A Scalar Approach to Slavic Verbal Prefixes[1]
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1. Introduction
Verbal prefixation plays a central role in Slavic aspectual system and word formation. Although a lot of work is devoted to the semantics of verbal prefixation in Slavic, numerous questions regarding the semantic nature of the prefixes remain open.

Verbal prefixes in Slavic languages receive a wide range of interpretations, including the following:

- spatial (e.g. crossing, approaching, entering)
- aspectual (inchoative, completive, iterative)
- temporal (delimitative)
- quantificational (diminutive, accumulative, distributive)

The whole range of interpretations would be hard to list, given that the attachment of a prefix may create idiomatic or not fully compositional readings, and, more generally, due to the diverse nature of the contributions of prefixes. A given verbal stem may combine with a wide range of prefixes, each of which would make a different semantic contribution. For instance, the unprefixed verb *pisat'* 'write' in Russian has such prefixed counterparts as **na**pisat' 'write', **pere**pisat' 'rewrite' and **pod**pisat' 'sign' (and this list is by no means exhaustive). Given such variation, is it possible to make any generalizations regarding the semantics of verbal prefixes? Or do we have to confine ourselves to investigating the properties of each prefix in isolation?

The situation is further complicated by the fact that a prefix with a given phonological realization may be associated with multiple meanings. For instance, the Russian prefix *pere-* may contribute a spatial interpretation 'to cross' (e.g. *perejti* 'cross by walking'), one of excess (*perepit'* 'drink too much'), an iterative meaning (*perečitat* 'reread'), a distributive meaning (*perestreljat'* 'shoot one by one'). The different uses of a single phonological prefix are set even further apart in the context of the lexical/superlexical contrast. *Lexical prefixes* affect the lexical meaning of the verb; they may change its argument structure; their contribution may be idiosyncratic and not (fully) compositional, and they are compatible with secondary imperfectivization. In contrast, the contribution of *superlexical prefixes* is transparent; they do not change the lexical meaning or argument structure of the verb, but rather contribute some kind of quantificational or aspectual meaning in a purely compositional manner; further, they are typically incompatible with the imperfectivizing suffix (e.g. Babko-Malaya 1999, Romanova 2004, Svenonius 2004). Importantly, the same string of sounds may correspond to a lexical prefix under one meaning and to a superlexical one under another. As a result, in the literature that concentrates on the lexical/superlexical distinction, such strings are sometimes implicitly treated as distinct prefixes[2]. An important theoretical question thus emerges

[2] It should be emphasized, however, that a polysemy or homonymy position is not obligatory under an approach that distinguishes between lexical and superlexical uses of the same phonological prefix. Under this approach, lexical and superlexical prefixes are assumed to occupy different structural positions (superlexical prefixes attach higher than

regarding the status of such items, which are identical phonologically but not semantically. Should they be treated as a single prefix with a uniform but indeterminate meaning, and, thus, provided a unified account? (This approach, whereby an invariant meaning of a prefix is sought, is in the spirit of Jakobson's work and has been recently applied to certain prefixes in Russian and Czech by Braginsky (2008) and Součková (2004a,b).) Or should they rather be regarded as exhibiting polysemy or homonymy? With different prefixes, different answers may be correct. Further, assuming that for some prefixes, a unified account is the right solution, can we make any generalizations as to what aspects of meaning are likely to remain stable across multiple uses and what are the likely parameters of variation?

The purpose of this paper is to contribute to the study of Slavic prefixation and to the investigation of the issues raised above. I propose an approach to verbal prefixes that is formulated within the framework of degree semantics. Under this approach, the major semantic function of a prefix is to impose a certain relation between two degrees on a scale. Prefixes differ in the type of scale to which they apply, in the properties of the compared degrees and in the relation that holds between the degrees and the event argument contributed by the verbal stem.

Importantly, the notion of scales and degrees has received a central role in a number of recent approaches to telicity, perfectivity and perfectivization (e.g. Kennedy and Levin (2002), (2008), Filip and Rothstein (2006), Filip (2008), Rappaport Hovav (2008), (2009), Piñón (2008)). For instance, Kennedy and Levin (2002) define *verbs of gradual change*, which denote events that involve an increase in the degree to which their argument possesses a certain gradable property (p. 5). To illustrate, the degree achievement *cool* denotes an increase in the degree of coolness. Analogously, the verb of motion *ascend* entails a progress along a path on the part of its argument, and is therefore associated with an increase in the property of advancement along a path. The semantics of verbs of gradual change involves a 'degree of change argument'. This is the degree to which an argument undergoes an increase in the relevant property between the beginning point of the event and the endpoint of the event. We can think of a degree of change as the length of the interval between the point on the scale associated with the beginning of an event and the point on the same scale associated with the end of the event. The degree of change plays a crucial role in the telicity of the predicate. In particular, if the degree of change is quantized, or bounded, then an endpoint of the event can be identified, and the predicate is telic. If the degree of change is non-quantized, the predicate is atelic (Hay et al. 1999, Kennedy and Levin 2002, 2008).

In turn, Filip (2008) and Filip and Rothstein (2006) analyze telicity and perfectivity as maximalization on events. Perfective predicates are taken to denote sets of events that are *maximal*, in a given situation, relative to a particular scale (e.g. a time scale or a path scale). Turning to verbal prefixation, Filip (2008) states that certain uses of prefixes "contribute to the specification of the ordering criterion on events" and "can be assimilated to the class of scale inducing expressions". Filip points out that "[m]any prefixes historically developed from prepositions and adverbs used for the expression of directed path structures in space and time. Other meanings commonly lexicalized by prefixes are related to cardinality and measure. Directed path structures, cardinality and

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lexical ones). Therefore, such an approach is perfectly compatible with an assumption that we deal with a single prefix whose semantic contribution depends on the structural position in which it is merged.

measurement notions are precisely the type of meaning components that have independently been uniformly represented by means of scales."

The analysis developed in this paper is in the spirit of the abovementioned approaches in that it assigns to verbal prefixes a scalar semantics. I put forward a hypothesis that a verbal prefix imposes **a relation between two degrees on a scal**e, one of which is a degree associated with the event denoted by the verbal predicate, and the other, the standard of comparison. A degree may be linked to an event in several different ways; for instance, this may be the degree of change argument of the event in the sense of Kennedy and Levin (2002). Additional possibilities will be demonstrated below. In turn, the standard of comparison can be contributed either by a linguistic expression that appears in the sentence, or by the context. The scale to which the prefix applies is typically contributed by the linguistic environment in which the prefix appears (e.g. by the verbal stem or by a direct object); in more rare cases, a lexical prefix may introduce a scale of its own. This approach will be referred to below as *The Scale Hypothesis*.

Intuitively, the idea behind the Scale Hypothesis is the following. A sentence that contains a prefixed verb denotes a certain event. There is a gradable property that is related to this event in a certain way. (Different relations are possible, as will be discussed in more detail below. For instance, this could be a property that holds of an argument during the result state of this event, or a property an increase along which is denoted by the predicate.) This property is entailed to hold of an event participant to a certain degree d. The role of the prefix is to apply to this degree and "compare" it to another degree, a standard of evaluation. (For instance, the prefix could specify that d is lower than or higher than the standard of evaluation, or identical to it.) This core meaning proposed for verbal prefixes can be formally represented as in (1). (It will be shown in Sections 3 and 4 that the formula needs to be slightly revised in order to capture the finer distinctions imposed by certain prefixes.)

(1)   The Scale Hypothesis
       $\lambda P \lambda d \lambda x \lambda e \lambda d_s.[P(d)(x)(e) \wedge d\ R\ d_s]$

R stands for a relation between the two degrees, d and d_s, the precise relation (e.g. '<', '=', '≥') being determined by a given prefix. All the uses of a given prefix will involve the same relation between the two degrees. The different uses differ primarily in terms of the scale on which the two degrees are compared (e.g. a path scale, a property scale, a time scale, etc.) The intuitive contrast between the different uses, which sometimes makes them seem absolutely unrelated semantically despite the phonological identity, is to a large degree reducible to this basic distinction. With some prefixes, the uses will also differ in terms of additional properties, such as the source and the nature of d_s, the standard of comparison. Distinct prefixes may differ from one another along a whole range of parameters, which are discussed in more detail at the end of the paper, in Section 5.

A support of a scalar approach along the line of (1) comes from the analysis formulated by Součkova (2004a) for two specific prefixes, *po-* and *na-* is Czech (the analysis is largely based on Filip's (2000) account of the prefixes *po-* and *na-* in Russian). Following Filip (2000), Součkova treats these prefixes as measure functions that delimit the event. Crucially, she argues that they do so by virtue of measuring an interval on the scale that is relevant for the delimitation of the event. More precisely, they measure the degree of change of the event. (In other words, they measure a change

that an event participant undergoes in some gradable property in the course of the event.) *na-* specifies that the degree of change reaches or exceeds a contextually provided standard; *po-*, on the contrary, specifies that the degree does not exceed such a standard. The different uses of the prefixes correspond to the different scales to which they apply (for instance, *po-* in Czech can apply to property, path and time scales). This analysis can be translated into the framework adopted in the present paper as follows:

(2) $[[po\text{-}]] = \lambda P \lambda d \lambda x \lambda e. [\ P(d)(x)(e) \wedge d \leq d_c]$
        $[[na\text{-}]] = \lambda P \lambda d \lambda x \lambda e. [\ P(d)(x)(e) \wedge d \geq d_c]$
        where d is the degree of change (Kennedy and Levin 2002)

In this paper, I argue that the analysis provided in (1) successfully applies to additional prefixes, which differ considerably from both *po-* and *na-* in terms of their properties. One goal of the paper is to propose that the analysis in (1) represents a general pattern followed by multiple prefixes which exhibit different properties and belong to different groups (rather than being an accidental property that happens to characterize a couple of prefixes). Importantly, I will argue that the Scale Hypothesis applies even to prefixes that are not superlexical, do not make a purely transparent contribution and do not necessarily function as event delimiters or measure functions. In what follows, the Scale Hypothesis will be discussed and argued for in four stages, briefly discussed below.

(i) In Section 2, I extend The Scale Hypothesis to the prefix *pod-* in Russian. This prefix is characterized by a variety of uses, mainly lexical, which are intuitively quite different from each other. I will argue that all these uses are unified by the semantic core represented in (3):

(3) $\lambda P \lambda d \lambda x \lambda e \lambda d_s.[P(d)(x)(e) \wedge d < d_s]$[3]

The prefix consistently specifies that a certain degree on a scale associated with the event is lower than a standard of comparison. The uses of *pod-* differ in terms of the scale to which this prefix applies, as well as in terms of the source of the standard of comparison: with some uses, it corresponds to a contextually specified norm, while with others it is contributed by the semantics of a linguistic expression. Some lexical uses of *pod-* may be associated with additional meaning components.

(ii) In Section 3, the Russian prefix *do-* is discussed. It is proposed that the prefix identifies the point on a scale that is reached by an event participant at the endpoint of the event with a standard of comparison. It will be shown that the prefix can apply to scales with different types of dimensions, including path scales, property scales and the time scale.

(iii) In section 4, the general semantics for prefixes proposed in (1) is slightly revised, in accordance with the demands revealed in the previous sections.

(iv) In addition to capturing the semantic core that unifies different prefixes and their uses, the Scale Hypothesis allows us to identify a whole range of parameters along which prefixes are predicted to vary. These parameters are discussed in Section 5.

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[3] I assume that *d*, the degree associated with the event, may be, and often is, existentially quantified over.

Only two prefixes will be discussed in this paper in detail for reasons of space. However, the choice of the prefixes is not accidental. *pod-* is a lexical prefix under most of its uses; it affects the lexical meaning of the verb and sometimes changes its argument structure, and its contribution is not always purely transparent. In turn, *do-* has properties of both lexical and superlexical prefixes. For instance, like a lexical prefix, it is compatible with secondary imperfectivization (*dopisat' – dopisyvat'* (to finish writing)), but like a superlexical prefix, it contributes an aspectual interpretation in a purely compositional way. Tatevosov (2008) captures these facts by arguing convincingly that *do-* belongs to a third group of *intermediate prefixes*. Given that the prefixes *po-* and *na-* discussed by Filip and Součková are superlexical, the discussion below will allow us to conclude that the Scale Hypothesis successfully applies to prefixes belonging to all the three types – lexical, intermediate and superlexical. The prefixes *pod-*, *do-*, *na-* and *po-* differ considerably in their properties, belong to different classes and, therefore, do not form a natural class to the exclusion of other prefixes. The fact that all these morphemes receive a scalar analysis along the line of (1) suggests that the scalar semantics is not an accidental characteristic of two or three morphemes but rather a more general property associated with Slavic verbal prefixation. Of course, future research is needed in order to determine how far The Scale Hypothesis can be extended, whether it applies to the complete set of prefixes or not, and if not, how the precise range of prefixes for which it is valid can be classified. This paper constitutes one of the first steps toward this goal and may provide a basis for future investigation. Hopefully, the direction of research developed in this paper will prove helpful in the study of additional prefixes.

2. The Prefix *pod-*

This section is devoted to a discussion of the semantics of the prefix *pod-* in Russian. The semantics that unifies different uses of this prefix is provided in (3), repeated below:

(3) $\lambda P \lambda d \lambda x \lambda e \lambda d_s.[P(d)(x)(e) \wedge d < d_s]$

Roughly speaking, I propose that the prefix specifies that an event, or some aspect of the event, reaches a degree on a certain scale that is lower than a standard of comparison (the latter being provided either by a PP found in the sentence or by the context). Given that the prefix is derived from the preposition *pod* 'under', 'below', the semantics of the prefix under the proposed analysis can be conceived of as metaphoric. The prefix specifies that the event in question reaches a degree on a scale that is located *below* another degree. In this sense, the analysis conforms to a generalization made by Janda (1988:328) according to which a prefix usually has a spatial submeaning, with the other uses corresponding to metaphorical extensions of this submeaning. The different uses of the prefix will be argued to differ in terms of the dimension of the scale to which it applies, and in the nature of the standard of comparison. What kind of scale is involved largely depends on the properties of the predicate to which the prefix attaches. Below, I discuss several uses of *pod-*.

2.1 Four Uses of *pod-*
2.1.1 *pod-* of Limited Change
pod- of limited change is found mainly with degree achievements. These predicates denote an event of change whereby an event participant comes to be characterized by a gradable property to a certain degree (e.g. *melt*, *shorten*, *grow*). The change of state is from having the property to a degree d to

having it to a *higher* degree d' (see Hay at al. 1999, Kennedy and Levin 2002, 2008, Rothstein 2008, and references therein). (For instance, a growing event is an event whereby a participant undergoes a change in size; at the end of the event it comes to be bigger than at its beginning.) When *pod-* attaches to such verbs, it specifies that the degree to which the property comes to hold of the participant at the end of the event is relatively low. Examples: *podtajat'* (*pod- + melt*, melt a little bit / incompletely), *podrasti* (*pod- + grow (up)*, grow (up) a little bit), *podzabyt'* (*pod- + forget*, forget slightly, not completely), *podgoret'* (*pod- + burn*, to burn slightly), *podmoknut'* (*pod- + get-wet*, get slightly wet (**not** to be thoroughly soaked)), *podsoxnut'* (*pod*-dry) 'get somewhat drier', *podgnit'* (*pod*-rot) 'become tainted', *podustat'* (*pod*-get-tired) 'to get somewhat tired'.

I will assume the semantics of degree achievements in (4), which is based on Kennedy and Levin (2002), with several modifications in accordance with the formal framework adopted in this paper. (5) formalizes the denotation of the complex predicates which contain *pod- of limited change*.

(4) $[[V]] = \lambda d'_d \lambda y_e \lambda e'_v \lambda d''_d. [Q(d')(y)(END(e')) \wedge Q(d'')(y)(BEG(e')) \wedge d'>d'']$

(5) $[[pod\text{-}V]] = \lambda d \lambda x \lambda e \lambda d_s. \lambda d''. [Q(d)(x)(END(e)) \wedge Q(d'')(x)(BEG(e)) \wedge d > d'' \wedge \mathbf{d < d_s}]$
        (where Q is the gradable property lexicalized by the verb,
        BEG is the function from events to times that returns an event's beginning point
        END is the function from events to times that returns an event's final point
        (Kennedy and Levin 2002))

pod- applies to the property scale lexicalized by the verb, and to the degree associated with the endpoint. As a result, we get the following meaning: at the end of the event, the corresponding property characterizes the participant to a relatively low degree, to a degree that is lower than the standard of comparison. The standard of comparison can come from two sources, depending on the type of scale introduced by the predicate. The important distinction is between upper (or totally) closed scales, on the one hand, and open (or lower closed) scales, on the other, in the sense of Kennedy and McNally (2005)[4]. Upper closed and totally closed scales are scales that have a maximal element. For instance, consider a gradable adjective like *full*. A vessel can filled to different degrees, but if it is completely full, then it is filled to a maximal degree that cannot be further exceeded. In contrast, lower closed and open scales lack such a maximal element. Such a scale is introduced by the adjective *high*: no matter how high a given entity is, it is always possible to conceive of something that is yet higher, i.e. the scale is not associated with an upper boundary, or a maximal value.

It turns out that the type of scale plays a crucial role in determining the standard of comparison that is invoked by *pod-*. If a verbal stem lexicalizes a totally or upper closed scale, then the comparison is to the maximal degree on this scale. The predicate with *pod-* denotes a set of events whose participant fails to reach this maximal degree. To illustrate, *tajat'* (melt) introduces a closed scale whose maximal degree corresponds to the state of being absolutely liquid. *Podtajat'* denotes a set of events in whose course an object becomes more liquid than it was at the beginning of the event but still fails to become absolutely liquid. Importantly, the change of state may be quite considerable, as long as by the end of the event the object fails to completely turn into the liquid state.

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[4] See Filip (2008) for a detailed discussion of the relation between the upper boundary of closed scales and perfectivity and maximalization.

In turn, if the predicate introduces an open (or lower closed) scale, a scale that does not have a maximal element, then the degree reached by the participant is required to be lower than some contextually specified expectation value or norm. For example, the property scale lexicalized by *rasti* (grow) is open. The subject of *podrasti* is entailed to reach a higher degree on this scale than it used to have, but the degree it reaches is still lower than a contextually specified standard. In other words, in the course of the event, the subject becomes higher or taller than it used to be, but it still does not become truly high/tall (with the denotation of *high/tall* being contextually determined).

A strongly related fact is that, as pointed out by Filip 2008, what counts as a **maximal** event is determined by the context if the associated scale is open, and on the upper bound of a scale if it is closed.

To sum up thus far, we have seen that *pod- of limited change* applies to a property scale and relates the event to a degree that is lower than either the maximal element on the scale (if the latter exists) or a contextually specified value.

2.1.2 Stative *pod-*
Stative pod- is not productive and is found with a small number of verbs. Despite this fact, I believe this use is worth discussing because it illustrates the contribution of the prefix is a straightforward way.

Stative pod- is found with verbs that are not eventive, but rather denote a state whereby a certain gradable property holds of their argument. The function of the prefix is to indicate that the property in question holds of the argument to a relatively low degree. An example would be the verb *podtašnivat'*, derived from the prefix *pod-* and the verb *tošnit'* 'nauseate'. The resulting verb means 'nauseate slightly'. Importantly, the verb does not have a perfective form, a fact that is related to its purely stative nature. However, an attachment of a prefix normally results in a formation of a perfective verb. As a result, *pod-* can only attach to this root in combination with a secondary imperfective suffix *-va*. Thus, we deal with a situation whereby a prefix can only appear in an imperfective verb with a stative semantics. Even though such cases are relatively rare, their existence constitutes additional evidence against the treatment of prefixes as semantic perfectivizers (Cf. Filip 2000 for a detailed argumentation against such a treatment.).

The same holds for *podnyvat'* (ache slightly), which contains the prefix *pod-* and the suffix *-va* (the verb is used only in spoken, informal language). The more basic verb *nyt'*, 'to moan' under its literal meaning, can also be used with the meaning 'to ache (slightly)'. The attachment of *pod-* indicates an even lower intensity of the pain. *Stative pod-* is further illustrated in such verbs as *podvanivat'* (*pod- + stink*), 'to stink' (not too heavily) and its synonym *podpaxivat'* (*pod- + smell*).

While this type of *pod-* is highly restricted, its use is sometimes extended in informal speech to stems with which it cannot combine in the more formal or standard dialects (even spoken ones). Some examples from the internet are provided in (6). It is very likely that the speakers of these sentences would say upon second thought that the verbs in question do not exist. Still, such examples are interesting as they illustrate the speakers' ability to use the prefix productively, in predictable ways which reveal the speakers' implicit understanding of the function of the prefix.

(6) a.   posle pročtenija otvetov menja stalo **podznablivat'**
        after reading answers me started *pod*-chill
        'After having read the answers, I started to feel a slight chill.'
                          http://forum.ozpp.ru/showthread.php?t=57117&page=12

    b.   golova tože možet **podbalivat'**
        head too may *pod*-ache
        'The head may ache slightly, too.'
                          http://forum.antivsd.ru/index.php?topic=3174.0

    c.   Včera začesalsja glaz, vtoroj k noči načal **podčosyvat'sja**.
        yesterday started-itching eye second toward night started *pod*-itch
        'Yesterday an eye started itching; the second one started itching slightly by night.'
    http://club.passion.ru/viewtopic.php?t=158028&postdays=0&postorder=asc&start=405&sid=

It should be noted that this type of *pod*- is only compatible with a limited range of gradable properties – mainly, properties having to do with physical health, with the exception of smell emission. The prefix thus only combines with verbs that report a physical experience/perception and introduce an experiencer argument, either explicitly or implicitly.

(7) $[[V]] = \lambda d \lambda x \lambda e. [P(d)(x)(e)]$
        where P is the property lexicalized by the verb, and x stands for either an experiencer
        argument or, with such verbs as *vonjat'* (stink), for the stimulus

pod- applies to the degree argument which is present in the semantics of the stem to begin with, and specifies that the degree is lower than the standard of comparison. Note that in this case, the degree is not linked to the endpoint of the eventuality, but rather to the state in general. This results from the fact that here, *pod*- does not apply to verbs that denote a change (in contrast to the case of *pod- of limited contribution*).

(8) $[[pod\text{-}V]] = \lambda d \lambda x \lambda e. [P(d)(x)(e) \wedge d < d_s]$[5]

With *stative pod*-, the standard of comparison consistently corresponds to a contextually supplied value. It is world knowledge together with the more specific context of utterance that determines which degree of stinking or aching is judged as high and which, as low.

2.1.3 *pod*- of Approaching

This use of the prefix attaches mainly to verbs of directed motion. The resulting verbs mean *to approach* (in the manner of motion specified by the stem). *pod- of approaching* is present in such verbs as *podojti* (*pod*- + *idti* (walk), approach by walking), *podbežat'* (*pod*- + *bežat'* (run), approach by running), *podletet'* (*pod*- + *letet'* (fly), approach by flying). It is also found with verbs belonging to other classes, e.g. the transitive verb *pododvinut'* (*pod*- + *dvinut'* (move), to move an object x close to y). The object that is approached is typically specified by a PP headed by the preposition *k*

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[5] I am using *e* as a variable over eventualities of any kind, including both events and states. Alternatively, the variable *s* could be used to indicate that we deal with state predicates.

(towards) (alternatively, it can be specified by the context). According to (9), Masha reached (by walking) a location that is close to the store (the result state is one of her being *near* the store.)

(9)   Maša   podošla   k   magazinu.
      Masha *pod*-walked toward store
      'Masha approached the store.'

Let us now turn to the semantics of this use of *pod*-. It is found with verbs that introduce a path scale. It applies to the path scale contributed by the verb. The path scale orders objects located along a path in accordance with their remoteness from the source. Here, the standard of comparison is provided by the direction phrase (e.g. *toward the store* in (9)). *pod*- specifies that the point reached by the moving object at the end of the event is lower on the scale than the point provided by the direction phrase. Thus, in (9), the subject does not enter the store in the course of the reported event; she comes close to the store but does not quite reach it.

One way to partially represent the meaning of *pod*-verbs is by relating directly to the gradable property in which the subject undergoes a change (along the line of Kennedy and Levin's approach in (4).) The gradable property is in this case *advancement along a path* (ADV).

(10) $\lambda d \lambda x \lambda e \lambda d_s \lambda d''. [ADV(d)(x)(END(e)) \wedge ADV(d'')(x)(BEG(e)) \wedge d > d'' \wedge d < d_s]$

Interestingly, predicates with *pod- of approaching* may contain an adjunct phrase (headed by the preposition *na*) that specifies the distance between the degree reached at the endpoint of the event and the standard of comparison. Essentially, it provides the difference between the two degrees to which the prefix applies.

(11)   a.   …on podojdjot   k   vam na rasstojanije udara…
            he *pod*-walk$_{FUT}$ toward you on distance   strike$_{GEN}$
            'He will come within hitting distance of you.'
       b.   …vrag   podojdjot   na rasstojanie 80 kilometrov k   Kremlju…
            enemy *pod*-walk$_{FUT}$ on distance   80 kilometers toward Kremlin
            'The enemy will come within an 80 kilometer distance of Kremlin.'
                                                    National Corpus of Russian

Finally, it should be noted that *pod- of approaching* contributes an additional meaning component. It specifies that the maximal degree reached by the event participant is **close to** the degree contributed by the direction phrase. Thus, at the end of the event, the subject reaches a degree that is lower than but close to the standard of comparison. (Note, however, that as (11b) shows, the notion of proximity is relative.)This proximity meaning component does not characterize most types of *pod*-. It will be shown in Section 2.3, however, that the proximity component does characterize some uses of *pod* as a free morpheme (although, again, not all of them).

2.1.4 Vertical *pod*-
This use of *pod*- is especially strongly related to the semantic meaning of the preposition *pod* (under). The precise effect of the attachment of the prefix is in part idiosyncratic, but the resulting predicates can be roughly divided into two types. Verbs of the first type denote events whereby an

object x undergoes motion, with the result of x being located under an object y. Compositionality is to a high degree observed with verbs of placement. Such verbs, in combination with *pod-*, mean roughly "to put x under y", with additional meaning components contributed by the lexical semantics of the root. This kind of interpretation is exhibited by such verbs as *podložit'* (*pod-lay/put down*) 'to lay x under y', *podstavit'* (*pod-put (in a vertical position)*) 'to place x under y', *podstelit'* (*pod-lay/spread*) 'to lay x under y'. The use of such verbs is exemplified in (12):

(12)　a.　　podložit' podušku (pod　golovu)
　　　　　　pod-lay　pillow　under head
　　　　　　'to put a pillow (under one's head)'
　　　b.　　podstavit' skamečku pod　nogi
　　　　　　pod-put　footstool　under legs
　　　　　　'to put a footstool/a small bench under one's legs.'[6]

Podpisat' (*pod-write*) is a verb whose meaning is not compositionally derived, but in which the vertical meaning of *pod-* can be still made out. This verb means *to sign*. Signing involves writing, and in the prototypical case, a signature is placed **below** a picture / text etc. Of course, *sign* is not identical to *write below*; still, it is non-surprising that the prefix *pod-* is used to derive a verb with this meaning.

The second type consists of verbs in which *pod-* introduces the meaning of moving upward, such as *podnjat'* 'lift' (the stem is a bound morpheme which cannot function as an independent word), *podprygnut'* (*pod-jump* (once)) 'jump up', and *podbrosit'* (*pod-throw*) 'throw up'. Although, perhaps surprisingly, the motion is upward, rather than downward, we can still detect the original meaning of 'under': the point in space at which the motion begins is located at the lower end of the vertical path traversed by the object. Roughly, the source is located **under** the goal.

It can be seen that *vertical pod-* introduces the 'lower than' relation in the most literal way. This relation unifies it with the other uses of the prefix discussed above. But the relation contributed by *vertical pod-* can, too, be represented in scalar terms.

Let us begin with the preposition *pod* (under), from which this use of the prefix receives its meaning. This preposition, similarly to many others, encodes a certain spatial relation between two objects, a theme / figure / trajector and a reference object / ground / landmark (cf. Janda 1988, Levinson 2001, Rappaport Hovav 2009, and references therein). This relation can be treated as a relation between two degrees on a scale. The scale can be conceptualized as a path scale, since it imposes an ordering relation on objects in accordance with their spatial configuration. The path is formed by a "set of contiguous locational points between the theme and [the reference object]" (Rappaport Hovav 2009:7). In the case of the preposition *pod* and its English counterparts *under* and *below*, this scale is concerned particularly with verticality. It orders points that are spatially located under one another, with a lower position corresponding (iconically) to a lower degree on the scale. The prepositions specify that a certain object (the theme) receives a lower value than another one

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[6] Note that *podstavit'* can be used even if one's legs are not located on/above the footstool immediately after the putting event. The verb can be used as soon as the subject intends for someone to put his or her legs on the object in the near future. In this case, the *purpose* of the subject is sufficient.

(the reference object) on this scale. A sentence of the form *x is below y* relates x to a degree on the vertical path scale which is lower than the degree corresponding to the location of y. The fact that these prepositions introduce a scale is supported by their compatibility with degree modifiers (cf. Rappaport Hovav 2009:7), e.g. *three meters below*, *five meters under*, *far below*, *v vos'mi metrax pod* 'in eight meters under'.

I propose that the *vertical pod-* contributes the same scale as the preposition *pod* and specifies the same relation along this scale. This is the only use of the prefix that *contributes a scale of its own* (rather than applying to a scale contributed by the environment). This is the scale inherited from the preposition from which the prefix is derived. As shown above, *vertical pod-* has evident signs of a lexical prefix: its contribution is not transparent and varies from verb to verb. It is important that despite this fact, the prefix is characterized by the meaning component in (3). It makes sure that a certain degree associated with the event is lower on the scale of vertical configuration than another degree. A point on this scale occupied by an argument at some stage of the event is lower than the standard of evaluation. The more precise relation between the reported event and the two degrees in question depends on the particular verb involved since, as we have seen, the contribution of the prefix varies to a certain degree with the stems it attaches to. To illustrate, verbs like *podstelit'* 'lay x under y' or *podnyrnut'* 'dive under' denote a set of events which result in one of their participants located under another object. (The latter object is normally referred to by a linguistic expression). Here, the result state is one whereby an argument occupies a certain degree on the (vertical) path scale which is lower than the standard of evaluation.

To sum up, I have argued that all the uses of *pod-* discussed in this section are unified by the meaning component formally represented in (3)[7]. Each of them relates an event to a degree on a scale that is low relative to another salient degree. In addition, it can be seen how the semantics of the prefix *pod-* is related to the interpretation of the preposition *pod*. The preposition encodes a relation between two entities whereby one of them is assigned a lower degree on a scale of vertical spatial configuration than the other one. This relation reflects a state of affairs whereby one element is located lower than another one in the most literal sense. The different uses of the prefix *pod-* retain the meaning component whereby a certain degree is entailed to be lower than another degree (i.e. to be located "under" another degree) on a scale; however, most of them lose the original literal meaning of a vertical spatial configuration. The notion of a *relatively low* position becomes metaphoric (associated exclusively with scale structure), rather than spatial.

2.2 Generalizations and Predictions
2.2.1 The Meaning of *pod-* Depends on the Semantics of the Stem
The unified treatment of *pod-* argued for above allows us to make predictions regarding the meaning of the prefix on the basis of the environment in which it appears. Predictability is somewhat restricted due to the presence of certain lexical uses whose contribution is not purely transparent. Still, a number of generalizations can be made, including the following:

1. *pod- of limited change* is obtained with those stems that denote events of change and lexicalize a property scale.

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[7] Some uses of *pod-* are not discussed in this paper for reasons of space. See Kagan (to appear) for an analysis of such uses within the framework of The Scale Hypothesis.

The prefix applies to the scale contributed by the stem, which results in the limited change interpretation. Furthermore, the standard of comparison, too, depends on the environment, or more precisely, on the kind of scale lexicalized by the verb. If this is an upper closed scale, the standard of comparison will correspond to its maximal element (the degree which an argument reaches on this scale will be entailed to be lower than the maximum.) If this is an open scale, the standard of comparison will be a contextually supplied norm.

2. *pod- of approaching* is obtained with those stems that introduce a path scale. Again, the interpretation is a product of the prefix applying to the scale contributed by the verb.

3. It is somewhat more difficult to predict the attachment of *vertical pod-*, due to its restricted productivity and "highly lexical" nature. Typically, this type of *pod-* is available with those stems that denote events of motion or placement and which are especially easily conceptualized as involving motion directed either upward (as in *podprygnut'* (jump upward)) or to a position that is located under a certain object (e.g. *podstelit'* (lay under), *podpolzti* (crawl under), *podlezt'* (creep under), *podnyrnut'* (dip under)). As stated above, the scale of vertical configuration is contributed by the prefix, rather than its environment, but the stem must be semantically compatible with this scale.

4. If the stem is semantically compatible with the vertical path that can be introduced by *pod-*, and also contributes a scale of its own, an ambiguity may result, since the prefix may apply to each of the potentially available scales. To illustrate, the verb *podpolzti* is ambiguous: it may mean 'to approach by crawling' (13a) or 'to crawl under' (13b), depending on whether the prefix applies to the path scale introduced by the verb or contributes and applies to a vertical path scale.

> (13)   a.   Jaščerica podpolzla   k   derevu.
>   lizard   *pod*-crawled toward tree
>   'The lizard crawled to the tree.'
>   b.   …[dog]… podpolz   pod   slomannyj divan.
>   Great-Dane *pod*-crawled under broken   sofa
>   '…the Great Dane crawled under a broken sofa.'
>   Kanžinsky, "Biologičeskaja radiosvjaz'" ("Biological Radio Communication")
>   http://www.teatr-zverey.ru/test_new/kanjin_1.html

The same kind of ambiguity holds for *podprygnut'* (*pod*-jump).

2.2.2 Non-Existent Interpretations
In addition to making predictions regarding the contributions available to *pod-* on the basis of its environment, the proposed analysis allows us to deal with those meanings that *pod-* **cannot** have. The degree framework makes it possible to list some scales to which *pod-* cannot apply and account for the corresponding gaps in its use.

First of all, is can be seen that *pod-* cannot apply to a volume/extent scale associated with the object. This results in non-existence of such VPs as **podčitat' knig* (*pod- + read books*), meaning *to read few books*, **podjest' jablok* (*pod- + eat apples*), *to eat a small amount of apples*.

Secondly, *pod-* cannot apply to the time scale. For example, there does not exist a verb **podstojat'* (*pod-* + *stand*), whose meaning would be expected to be *to stand for a short while*. Analogously, one cannot say **podbolet'* (*pod-* + *be-sick*) with the intended meaning of *to be sick for a short while*. Thus, *pod-* cannot measure an event by applying to the time scale and asserting that the duration of the event denoted by the stem is shorter than some standard of comparison.

These restrictions can be accounted in the following way. It is generally accepted in the current literature on the topic that different verbal prefixes in Slavic occupy different structural positions (cf. e.g. Romanova 2004, Ramchand 2004.) For instance, superlexical prefixes appear higher in the structure than the lexical ones, which accounts for many of the differences between the two groups. I remain agnostic as to the precise syntactic position taken by *pod-*, but I propose that it applies locally to the verbal stem, so that other syntactic constituents remain outside of its scope. (In this respect it differs from some lexical prefixes which have been argued to take the object NP as their complement, or at least to include it in their scope, cf. Filip 2005, Ramchand 2004). As a result, the prefix can only apply to those scales that are already introduced at the level of the *pod-V* constituent[8]. Thus, it can apply to a scale that is lexicalized by the verb, e.g. a path scale or a property scale. It can also contribute a scale of its own, as is the case with *vertical pod-*. However, the prefix cannot apply to a scale that is introduced at a higher level of derivation. For instance, the time scale is not lexicalized by the verb; rather, it is introduced at a higher structural level (possibly in the area of AspP). This scale is thus not available for *pod-* to apply to. The case is similar with the volume/extent scale. As argued by Rappaport Hovav (2008), this scale is not lexicalized by the verb but rather contributed by its object. As a result, it, too, is not accessible to the prefix.

2.3 Non-Verbal *pod-*
Further evidence of the scalar nature of *pod-* comes from the uses of this item not as a verbal prefix. In the following subsections, I discuss certain uses of *pod* as a free morpheme and the prefix *pod-* that attaches to nouns.

2.3.1 *Pod* as a Free Morpheme

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[8] The situation is not quite clear in those cases when *pod-* combines with an already prefixed stem, e.g. *pod-vy-pit'* (take a drop), pod-u-stat' (get somewhat tired) and *pod-za-rabotat'* (earn a little bit). Since lexical prefixes cannot stack, *pod-* that appears in such verbs is more likely to be a superlexical (or maybe an intermediate) prefix, which as such is expected to attach at a higher structural position. Still, even with these verbs, the scale to which the prefix applies appears to be contributed by the verbal stem. For instance, *ustat'* (get tired) contributes the property scale of weariness. *Vypit'* under the relevant meaning of drinking alcohol contributes the scale of drunkenness. *Pod-* applies to this scale, rather than to a volume/extent scale contributed by an object. This can be seen from two facts. First, the verb *podvypit* does not easily combine with an object at all. Second, what the verb measures is the state of the subject's drunkenness, and not the amount of alcoholic beverages that have been drunk. The subject is entailed to be drunk but not dead drunk; the verb provides no information about the amount of alcohol he has consumed. Finally, the verb *podzarabotat'* may seem to measure the object (the amount of money). However, the prefixed stem *zarabotat'*, meaning 'to earn', seems to contribute the scale corresponding to the amount of the income on its own, independently from whether it combines with an object or not (in fact, the object is perceived as redundant in the phrase *zarabatyvat' den'gi* (earn money).) All these facts suggest that even when *pod-* combines with a prefixed stem, it applies to the scale that is made available by the verb, rather than by additional constituents.

We have seen that the standard spatial meaning of the preposition *pod* can be represented in scalar terms (cf. Section 2.2). The free morpheme *pod* is interpreted as a relation between two degrees under at least two additional uses, quantificational and temporal.

2.3.1.1 *Pod* with Quantity Expressions

Firstly, the morpheme *pod* can combine with quantity expressions, mainly numerals. The resulting [*pod* Num] constituent denotes a quantity that is close to, but somewhat lower than, the quantity denoted by the original numeral. Two examples are provided in (14):

(14)   a.   Ej   pod 80.
                  she$_{DAT}$ pod 80
                  'She is slightly less than 80 years old.'
        b.   V etoj glave   pod 40 stranic.
                  in this chapter pod 40 pages
                  'This chapter is a little less than 40 pages long.'

(14a) entails that the subject is slightly less than eighty years old (probably 78 or 79). According to (14b), the length of the chapter is slightly less than 40 pages; it is maybe 37 or 39 pages long. Under this use, *pod* applies to a scale that orders numbers. A certain degree on this scale is entailed to be slightly lower than the degree contributed by the numeral. This way, the degrees corresponding to the woman's age in (14a) and the length of the chapter in (14b) are entailed to be slightly lower than the values provided by the numerals that complement the preposition.

2.3.1.2 *Pod* with Temporal Expressions

Secondly, a scalar interpretation is sometimes invoked when *pod* combines with a temporal expression. The event modified by the *pod*-phrase is then entailed to take place slightly before the time denoted by the original temporal expression. For instance, the expression *pod utro* (*pod* morning) in (15a) is used to refer to the time of day that precedes the morning (possibly 4 or 5 a.m.) The expression *pod Novyj God* (*pod* New Year) can be used to temporally locate events that take place, for instance, on December 29-30, or in the morning of December 31.

It should be noted that this use of *pod* is not fully productive; in fact, it is highly restricted. The most typical examples are the ones provided in (15). Still, a search in National Corpus of Russian renders a considerable amount of additional examples (e.g. 16), showing that this use of *pod* is productive to a certain degree, and is not limited to a number of frozen expressions. The example in (16c) is interesting since the speaker explicitly specifies what she means by the expression *pod zimu* (*pod* winter). The expression is used to pick up a relatively late part of the fall, here, the end of October.

(15)   a.   pod utro   /   pod večer
                  pod morning pod evening
        b.   pod konec
                  pod end
        c.   pod Novyj God / pod Roždestvo
                  pod New Year   pod Christmas
        d.   pod osen'
                  pod fall

(16) a. …pod final zadam   vam krasivyj vopros   ot   slušatel'nicy...
          pod end I-will-ask you beautiful question from auditress
        'In the end, I will ask you a beautiful question from our auditress.'
     b. Esli už   oxota na oligarxov, to   pod vybory.
        if   already hunt   on oligarchs then pod elections
        'If there is a hunt on oligarchs, it takes place before elections.'
     c. Možno sejat' osen'ju pod zimu (v konce oktjabrja)…
        may   sow in-fall pod winter in end   October
        'One may sow in the fall, before the winter (at the end of October.)'

Once again, *pod* imposes a relation between two degrees, this time on the time scale. The time of the event modified by the PP is entailed to be lower on the scale than the value invoked by the complement of the preposition.

Interestingly, the uses of *pod* discussed in this subsection involve a proximity meaning component, in addition to contributing the 'lower than' relation between two degrees. As we saw above, this meaning component is also present in the meaning of *pod- of approaching*. However, it does not characterize the other uses of the prefix *pod-*, nor does it characterize the preposition *pod* under its basic spatial meaning. A sentence of the form *X is under Y* does not entail that the distance between X and Y is relatively small, as one can, for example, talk about cities located under the blue sky. It thus appears that the proximity meaning component characterizes some uses of *pod* but not all of them, both when it functions as a verbal prefix and when it appears as a free morpheme.

2.3.2 *pod-* as a Nominal Prefix
The nominal *pod-* is a derivational prefix that attaches to nouns. The semantic contribution of this prefix is comparable to that of the prefix *sub-* in such words as *subset* or *subtype*. The nominal *pod-* indicates a lower level on a taxonomy/hierarchy than the one associated with the stem. Thus, *pod-* nouns are often hyponyms of their counterparts that do not contain *pod-*.

(17) podvid   podrazdel   podpolkovnik   podderevo
      pod-species *pod*-section   *pod*-colonel   *pod*-tree
      subspecies   subsection   lieutenant colonel   sub-tree

      podmnožestvo   podsistema
      pod-plurality   *pod*-system
      subset   subsystem

Here again, the function of the prefix can be formulated in scalar terms. The relevant scale orders elements in accordance with their rank in a certain hierarchy or with their level in a taxonomy. The value of the *pod*-noun on this scale is one-level lower than the value associated with the stem. Thus, the 'lower than' relation between two degrees is contributed by this type of *pod*, too.

2.4 *Pod*: A Summary
To sum up the discussion of the verbal *pod-*, I have argued that this prefix denotes a relation between two degrees. It specifies that a degree associated with an event (in some cases, the degree reached by an event participant at the endpoint of the event) is lower than the standard of

comparison. This approach allowed us to unify different uses of *pod-*, which were argued to differ largely in terms of the scale to which the prefix applies. The range of contributions available to the prefix is to a large degree predictable on the basis of the environment in which it appears. Further, the impossibility of certain contributions can be accounted for on the basis of the structural position of the prefix and its semantic scope. Finally, it has been shown that certain non-verbal uses of *pod* (as a free morpheme and as a nominal prefix) render support to the scalar nature of this morpheme.

3. The Prefix *do-*
The prefix *do-* is derived from the preposition *do*, which can be translated as *to*, *until*, or *as far as*. This prefix can often be translated as *finish*, since it relates the event denoted by the stem to a certain finishing point. It is referred to as a **terminative** prefix by Filip (2008), who points out that the prefix relates to an endpoint on a certain scale, with the details of the latter being determined by the environment in which the prefix appears.

Uses of this prefix are illustrated in (18).

(18) a. Vasja dočital knigu.
          Vasja do-read book
          'Vasja finished reading a/the book.'
      b. Vasja dočital knigu do konca / do serediny.
          Vasja do-read book till end   till middle
          'Vasja finished reading the book / half of the book.'
      c. Vasja dobežal do magazina.
          Vasja do-ran   till store
          'Vasja reached the store by running.'
      d. My dosideli tam do utra.
          we do-sat   there till morning
          'We sat there till the morning.'
      e. …ja eščo ne   doros   do amerikanskogo pensionnogo vozrasta…
            I yet NEG do-grew till American   pensionable   age
          'I have not yet reached the American retirement age.'
                                                    (National Corpus of Russian)
      f. Dotajal   poslednij sneg v ovragax.
          do-melted last   snow in ravines
          'The last snow finished melting in (the) ravines.'

For instance, (18a) asserts that Vasja finished reading the book. (For the sake of comparison, its non-prefixed counterpart *Vasja čital knigu* entails that Vasja was engaged in reading a book but provides no information as to whether the event reached its natural endpoint or not.) A PP headed by the preposition *do* can be added to this sentence (18b), the resulting sentence entailing that the reading event reached the point specified by the *do*-phrase. If the phrase is *do serediny* (to middle), then the sentence entails that the middle of the book was successfully reached in the course of the reading event, i.e. Vasja finished reading half of the book. (18c-f) constitute additional illustrations of the use of this prefix; some of them contain a *do*-phrase and some do not.

I propose that the prefix *do*- introduces the relation of identity between two degrees. It identifies the degree associated with the endpoint of an event (i.e. a degree reached by some event participant at the endpoint of the event) with a standard of comparison. This way, the prefix functions as an event delimiter, as it contributes information regarding the endpoint of an event[9].

(19) $\lambda P \lambda d \lambda x \lambda e \lambda d_s. [P(x)(e) \wedge Q_P(d)(x)(END(e)) \wedge d=d_s]$
        where P is the event property denoted by the verbal predicate, and Q_P is the gradable property an increase in which is denoted by the predicate

It should be noted that the formula in (19) does not constitute an instance of (1). In fact, the schema in (1) turns out to be insufficient for the purposes of representing the requirements imposed by *do*- in a sufficiently precise way. More specifically, it does not leave open the possibility of indicating the precise relation between the degree argument d and the event denoted by the verb. This suggests that the semantics in (1) should be slightly modified. I turn back to this issue in Section 4 below.

With the prefix *do*-, the standard of comparison is often specified by a linguistic expression, in particular, by the *do*-PP, e.g. *do magazina* in (18c). This way, (18c) reports a running event at the end of which Vasja reaches a point on the path that corresponds to the location of the store. In the absence of such an expression, the source of the standard of comparison depends on the type of scale involved. Here again, the important question is whether the scale is upper closed or not. If the scale is upper closed, then the standard of comparison corresponds to the maximal point on this scale. An event participant is thus entailed to reach this maximal point at the end of the event. For instance, (18f) asserts that the snow has melted completely. The verb *melt* lexicalizes a property scale which has a maximal point (corresponding to the state of being absolutely liquid). In the absence of a *do*-phrase, the sentence entails that the snow, which undergoes a change of state, reaches the maximal point on the property scale (i.e. it completely turns into water) at the end of the melting event. The situation is similar in (18a). Here, the volume/extent scale introduced by the object *knigu* is a closed one (the maximal point on this scale corresponds to the book in its wholeness.) The sentence entails that this point was reached at the end of the reading event, namely, that Vasja finished reading the book. However, once a *do*-PP is added, it overrides the contribution of the maximal point, winning the competition for the status of the standard of comparison. If present, a *do*-phrase will determine the standard of comparison. As a result, (18b) with the *do serediny* variant entails that at the end of the reported event, Vasja completed reading half of the book, rather than the book in its wholeness, i.e. he "reached" the middle of the book.

If *do*- applies to a scale that is not upper closed, and a *do*-PP is absent, the context has to be sufficiently rich to determine what counts as the standard of comparison. For instance, a sentence like (20) is somewhat strange out of context. However, it is perfectly acceptable in a context

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[9] As discussed by Filip (2008), if the verb is imperfective and receives a progressive interpretation, the resulting sentence does not entail that this endpoint is reached in the actual world. The details of the semantics of such sentences depend on one's more general assumptions on the semantics of progressive and imperfective aspect. For instance, an intensional approach to the progressive originally proposed by Dowty (1979) may be assumed. Under this approach, the imperfective sentences entail that the endpoint is reached in so-called *inertia worlds*, worlds in which events develop without interruption, but not necessarily in the actual world.
In any event, the presence of *do*- makes sure that an endpoint is introduced into the semantics of the sentence (and identified with the standard of comparison). However, in the presence of an imperfective operator, this endpoint need not be entailed to be reached in the actual world.

whereby it is known that Vasja had been running towards the store. Then an overt *do*-phrase is not required, and information regarding the point on the path which Vasja is asserted to reach is recoverable from the context.

(20)   Vasja dobežal.
        Vasja do-ran

It can be seen from the examples in (18) that *do*- can apply to scales with different dimensions, including a scale of volume/extent associated with the object (as in (18a-b)), a path scale (18c), a time scale (18d), or a property scale (18e-f). The scale to which the prefix applies depends on the environment in which it appears (cf. Filip 2008), as is also the case with *pod*- (and even more so, given that the contribution of *do*- is purely compositional.) If the verbal stem contributes a scale, it is to this scale that *do*- will apply. This may be a path scale or a property scale. If the verb itself does not contribute a scale, but it is an incremental theme verb, then the prefix will apply to the scale introduced by the direct object (a volume/extent scale)[10]. If none of these conditions are satisfied, the prefix can apply to the time scale. (Součkova 2004 shows that an analogous hierarchy determines the scale to which the prefix *po*- applies in Czech: it "selects" a time scale only in case no other scale is lexicalized by the VP.)

Finally, let us illustrate the semantics of a sentence that contain the prefix *do*-, assuming the analysis proposed for this prefix in (19). The logical form of (21) is provided in (21'):

(21)   …radiator dogrelsja   do 60 gradusov…
         heater   *do*-warmed *do* 60 degrees
         'The heater warmed up to 60 degrees Celcius.'
                                                     http://forum.ixbt.com/topic.cgi?id=62:15454-113

(21') $\exists e \exists d \exists d'$ [warm(d)(the radiator)(BEG(e)) $\land$ warm(d')(the radiator)(END(e)) $\land$ d'>d $\land$ d'=60℃]

4. Semantics for Prefixes Modified

As we have seen above, the semantics in (1) does not allow for us to define some nuances of the more specific relations between an event and a degree argument imposed by such prefixes as *do*-. For instance, it does not make it possible to relate the degree specifically to the final point of the event. In order for such restrictions to be represented, I propose to modify the scalar semantics for prefixes in the following way:

(22)   The Scale Hypothesis (Final Version)
        $\lambda P \lambda d \lambda x \lambda e \lambda d_s.[P(x)(e) \land Q_P(d)(x)(f(e)) \land d \ R \ d_s]$

(Note that the semantics proposed for *do*- in (19) does constitute an instance of (22).)

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[10] See Rappaport Hovav (2008) for evidence that volume/extent scales are contributed by the object, rather than by the verb itself.

Here, P is the event property denoted by the verb (or by the higher verbal projection to which the prefix applies). Q_P is a gradable property related to P in a certain way; the precise relation is underspecified in the general formula and has to be fixed for a particular prefix or a particular use of a prefix. Indeed, prefixes may differ in terms of the precise relation between P and Q_P. The two properties may be identical. Alternatively, as in the case of *do-*, Q_P may stand for the property a change along which is denoted by the predicate. (For instance, if P is a property of events of growing, Q_P would be the property of being big to a degree d.) Finally, *f* is a function that takes an event as its argument. The precise nature of the function is, again, determined by a prefix or by its particular use. For example, this may be a function from events to times, as is *END* in the semantics of *do-*. The application of this function allows for us to relate the degree d to an event via a particular temporal stage of this event. *f* may also be an identity function, in which case d is related more directly to the event *e*.

It should be noted that if *f* is an identity function, and it holds that $P = Q_P$, then (22) is reducible to (1), repeated below:

(1) $\lambda P \lambda d \lambda x \lambda e \lambda d_s.[P(d)(x)(e) \wedge d \ R \ d_s]$

Finally, turning back to the prefix *pod-*, its semantics under the modified approach can be represented as follows:

(23) $\lambda P \lambda d \lambda x \lambda e \lambda d_s.[P(x)(e) \wedge Q_P(d)(x)(f(e)) \wedge d < d_s]$

(23) is identical to (22) except for the fact that the relation between the two degrees is now fixed. The contrast between (23) and the semantics of *pod-* originally formulated in (3) does not affect the semantics of the sentences discussed in Section 2 in any significant way.

5. The Scale Hypothesis: Diversity in Unity
It can be seen that The Scale Hypothesis successfully applies to the lexical (under some uses) prefix *pod-*, the intermediate prefix *do-*, in addition to the superlexical *po-* and *na-*. Thus, it applies to morphemes that have different properties and do not form a natural class to the exclusion of the other verbal prefixes.

As suggested above, the Scale Hypothesis seeks to capture the common semantic core shared by different prefixes, as well as by different uses of a given prefix. An additional advantage of this approach lies in its ability to predict semantic variation across prefixes in a whole range of parameters. Thus, the approach makes it possible to compare different prefixes explicitly, formulating in a clear way which properties unify them and which distinguish between them. Below, several parameters along which the prefixes are predicted to vary are briefly discussed.

(i)   Most obviously, prefixes are predicted to differ in terms of the relation between two degrees that they impose (e.g. '<' in the case of *pod-*, '=' for *do-*, '≥' for *na-*, etc.) It should be noted that the fact that a prefix may impose a relation between *intervals* on a scale, and not only points, makes the range of potential relations wider. For instance, two intervals may be related via the relation of inclusion. (This relation seems to be involved in the semantics of the prefix *pere-*, which under its

most basic, spatial interpretation means 'to cross'.) Investigation of additional prefixes is needed in order to determine an exhaustive list of relations that they may encode.

(ii)   Prefixes differ in the range of scales to which they apply. For some prefixes, the range of scales may be lexically determined (and, thus, in some sense analogous to selectional restrictions imposed by a predicate). In many cases, however, the range of scales can be motivated. For instance, prefixes that constitute measure functions or event delimiters can only apply to a scale if there is homomorphism between progress along the scale and the event (cf. Součkova 2004a). This restriction applies to *po-* and *na-* (Filip 2000). Further, the range of scales accessible to a prefix depends on its structural position and scopal properties, as has been suggested above for the prefix *pod-*.

(iii)   Prefixes differ in the nature of the compared degrees: they can denote relations between points on a scale (e.g. *do-*) or intervals (e.g. *na-*). Some prefixes apply only to the degree of change (*na-*, *po-*), which can be analyzed as an interval on a special, derived scale (Kennedy and Levin 2008).

(iv)   Another parameter of variation is the source of the standard of comparison. For instance, it can be provided by a linguistic expression, it may correspond to a contextually provided expectation value, or to the maximal point of an upper closed scale. With *po-* and *na-*, the standard of comparison can only be a contextually specified value. With *pod-*, the source of the standard of comparison varies with the different uses.

(v)   Finally, prefixes (as well as individual uses of a given prefix) may differ in terms of the relation that holds between the degree d and the event e. In the case of *do-*, *pod- of approaching* and *pod- of limited change*, the verbs denote events of change along a certain property, and d constitutes the degree to which the property holds of an argument at the endpoint of the event. In contrast, with *po-* and *na-*, d corresponds to the degree of change. In order to provide a more detailed and exhaustive list of possible relations between d and e, a larger number of prefixes has to be analyzed. I leave further investigation of this issue to future research.

Table 1 below summarizes semantic properties of the four prefixes discussed in this paper, relating to the parameters listed above. The information on *po-* and *na-* is based on the discussion in Filip (2000) and Součkova (2004a,b).

Table 1

Prefix	Type	Relation	Scales	The nature of the degree d	The source of the standard of comparison
pod-	mostly lexical	$<$	vertical path, path, property, contribution	point (typically linked to the endpoint of the event)	linguistic expression or contextually provided standard
do-	intermediate	$=$	time, path, property, volume/extent	point (always linked to the endpoint of the event)	linguistic expression (a tendency) or a contextual standard
po-	superlexical	$\leq$	<u>Czech</u>: time, property, path, ?volume/extent (restricted) <u>Russian</u>: time, property (restricted), ?volume/extent (restricted)	the degree of change	contextually provided expectation value
na-	superlexical	$\geq$	volume/extent, incremental experience	the degree of change	contextually provided expectation value

5. Conclusion

To sum up, this paper investigated the semantics of two Russian prefixes, *pod-* and *do-*. It has been argued that each of these morphemes, in its own way, provides evidence in favor of the scalar approach to Slavic prefixation. Under this approach, a prefix is analyzed as an element imposing a certain relation between two degrees on a scale – a degree associated with the event denoted by the verb and another degree, contributed either by a linguistic expression or by the context. The different uses of a given prefix are assumed to share the relation they impose but to differ in terms of the scale they apply to and, sometimes, in terms of additional factors, such as the source of the standard of comparison. We have also considered a number of parameters along which prefixes are predicted to exhibit variation.

The approach to verbal prefixes argued for in this paper raises the following important question. The fact that prefixes of different types exhibit scalar semantics suggests that we deal with a non-accidental property that is characteristic of verbal prefixation in Slavic. Why should verbal prefixes contribute scalar meanings? There are at least two reasons for their scalar nature. First, as pointed out by Janda (1988:328), most prefixes usually have a basic spatial submeaning, with their other uses corresponding to metaphorical extensions of this submeaning. Spatial meanings contributed by the more basic use can often be conceptualized as relations between two entities on a path scale (as

discussed above for *vertical pod-*.) The metaphorical extensions can then be most naturally seen as involving the same relation between entities applied to a different type of scale.

Second, verbal prefixes typically fulfill an aspectual function, by measuring out an event or relating to its natural endpoint. It has been recently suggested that telicity and event delimitation can be analyzed in scalar terms, and attributed to a bounded degree of change (Kennedy and Levin 2002, 2008, Součkova 2004a) or to the notion of maximalization (Filip and Rothstein 2006, Filip 2008). If this approach to telicity is correct, then the scalar semantics of prefixes is non-surprising.

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