on, can very naturally be analyzed as constraints on the elements of the incremental chain as well, i.e. on the domain of the μ function, and thus as constraints on the incremental structure of the event. '*X za X*' modifiers determine what are the contextually relevant stages, which chart the progress

of the event, or more formally, what is the domain of the 'stage-of' relation that determines the incremental chain. Consider the examples in (46):

- (46) a. On stroil^{IMPERF} dom etaž za etažom.
 He built house floor by floor
 'He was building a / the house floor-by-floor.'
 b. Ivan el^{IMPERF} cornfleks ložka za ložkoj.
 Ivan ate cornflakes spoon by spoon
 'Ivan ate cornflakes spoon by spoon.'

Example (46a) 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. Example (46b) is true if there was an event of eating cornflakes whose salient parts are the events of eating spoonfuls. Contrast example (46b) with (47):

- (47) On el^{IMPERF} cornfleks xlopinka za xlopinkoj.
 He ate cornflakes cornflake by cornflake
 'He ate cornflakes cornflake by cornflake.'

(47) asserts that the contextually relevant stages of the eating cornflakes event were stages which grew by the eating of just one cornflake. We can imagine a situation in which (47) is appropriate: it would be a situation in which the eating of each separate cornflake was perceptually salient, and the event progressed at what was probably a snail's pace. Note crucially that (46b) and (47) are mutually incompatible: an event of eating (the) cornflakes spoon by spoon cannot at the same time be an event of eating the cornflakes flake by flake. Furthermore, not only are the salient stages of the event, i.e. the events in the incremental chain, measured in terms of X, but all events which can be measured in terms of X must be in the incremental chain. 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 and must appear in the incremental chain.

We thus want an analysis of *X za X* modifiers which will capture these intuitions: *X by X* modifiers specify the properties of the incremental stages of an event, proposing a scale in terms of which the stages in the event are measured. In the theory we are using, accomplishment meanings include an incremental chain which determines the salient incremental stages of the event. *X za X* modifiers are naturally analysed as VP modifiers which constrain this incremental chain by determining the scale in terms of which stages in the incremental chain are measures. Roughly speaking, the modifier imposes the constraint that the incremental chain includes a new stage for every unit of measurement specified by the modifier.

We define *X za X* modifiers 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 cardinality and a standard of measure relative to a particular scale S (see e.g. Landman 2004). If Ivan is six feet tall, then $MEAS_{height}(j)$ has the value $\langle 6, FOOT \rangle$ and if he is six feet wide, then $MEAS_{width}(j) = \langle 6, FOOT \rangle$. $MEAS_S$ can apply to events: if an event e takes two hours, then $MEAS_{duration}(e) = \langle 2, HOUR \rangle$. We call the set of ordered pairs

which are the values of $MEAS_S$ for some scale S , R_S . Since we are concerned only with measuring the duration of events, we will leave out the subscript on $MEAS$ (and on R).

The $MEAS$ function is generally available in the grammar (since it is used by comparative constructions), and X *za* X modifiers make use of it too. X *za* 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 X s, where X is floors, spoonfuls and etc. In other words, if a verb V is modified by X -*by*- X , then the salient stages of V becoming the case will be the event of V -ing one X , the event of V -ing two X s, the event of V -ing three X s and so on. *Stroil*^{IMPERF} *dom etaž za etažom*, "built a / the house floor-by-floor", constrains the salient incremental stages of event of building the house as being the event of building one floor, the event of building two floors and etc. *El*^{IMPERF} *cornflakes ložka za ložkoj*, "ate cornflakes spoon by spoon", determines that the perceptually salient stages of the event of eating the cornflakes are the event of eating one spoonful, the event of eating two spoonfuls, and so on. This means that the stages of the maximal event e of eating the cornflakes are eating stages in which each subsequent stage grows by the extent of eating another spoonful.

The meaning for X *za* X is given formally in (48) (where N is the set of natural numbers). Like *postepenno*, X *za* X is a VP modifier of type $\langle\langle e, t \rangle \langle e, t \rangle\rangle$. However, it does not specify the properties of the incremental subevent e_2 , but rather of the incremental chain mapping from e_2 to the activity event:

$$(48) \lambda e. \exists e_1, e_2 [e =^S (e_1 \text{ } \tau \text{ } e_2) \wedge P_{\text{ACTIVITY}}(e_1) \wedge \text{BECOME-P-ed}(e_2) \\ \wedge \text{INCR}(e_1, e_2, C(e_2)) \\ \wedge \forall e' \in C(e_2): e' \in P_{\text{ACTIVITY}} \wedge \text{MEAS}(e') \in R_X \\ \wedge \text{MEAS}(e_2) = \langle n, X \rangle \rightarrow \forall n' < n: \exists e'' \in C(e_2): \text{MEAS}(e'') = \langle n', X \rangle]$$

$\lambda e. P^*(e) \wedge X$ *za* $X(e)$ denotes a set of events in P which consist of an activity e_1 and a BECOME-P-ed 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 themselves are activity parts 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 (46b), *Ivan el*^{IMPERF} *cornfleks ložka za ložkoj* is interpreted in (49):

$$(49) \exists e, e_1, e_2 [e =^S (e_1 \text{ } \tau \text{ } e_2) \wedge \text{EAT}(e_1) \wedge \text{Ag}(e_1) = \text{IVAN} \wedge \text{Th}(e_1) = \text{THE CORNFLAKES} \\ \wedge \text{BECOME EATEN}(e_2) \wedge \text{Arg}(e_2) = \text{Th}(e_1) \\ \wedge \text{INCR}(e_1, e_2, C(e_2)) \\ \wedge \forall e' \in C(e_2): e' \in \text{EAT}_{\text{ACTIVITY}} \wedge \text{MEAS}(e') \in R_{\text{SPOONFUL}} \\ \wedge \text{MEAS}(e_2) = \langle n, \text{SPOON} \rangle \rightarrow \forall n' < n: \exists e'' \in C(e_2): \text{MEAS}(e'') = \langle n', \text{SPOON} \rangle]$$

"There is an event which has an 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".

So the incremental chain picks out as contextually salient the event of eating one spoon of cornflakes, the event of eating two spoons of cornflakes, the event of eating three

spoons of cornflakes, and so on up to the maximal event. Line 4 of the meaning gives us the sortal restriction on the stages, that they all have the activity property, in this case that they are all eating stages, and that each event in the incremental chain (i.e. each relevant stage) has a measure in terms of spoonfuls. This means that once we have chosen our measurement by means of the *X za X* modifier, stages which are measured in terms of some other scale are excluded from the incremental chain. Line 5 gives us the statement that the BECOME event has a measure of *n* spoonfuls, and that for all numbers *n'* less than *n*, the event of eating *n'* spoonfuls is in the incremental chain. This guarantees that the stages of eating each and every number of spoonfuls are in the incremental chain.

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 (46b) with (47). *On el^{IMPERF} cornflakes xlopinka za xlopinkoj*, 'He ate cornflakes cornflake by cornflake'. Here the modifier picks out as salient events in which one cornflake was eaten. This, of course, imposes an incremental chain, which is very much more fine-grained than the chain used in the interpretation of (46b). Since the semantic constraints on incremental chains require the stage of relation to impose a linear order on 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 event stages is how many cornflakes have been eaten, rather than if it is how many spoonfuls of cornflakes have been eaten.

We can now see why *X za X* modifiers, like *postepenno*, 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.

Note that we constrain all events in the incremental chain to be of the same type as the activity part of the verbs meaning. This constrains the meaning in two ways. First, the relevant salient incremental stages of the event are not pause stages. This corresponds with our intuition that all the salient event stages of the 'eating cornflakes' event are themselves eating events. Second, this explains the unnaturalness of the example in (50a), despite the fact that *činil^{IMPERF}* is clearly incremental, since it can be modified by *postepenno*, as in (50b):

- (50) 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 gradually.'

The infelicity of (50a) is predicted by the clause in line 4 of (48b), that all event stages of the incremental chain to be events which have characteristics of the activity 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. They are events which can be parts of the repairing activity, but they don't share enough properties of the characteristic activity of the verb itself. We can see that this is a pragmatic matter, and

not a property of *činit'*^{IMPERF}, since the verb is compatible with an *X za X* modifier in a context in which the condition in line 5 of (48) is met straightforwardly, such as (51) which entails that each stage of the event of repairing the clock mechanism is an event of repairing a cog-wheel.

- (51) Ivan činil^{IMPERF} časovoj mexanizm šesterenka za šesterenkej.
 Ivan repaired a clock mechanism cog-wheel by cog-wheel
 'Ivan repaired a / the clock mechanism cog-wheel-by-cog-wheel.'

(50) 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 this, (50a) is unproblematic.

As mentioned above, for some speakers, the *X za X* modifiers do not occur easily with perfective verbs. For these speakers, (52) is acceptable only in some contexts, for example, if Ivan usually builds the houses block by block, but in this one case he built it floor by floor:

- (52) Ivan postroil^{PERF} dom etaž za etažom.
 Ivan built house floor by floor.
 'Ivan built the house floor-by-floor.'

The fact that (52) is perfectly acceptable in the appropriate contexts indicates that the issue is a pragmatic one. A possible direction of explanation is the following. Assume that perfectivity is associated with boundedness or totality (see for example Filip 2000 and Filip and Rothstein 2005), with the perfective verb denoting a set of total or maximal or bounded events. Since the choice of perfective verb indicates that the event is being related to as a complete and maximal whole, some speakers may find it inappropriate to predicate properties of the parts or stages of the event, unless a specific context is set up to do so.

The only non-accomplishments which allow *X za X* modification seem to be imperfective verbs of motion as in (53)⁹:

- (53) a. Ivan bežal^{IMP DETERMINATE} km za km.
 Ivan begal^{IMP INDETERMINATE} km za km.
 'Ivan ran kilometer by kilometer.'

We assume that these verbs are lexically associated with a path, or measure of distance incrementally covered. They can thus be modified by *X za X* modifiers, but only as long as the unit of measure is a measure of distance. They thus differ from accomplishments where the unit of measure can be any contextually relevant measure. There is some leeway, since apparently some lexical items can be metaphorically interpreted as measures of distance, but this is quite limited. So (54a) is acceptable, but (54b) absolutely isn't, presumably because stones are not reinterpretable as measures of distance. No such constraint occurs with accomplishments:

⁹ More properly, motion verbs seem to be the only class of exceptions. There seem to be a couple of 'rogue' examples with activity verbs which allow *X za X* modification:

(i) *Ptiza xlopala kryl'jami xlopok za xlopkom* - The bird flapped its wings flap by flap.
 (ii) *Ivan smotrel televizor film za fil'mom* - Ivan watched television movie by movie.

- (54) a. Ivan bežal^{IMP DETERMINATE} ulica za ulicej.
 Ivan begal^{IMP INDETERMINATE} ulica za ulicej.
 'Ivan ran street-by-street.'
 b. *Ivan bežal^{IMP DETERMINATE} kamen' za kamnem.
 *Ivan begal^{IMP INDETERMINATE} kamen' za kamnem.
 'Ivan ran stone-by-stone.'

The motion verbs constitute a separate subclass of activity verbs within the Russian aspectual system. They are divided into determinate and indeterminate motion verbs, both of which are imperfective. Determined motion verbs denote a motion in one direction, while indeterminate ones define a motion type in general or motion in different directions, excluding a reference to specific motion at a specific point in time. Lexical representations of both types of verbs plausibly involve reference to a path. In contrast, *guljat'* (to walk), which we used as an example of an activity above, is not a part of the motion verb class, since it is neutral with respect to the directionality. Thus, the Russian sentence 'Ivan guljal po parku' is best compared to the English 'John took a walk in the park', meaning that John did not have a specific destination or direction in mind, but was simply engaged in a walking process without any restrictions on directionality or specific time frame. Being a verb outside the motion verbs class, *guljat'* is incompatible with the measures of distance, presumably since its meaning involves no reference to a path. Thus we get a minimal contrast between (53) and (55) which is completely unacceptable:

- (55) a. *Ivan guljal^{IMPERF} po parku km za km.
 Ivan walked on park km by km
 'Ivan walked in the park km by km.'
 b. *Ivan guljal^{IMPERF} ulica za ulicej.
 Ivan walked street by street
 'Ivan walked street-by-street.'

This supports our original claim that incremental modifiers modify verbs which are inherently incremental.

One final point. For reasons, which we do not as yet understand, *X-by-X* modifiers with accomplishments are less acceptable when the standard of measure is a 'canonical' measure, such as *hour-by-hour* or *meter-by-meter*. The construction clearly prefers standards of measures determined by the lexical content of the V. So (56) is less natural than the other examples, but still grammatical.

- (56) On čital^{IMPERF} knigu čas za časom.
 He read the book hour by hour
 'He read a / the book hour-by-hour.'

5. Delimited activities

The account that we proposed so far allows us to make some interesting general points about the aspectual system in Russian, and the comparison between the Russian/English systems.

We have identified a class of incremental modifiers, which apply to verbs with incremental structure in both perfective and imperfective aspects. We showed that incremental modifiers apply to these verbs independent of their aspect and independent of whether they are understood to denote bounded or unbounded, completed or uncompleted events, even in the imperfective. Such incremental modifiers do not modify activities (except, in a restricted way, the verbs of directed motion), states or achievements. The verbs which can be modified by these incremental modifiers lexically correlate with those argued to be accomplishments in English. We conclude therefore that incremental modification picks out a class of verbs with incremental structure which can be characterized as accomplishments which occur in both imperfective and perfective aspects. This supports Paducheva's (1996) claim that accomplishments are not restricted to a single aspect but occur in both aspects, and it further provides a test for whether a particular verb is indeed classifiable as an accomplishment. It lays open the way for a study of how the semantics of the perfective/imperfective distinction interacts with the semantics of accomplishments to get the differences in meaning that we see in pairs, such as *stroit'*^{IMPERF} / *postroit'*^{PERF}.

More generally, the implications of this study are that the Vendlerian classification is indeed a characterization of 'kinds of events'. Being an accomplishment is being an extended event whose parts have an inherent temporal ordering according to a template laid down by an incremental structure dictated by the meaning of the verb. A temporal ordering of a non-accomplishment event is extensional, mapping the stages of some event onto their temporal location in the world and ordering the results. A temporal ordering of an accomplishment can be seen as intensional, mapping an event onto its incremental structure and assigning the inherently ordered stages of this structure their temporal locations. Incremental modifiers constrain the properties of this incremental structure.

Understanding the Vendlerian classification as a characterization of the inherent properties of events in this kind of way is precisely the conceptual position underlying the hypothesis that the Vendlerian classification is a potential 'linguistic universal', and, thus, a set of cross-linguistic constraints on properties of verbal meaning. Crucially, this set of constraints interacts with the grammatical properties of a particular language, and, consequently, imperfective and perfective accomplishments will have different properties in Russian because of the interaction between the semantics of the aspects and the properties of the accomplishments. Thus, 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 Russian in a more flexible exploitation of lexical aspect, and in particular of accomplishments, than is possible in English.

We hypothesize that the same approach can explain the presence in Russian of what has often been called a non-Vendler class, namely the class of bounded activities, or perfective activities which Paducheva 1996 calls *delimitativ* and Piñón 1993 calls "pofectives". Paducheva and Piñón both argue that these verbs are derived from activities and have the meaning of 'do the activity for some time/for less time than contextually expected' (after which the activity stopped). Characteristic examples are *pogulat'*^{IMPERF} (to walk for a while), *porabotat'*^{IMPERF} (to work for a while). (Mehlig 2006 argues that *po-* can be prefixed onto accomplishments if they are associated with a homogeneous activity, in which case the resulting verb is treated as non-incremental as in *čitat'*^{IMPERF} / *počitat'*^{PERF} (to read / to read for a while)). Piñón 1993 shows that these *po+*verbs are a puzzle, since on the one hand they clearly have properties of

perfective verbs, and on the other they seem also to have properties of imperfective verbs. What indicates that they are perfective is: (i) that they cannot have present tense interpretation in non-past forms (Ivan guljaet^{IMPERF} "Ivan is taking a walk"; Ivan poguljaet^{PERF} "Ivan will take a walk"); (ii) they do not admit a progressive reading in the past tense (Ivan guljal^{IMPERF}, kogda ja ego uvidel^{PERF} "Ivan was walking when I saw him" vs. * Ivan poguljal^{PERF}, kogda ja ego uvidel^{PERF} "Ivan walked for a while, when I saw him"); and (iii) an assertion that a *po*- event occurred in the past is not compatible with an assertion that this event unexpectedly continued (* Ivan poguljal^{PERF} i do six por guljaet^{IMPERF} "Ivan walked for a while and is still walking"). On the other hand, they have properties which we associate with the unprefixated imperfective forms; in particular, they are compatible with durative adverbs, such as *for an hour* and the modifier *a little* can have a temporal and not a nominal interpretation.

- (57) a. Ivan poguljal^{PERF} čas.
 Ivan walked hour.
 'Ivan walked for an hour.'
- b. * Ivan pročital^{PERF} knigu čas
 Ivan read book hour
 'Ivan read a book for an hour.'
- c. Ivan nemnogo poguljal^{PERF}.
 Ivan a little walked for a while
 'Ivan walked for a little while.'
- d. * Ivan nemnogo pročital^{PERF} knigu.
 Ivan a little read book

We are not going to propose an analysis of the *po*- prefix here. Piñón proposes a very plausible account in which the imperfective root denotes a process, while the *po*- prefix is a derived measure function, mapping the imperfective verb denotation onto a quantized denotation. In his account imperfectives denote normally non-quantized processes (or states), while perfectives denote quantized events. 'Pofectives' are a hybrid, because they are essentially quantized processes. Without going into the details of his analysis (which would require a detailed discussion of how the event/ process/ state distinction relates to the Vendlerian classification), we want to suggest a way of analyzing pofectives which explains his conclusions and solves Paducheva's question of what kind of lexical class these verbs belong to.

We assume that the semantics of perfective aspect is essentially the semantics of boundedness. This can be expressed in terms of quantized reference as in Piñón's paper, in terms of totality as in Filip 2004, or in terms of a maximality operation as suggested in Filip and Rothstein 2006. In all these cases, the perfective aspect is interpreted as denoting some kind of operator which is applied to a verb meaning (a measure operation, a totality operation or a maximalization operation), imposing a bounded structure on the event. We continue to assume that the semantic properties of Vendlerian classes classify the inherent properties of the event type itself, a classification of the kind of event it is. In one case (achievements), the event type is naturally bounded, but in the other cases this is not so. We thus have a framework for classifying verb behavior: a verb may have some distributional properties because of its Vendlerian class, and it may have other properties because of its aspect. As we have seen, incremental modification is a property which is (mostly) determined by Vendlerian class, while the possibility of a progressive reading is determined by aspect. From this point of view, the conflicting properties of pofectives are explained in the

following way. Perfectives such as *poguljat'* are indeed perfective, since the *po-* prefix is quantizing operator (Piñón 1993, Filip 2005) and the resulting verb is quantized/total/maximal/bounded. However, denoting a process verb (in Piñón's terms) is a reflection of lexical class, or of the intensional properties of the event type itself, and the *po-* quantizer does not affect this. This explains Paducheva's intuition that these verbs are best classified as *delimitativ* or delimited activities. But delimited activities are not a new Vendlerian class, but a class of verb which results from the interaction of the lexical semantics of activities, the semantics of the prefix and the semantics of perfective aspect. In terms of the table of verb features in table 1 (section 4), we see that *guljat'*^{IMPERF} and *poguljat'*^{PERF} should both be classified as activities, since they both denote sets of events which are dynamic and do not involve change. However, the perfective aspect imposes a boundedness on the perfective predicate *poguljat'*^{PERF}. This correctly predicates that *poguljat'*^{PERF} does not behave as an accomplishment, since it does not acquire incremental structure, and indeed it cannot be modified by *postepenno*¹⁰:

- (58) * Ivan postepenno poguljal^{PERF}.
Ivan gradually walked for a while

A consequence of this analysis and the analysis of accomplishments in the previous section is that prefixation in Russian does not necessarily change lexical class. Prefixing *po-* to an activity verb does not necessarily affect the lexical class of the event type it is attached to. Prefixing may change the class of a verb; for example, in *lubit'*^{IMPERF} / *polubit'*^{PERF} (to love / to come to love) the prefix attaches to a state and results in an achievement.

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 analyzed 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.

¹⁰ Note that the accumulative prefix *na-* with an activity *begat'*^{IMPERF} (to run) forms a perfective accomplishment: *Ivan postepenno nabegal*^{PERF} 100 km (Ivan 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.

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