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This is a contribution from *Analogy and Contrast in Language. Perspectives from Cognitive Linguistics*.

Edited by Karolina Krawczak, Barbara Lewandowska-Tomaszczyk and Marcin Grygiel.

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## CHAPTER 6

# From nouns to verbs

## Analogy across parts of speech

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A conceptual metaphor motivates an analogy between nouns and verbs, here termed the Noun → Verb Analogy. The metaphor maps properties from the source domain of space for nouns to the target domain of time for verbs. Three case studies present evidence for this metaphorical analogy using data from Russian. The first study examines the metaphor that underlies the Russian system of verbal aspect. The second study catalogs parallels between numeral classifiers and aspectual markers in Russian. The third study, of the distribution of grammatical forms, shows that aspect in verbs behaves much like number in nouns. Recognition of the Noun → Verb Analogy facilitates a more orderly and straightforward understanding of Russian verbs.

**Keywords:** aspect, classifier, metaphor, Russian

### 1. Introduction

This chapter examines the contrast-making and analogy-making cognitive mechanisms that underlie the understanding of verbal aspect. I argue for a Noun → Verb Analogy motivated by a *TIME IS SPACE* metaphor, using data from Russian for illustration. My purpose is to follow the parallels of this analogy to arrive at a more coherent understanding of how (Russian) verbs work, and thus contribute to our understanding of aspect systems from the perspective of cognitive linguistics. Three case studies detail this analogy: (1) an inventory of metaphorical parallels between physical objects that occupy space and temporal events that are extended through time (presented in Section 2); (2) a catalog of parallels between numeral classifiers and aspectual markers, which are claimed to behave as verbal classifiers (presented in Section 3); and (3) the computational sorting of noun and verb lexemes according to their grammatical profiles, demonstrating that aspect is the verbal equivalent of number for nouns (presented in Section 4). The purpose of the

current section is to provide some background on the relationship between nouns and verbs both in general and specifically with respect to Russian.

The relationship between nouns and verbs is asymmetrical. While nouns and verbs are the most common parts of speech in Russian (and perhaps in most other languages as well), nouns are clearly prioritized. When it comes to the frequency of parts of speech, nouns are at the top of the list. In Russian, 28.7% of words in the disambiguated subcorpus of the Russian National Corpus are nouns; verbs are the next most common part of speech, accounting for 16.9% of words (Endresen et al. 2016: 124). For comparison, corpus data cited in Biber et al. 1999 shows that nouns account for 19–30% of English words, as opposed to verbs which comprise 10–16% of words.<sup>1</sup> Nouns also tend to be acquired earlier, more easily, and more abundantly by children (for a detailed overview of relevant literature, see Childers and Tomasello 2006). Gentner (1982) showed that nouns predominate in the vocabularies of young children across several languages. According to Gentner and Boroditsky (2001) the learning of nouns is facilitated by the fact that concrete objects (the prototypical referents of nouns) are “preindividuated”, meaning that they exist as independently observable entities outside of language. Childers and Tomasello show, in a series of experiments, that the learning of nouns is more robust in 2- and 2.5-year-olds than the learning of verbs.

Nouns occupy a privileged position as opposed to verbs, and this asymmetric relationship can be exploited to enhance the understanding of verbs. My thesis is that a Noun → Verb Analogy underlies much of the organization of Russian verbs, providing a harmonious system that uses on the same basic concepts that work for understanding nouns to bootstrap an understanding of verbs.

In the case of Russian verbs, observing the connections between nouns and verbs is advantageous because many of the notorious mysteries about Russian verbal aspect are easier to make sense of from the perspective of nouns and how they behave. Russian verbal aspect is the subject of much debate in the scholarly literature (cf. discussion in Dickey 2000; Zaliznjak and Šmelev 2000; Timberlake 2004; Janda 2007; Janda et al. 2013). Dahl (1985: 21, 27, 69, 70, 80, 84–86, 189) finds the Perfective vs. Imperfective distinction in Russian and other Slavic languages “idiosyncratic” and “deviant” in comparison with the distinction that goes by the same name in other languages. A comprehensive overview of Russian aspect is beyond the scope of this chapter. Instead, I limit myself to three well-known but problematic claims that demonstrate the extent of the problem. These three claims involve (a) the capacity of native speakers, (b) feature analysis, and (c) the semantics of aspectual markers.

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1. These estimates for English are corroborated by Morgan across various authors and genres at <http://infomotions.com/blog/2011/02/forays-into-parts-of-speech/>.

### 1.1 Native speakers always know which aspect to use, and, in fact, even children never make errors in the use of aspect

This claim dates back to Gvozdev (1961), based on a diary he kept of his son Ženja's acquisition of Russian, data that seemed initially to support the Generativist theory that aspect is a part of "Universal Grammar". According to this scenario, Russian children merely set their parameters for aspect rather than going through an acquisition phase. However, learning the categories of one's language always involves trial and error over time, and there is no a priori reason why Russian aspect should be exempt from this process. Re-analysis of Govzdev's and other data (Stoll 2001; Gagarina 2004) has shown that acquisition of Russian aspect is far from complete even at age 6, indicating that this is something children struggle with, in fact more so, not less, than other categories. In keeping with this fact, Russian aspect is also routinely listed as the single greatest challenge for non-Slavic second language learners (Offord 1996; Andrews et al. 2001; Cubberly 2002; Martelle 2011). The suggestion that Russian native speakers always choose one aspect is true only in the sense that it is impossible to express both Perfective and Imperfective simultaneously (nor is there any neutral aspect in Russian). However, as shown in an experiment (Janda and Reynolds 2019), native speakers of Russian are not at all uniform in their assessment of which aspect is most appropriate in many contexts, and there are furthermore contexts in which both aspects are appropriate. If it was the case that one and only one aspect was admissible in every possible context and that native speakers never disagreed, then we would be forced to conclude that aspect is entirely meaningless in itself (or redundant to context) and that there is no interspeaker variation. Neither of these deductions make sense given what we know about grammatical categories (they do express something) and about speakers (they are all individuals). In short, we must call into question the claim that Russian native speakers come equipped from the cradle with an infallible and undeviating capacity to select aspect. And, as I show in subsequent sections, the behavior of verbs actually parallels that of nouns, rather than being a mystery that native speakers have magical access to.

### 1.2 Perfective vs. Imperfective is a simple binary distinction

This claim has its roots in the Structuralist tradition of privative binary features. For Russian, the claim is that Perfective is "marked" for a feature going by various names such as "boundedness", "totality", "punctuality", or "definiteness", while Imperfective is "unmarked" for this feature. Proponents of this view (with some individual variations) include Jakobson (1957/1971), van Schooneveld (1958), Maslov (1965), Forsyth (1970), Bondarko (1971), Vinogradov (1972), Avilova (1976), Galton (1976),

Durst-Andersen (1992), and Čertkova (1996). And this view continues to motivate textbook presentations of aspect as an absolute  $+/-$  distinction. However, Glovinskaja (1982: 7–25) lists many specific problems with a feature analysis of Russian aspect (with examples where the features clearly fail to account for the facts), and points out that such “features” ultimately serve merely as synonyms for “Perfective” and “Imperfective”, meaning that this type of analysis reduces to circular reasoning. Padučeva (1996) offers an alternative approach, according to which the relationship is equipollent rather than privative. This alternative opens the way for an interpretation of aspect as a continuum rather than a crisp distinction. A continuous interpretation is much more in keeping with what we know about language, namely that most phenomena are continuous rather than discrete. Features are part of a heritage in linguistic description that predates the extensive use of corpora, which do not give support for an analysis of language in terms of features. In a corpus we typically find that linguistic phenomena are gradient rather than discrete as previously assumed. Langacker (2008: 13) asks “whether the basic discreteness commonly assumed by linguistic theorists has been **discovered in language or imposed on it**” (emphasis in original). For example, one might presume that singular vs. plural is a simple discrete distinction, especially in a language like Russian where all nouns must obligatorily express number. In a detailed study of corpus data, Lyashevskaya (2016) shows that this distinction is anything but simple, and that there is a continuum of nouns with a whole range of different affinities to singular and plural marking. I present evidence in Section 4 that the gradient behavior of Russian nouns in terms of their relationship to number is closely paralleled by the gradient behavior of Russian verbs in terms of their relationship to aspect.

### 1.3 Aspectual markers are semantically empty

The claim that Russian aspectual markers are void of semantic content is motivated in part by the  $+/-$  discreteness of feature analysis. The logic behind the claim of empty markers can be illustrated with an example. If we take the Imperfective verb *pisat'* ‘write’ and add the prefix *na-*, we get the Perfective verb *napisat'* ‘write’.<sup>2</sup> Since both verbs mean ‘write’ and differ only in their aspect, with *napisat'* having the “+ Perfective” value, and *pisat'* lacking that feature, then the prefix *na-* plays no semantic role since it is just a marker of “+ Perfective”. The prefix is thus “empty”. “Empty” prefixes have been postulated for Russian since Šaxmatov (1952: 201–202;

2. Note that Zaliznjak and Shmelev (2000: 79) (cf. also Mikaelian et al. 2007: 318) state this relationship as “deprefixation”, taking the Perfective verb as primary. For my analysis, the direction of the relationship is not crucial, since at any rate we have a relationship between an Imperfective verb without a prefix and a Perfective verb with a prefix with the same meaning.

first edition 1913), and supporters of this view include Vinogradov (1972: 395–424), Tixonov (1964, 1998), Forsyth (1970), Avilova (1976), Čertkova (1996), and Mironova (2004), and this is the model that prevails in textbooks that routinely require students to simply memorize the approximately 2000 combinations of 16 prefixes and 1400 verbs that yield Perfective/Imperfective pairs. Despite its enduring popularity, there are many reasons to doubt the claim that Russian aspectual prefixes are empty. Here are a few. One is that there are sixteen supposedly “empty” prefixes (although only one would be needed to mark “+ Perfective”), the distribution of which is left unexplained. Another is that all of the prefixes that are “empty” with certain verbs also perform other “non-empty” functions with other verbs, which means that we would have to accept not only the idea of empty linguistic units, but also of units that are capable of turning their meanings on and off. For example, the prefix *na-*, which seems to be empty in *napisat’* ‘write’ also combines with the Imperfective verb *grešit’* ‘sin’ to form the Perfective *nagrešit’* with the meaning ‘do a lot of sinning’, and here the prefix *na-* is acknowledged to have a cumulative meaning. A third argument is that over a fourth of Russian Imperfective verbs that have prefixed Perfective partner verbs actually use more than one prefix for this purpose, and again, this distribution is neither predicted nor accounted for if we assume that the prefixes are empty. Problems with the claim that there are empty prefixes have been observed since van Schooneveld (1958) and Isačenko (1960) (and Vey 1952 with reference to Czech), who offer as an alternative the hypothesis that the meanings of prefixes merely seem to disappear when they overlap with the meanings of verbs. This Overlap Hypothesis is argued for in detail and on the basis of five empirical case studies in Janda et al. 2013, who suggest that Russian aspectual prefixes actually behave as verb classifiers. In Section 3, I flesh out this verb classifier hypothesis, showing that verb classifiers are the verbal analog of noun classification systems.

Of course, the idea that there are parallels between nouns and verbs in languages is not news. Dahl (1985: 76) observes that the correspondence between count vs. mass for nouns and Perfective vs. Imperfective for verbs “has often been pointed out”. Relevant citations include Mourelatos 1978, Carlson 1981, Bach 1986, Morrow 1986, Langacker 1987 and 1991, and Mehlig 1996. My purpose in this chapter is to take this idea three steps further, by working out the details of the Noun → Verb Analogy in Russian on the basis of empirical data and statistical analysis. In so doing, I aim to show that the apparent mysteries of Russian aspect can be better understood when we invoke the Noun → Verb Analogy. The verbs aren’t so very strange when we recognize the parallels between verbs and nouns.

## 2. The properties of spatial and temporal objects

The first case study takes an inventory of the compelling isomorphism between the physical (and metaphorical) properties of realia named by nouns and the properties of situations named by verbs. Realia can be divided into two groups: countable objects for which number is a relevant category, as opposed to masses for which number is irrelevant. Likewise, Russian aspect divides verbs into Perfectives that denote unique countable event-objects, as opposed to Imperfectives that are the temporal equivalents of masses. This analogy plays out through a myriad of noun-verb parallels that reveal a more complex relationship than merely count vs. mass.

The referents of nouns are prototypically spatial objects that can be defined along several parameters. These parameters include shape (or shapelessness), heterogeneity (vs. homogeneity), divisibility, and spreadability. On one end of this continuum we find discrete solid objects with inherent boundaries and shapes that cannot be divided or spread unless they are destroyed. This is the realm of the referents of count nouns like *cat*, which are unique individuals, and we know that no part of a cat is also a cat, and barring some terrible accident, we cannot *spread cat around*. Fluid substances like sand, water, and smoke are at the other end of this continuum; any portion of sand is also sand, and sand can be spread around, but it is not usually possible to count *one sand, two sands*. Of course the physical world is more complex, with items that lie between these two poles (like gelatin and clouds) or differ along the parameters to varying degrees (like garbage, which is internally heterogeneous but externally perceived as homogeneous, or solid substances like wood and gold that have no inherent shape, but can be shaped). Nor are nouns limited to reference to physical objects, however, nouns that reference abstractions are arguably motivated as metaphorical substances or objects. For example, we can speak of *satisfaction* as a metaphorical substance that we can *get a lot (or a little) of*, of *consciousness* as a metaphorical container that we can *go in and out of*, and *awareness* as a metaphorical plant that can *grow*.

The main idea of this section is that the situations referenced by verbs are understood as metaphorical event-objects, motivating the Noun → Verb Analogy. More specifically for Russian, these objects are either discrete solids motivating Perfective aspect, or fluid substances motivating Imperfective aspect. I list fourteen properties that distinguish discrete solid objects from fluid substances and illustrate how each property corresponds to a difference in the behavior of Perfective vs. Imperfective aspect, using authentic examples from the Russian National Corpus ([ruscorpora.ru](http://ruscorpora.ru)). This metaphorical model of Russian aspect has been articulated in earlier work (Janda 2003 and 2004), but here is connected to both the broader theme of the Noun → Verb Analogy as well as the newer research reported on in Sections 3 and 4.

The fourteen properties of physical matter that are relevant to the Noun → Verb Analogy come under the umbrella of an Idealized Cognitive Model (ICM, cf. Lakoff 1987) of matter founded on human embodied experience with realia. Of course the entire model is ultimately more complex, but, as we know, metaphor is a selective process. Instead of mapping all the properties of a source concept in one domain onto the target concept, typically only some are mapped (cf. Lakoff and Johnson 1980). In the domain of lexical metaphor, when the restrictions on what gets mapped are violated, the result is humorous, as in: *That idea is so far out that the Hubble Telescope can't detect it.* Here a certain property of distant objects, namely that they can be detected by telescopes, does not normally get mapped in the conceptual metaphors that IDEAS ARE OBJECTS and FAMILIAR IDEAS ARE CLOSE, BUT STRANGE IDEAS ARE FAR AWAY. Because only a portion of our embodied knowledge of physical objects is mapped in the metaphorical model of Russian aspect, it is helpful to specify which properties are relevant. This metaphorical model focuses on the properties that maximally distinguish discrete solid objects from fluid substances, and those properties are inventoried here.

*Edges.* A discrete solid object, such as a chair, a book, or a pen, has inherent edges that set it apart from all other objects and substances. Fluid substances, like sand, air, water, and smoke, by contrast, have no inherent edges.

*Shape.* Discrete solid objects come in many different shapes and thicknesses, including infinitesimally thin, as in a leaf or a sheet of paper. Additionally, a discrete solid object can be thinly sliced. Fluid substances lack inherent shape and cannot exist as thin slices because they lack structural stability. Substances must have some extension.

*Integrity.* A discrete solid object is a unique individual, and one can neither take away any part of that individual nor add anything to it without changing it into something else. A given chair is a unique chair and no other chair in the world is that same chair, even if it might look identical. A discrete solid object is constituted of parts. If I saw a leg off of a chair, neither part of the result is that same chair. If I extend the chair by adding a piece in the middle so that it is wide enough to seat three people, the result is also not that same chair, but a bench. Fluid substances do not constitute unique individuals and can undergo all of the operations impossible for discrete solid objects without changing their status. Any pile of sand is sand, and is not constituted of different parts. If I divide a pile of sand into two piles, both piles are sand. And if I combine two piles of sand, the result is still sand.

*Inherent quantification.* Discrete solid objects are inherently countable, as in *one chair, two chairs*, etc. Solid objects also can be quantified by measuring the dimensions along their own edges. Fluid substances are masses that are not usually countable, so it makes no sense to say *one sand, two sands*, etc. Fluid substances



can be quantified only by imposing external measures like *one cup of flour, two cups of flour*, etc.

*Streamability.* A discrete solid object is something that comes as a complete package. If I drop a book off my desk, the whole book departs from the desk at once and arrives on the floor at once, in one piece. The same is not true of my tea: if I knock over the mug on my desk, the tea will pour out in a stream. In the end, there will be a puddle on my floor. So fluid substances, unlike discrete solid objects, can exist in two forms, flowing in a single direction (like the tea from the mug to the floor), or stagnant (like the puddle).

*Penetrability.* I can't stick my finger into my chair. As a discrete solid object, my chair has firm edges that hinder penetration. But I can stick my finger into my tea to discover whether it is hot or cold, because a fluid substance is penetrable.

*Convertibility.* There are various ways to convert discrete solid objects into fluid substances and vice versa. Some merely involve construal from a different viewpoint. For example, I might pluck out a single grain of sand and view it as a unique discrete solid object. Conversely, I could pile up a large number of books and view them from a distance as a mass, like a pile of sand. It is also possible to pulverize a discrete solid object, reducing it to a fluid substance. And conversely some substances can be shaped into objects, as in building a castle from sand or freezing water into ice cubes. Finally, fluid substances can fill up containers, thus participating in solid objects.

*Miscibility.* Two discrete solid objects cannot occupy the same place at the same time. They remain separate. But two substances, for example two types of sand of different colors, or smoke when it is released into the air, easily mix together. Notice also that it is possible to embed a discrete solid object in a fluid substance, for example when I (with my discrete solid body) jump into a swimming pool.

*Dynamicity.* A series of stepping stones promote movement and provide clear landmarks, whereas fluid substances like water or sand retard movement.

*Salience.* When we perceive a landscape that combines discrete solid objects with fluid substances, such as a shore with pebbles and seashells, as well as sand and water, it is the discrete solid pebbles and seashells that are salient, while the sand and water are backgrounded.

*Boundability.* A discrete solid object can serve to bound a fluid substance, as when the wall of a dam holds back water, or the walls of any container for fluid substances, such as cups and mugs.

*Manipulability.* A typical discrete solid object can be grasped by human hands and manipulated. Solid objects thus give the satisfaction of being stable, whereas fluid substances merely run through one's fingers.

*Texture.* A discrete solid object is always finite and cannot be spread. A fluid substance can be spread, and can even be ubiquitous and seemingly infinite like

the air around us and the water in the ocean. Because a discrete solid object is firm, it can be dangerous if it moves fast, whereas fluid substances are softer and less threatening.

*Volubility.* Some discrete solids leave behind traces of fluid substances when they are removed, such as the odor of an onion or a film of water from an ice cube.

Now that the relevant properties for referents of nouns have been established, we can show how these properties are mapped to verbs. The metaphors that are invoked are: PERFECTIVE IS A DISCRETE SOLID OBJECT and IMPERFECTIVE IS A FLUID SUBSTANCE. Consider the contrast of the Perfective *s'el 'ate'* (with the prefix *s-*) in Example (1), in which all verbs are Perfective as opposed to the Imperfective *el 'ate'* in Example (2), in which all verbs are Imperfective:

(1) Perfective *s'el 'ate'*

*Ja pošatalsja po ulicam, posidel v kakom-to dvorike, potom zašel v bližajšuju zabegalovku i s'el buterbrod* [Vera Belousova. Vtoroj vystrel (2000)]

'I wandered about the streets for a while, sat for a while in an outdoor cafe, and then stopped by in the nearest snack-bar and ate a sandwich'

(2) Imperfective *el 'ate'*

*On zadumčivo el, delal vid, čto vse, proisxodjaščee za dver'ju kuxni, ne imeet k nemu nikakogo otnošenija.*

'He ate pensively, behaving as if everything that was happening on the other side of the kitchen door had nothing to do with him.'

[Tokareva Viktorija. Svoja pravda // "Novyj mir", 2002]

In (1), eating is presented as a Perfective event with clear temporal *edges*, like a discrete solid object: there was a first bite into the sandwich when it started, and a last one when the sandwich was gone. While of course the eating in (2) in reality must have had a beginning and an end, those *edges* are not available in the Imperfective presentation of the situation. The eating of the sandwich in (1) has a temporal *shape*, lasting from the beginning to the end. The eating in (2) is shapeless, like a fluid substance. Note that the shapes of Perfective verbs in (1) differ: wandering around (*pošatalsja*) and sitting around (*posidel*) are relatively longer events, eating the sandwich is probably shorter, and entering the snack-bar is instantaneous (*zašel*; one moment the narrator was outside, and as soon as he crossed the threshold he was inside). The eating event in (1) has the *integrity* of a unique individual: no bite would by itself constitute the event of eating the sandwich, nor would it be possible to add a bite from another sandwich and make that part of this eating event. This particular event happens only once in the history of the universe, and it cannot be repeated. The eating in (2) can be extended and repeated without forcing us to change the way in which it is expressed. Eating in (1) is *inherently quantified* by the sandwich and the time it takes to devour it, whereas (2) shows no such

quantification. Example (2), however, illustrates *streamability*, since it flows through time, whereas the eating in (1) is presented as a whole that is not *penetrable*. We do *penetrate* into the eating in (2), since we can see how it unfolds, namely *zadumčivo* ‘pensively’. This is illustrative of a larger phenomenon in Russian, where adverbs of manner (which reveal the internal properties of a situation) are strongly associated with Imperfective verbs and tend to be avoided with Perfective verbs. Both (1) and (2) contain chains of verbs, and their interpretation is consistent with the property of *miscibility*. In Example (1), the verbs are all Perfective (*pošatalsja* ‘wandered for a while’, *posidel* ‘sat for a while’, *zašel* ‘stop by’, *s’el* ‘ate’) and they are interpreted as a sequence of events: first the narrator wandered around, then he sat around, then he entered the snack-bar, and then he ate the sandwich. This is because any two or more Perfective events typically cannot occupy the same position on the timeline. By contrast, all of the Imperfective verbs in (2) (*el* ‘ate’, *delal* ‘did’, *proisxodjaščee* ‘taking place’, *imeet* ‘has’) are interpreted as simultaneous to each other: the subject was eating, acting like he didn’t care, things were happening outside, and those things were irrelevant to him, and all of this takes place in parallel, at the same time. This is because any two or more Imperfective events can coincide on the timeline. *Dynamicity* and *salience* are evidenced in the roles that the verbs play in their respective narratives. In (1), *s’el* ‘ate’ is part of the dynamic sequence of salient plotline events that move the narrative forward. In (2) *el* ‘ate’ is the background in a descriptive part of the narrative that presents no plotline events.

Although nine of the relevant properties are partially illustrated in Examples (1) and (2), we are only scratching the surface thus far. Many more examples would be needed in order to fill out the picture both for these and the remaining properties, but here I limit myself to just a few, enough to illustrate how *miscibility*, *streamability*, and *convertibility* apply to Russian verbs, rendering some seemingly bizarre facts about Russian aspect more coherent.

In the discussion of *miscibility*, I showed above how the Perfective verbs in Example (1) are, like discrete solid objects, not capable of occupying the same place, and thus express a sequence of events, whereas the Imperfective verbs in (2) are interpreted as expressing simultaneous situations, like the mixing of fluid substances. In Example (3), we see what happens when a Perfective verb meets up with an Imperfective verb.

- (3) Perfective *s’el* ‘ate’ embedded in Imperfective *trjasjas* ‘shaking’  
*Trjasjas’ ot zlosti i otvraščeniya, ja s’el zatem protivnuju sosisku s kislym kečupom vozle kinoteatra “Saljut”.*  
 [Andrej Volos. *Nedvižimost’* (2000) // “Novyj Mir”, 2001]  
 ‘**Trembling** with anger and revulsion, I then **ate** that disgusting hot dog with acrid ketchup in front of the “Saljut” movie theater.’

From the properties of discrete solid objects and fluid substances, we would expect that a solid object can be embedded in a substance, and that is exactly what we see in Example (3): the trembling has begun before the eating of the hot dog, continues all through the eating, and lingers afterward too. So the eating of the hot dog is like my body swimming in the water of the pool alluded to above. This embedding of a discrete solid object in a fluid substance helps us to make sense of another systematic but odd fact about Russian concerning the interaction of tense and aspect. The very same form that signals future tense when used with Perfective verbs, as in *s'est* 'will eat' in Example (4), signals present tense when used with Imperfective verbs, as in *est* 'eats, is eating' in Example (5) (where the verb appears in stage directions for a play). Linguists call this form the "non-past", since this form is indicative, but can signal either future or present depending on aspect.

- (4) Perfective non-past *s'est* 'will eat' expressing future tense  
*Interesno, kogda že on s'est svoe jabloko?*  
 [Jurij Koval'. Sirotskaja zima (1980–1993)]  
 'I wonder when he's going to eat his apple?'
- (5) Imperfective non-past *est* 'eats, is eating' expressing present tense  
*[ANTON]. [(est jabloko, smotrit na Ilju)]. Xočeš'?*  
 [Nikolaj Koljada. Rogatka (1989)]  
 '[ANTON]. [(he eats an apple, looks at Ilja)]. Want some?'

This distribution of tenses can be explained with recourse to the *miscibility* property of physical matter. Unlike three-dimensional space, the timeline has only one dimension, and can be divided into three pieces: the past, the present, and the future. The present is a relatively small slice, but it is special because it is the place where I, the observer, stand. In other words, there is a discrete solid object (like my body) standing in the position of the present moment. If another discrete solid object, such as a Perfective verb, comes along, it can go to the past portion of the line (if it is marked for past tense), but it cannot go to the present tense because two discrete solid objects cannot occupy the same spot. Therefore, if that Perfective event-object is not marked for past tense, the only option is for it to fall to the future side of the line. However, an Imperfective event-object can surround the observer at the present moment, just as I can swim in the water surrounding me in the swimming pool, and just as the eating of the hot dog is embedded in the shaking with revulsion in Example (3). This is why an Imperfective non-past form can express present tense.

Russian motion verbs are notorious for their peculiar complexity, which makes more sense when we notice the parallels in discrete solid objects and fluid substances. Recall the discussion of the tea under *streamability* above, where the tea (a fluid substance) can exist both as a stream and as a puddle. In Russian, there are

fourteen pairs of Imperfective motion verbs (one pair for each type of motion, such as walking, flying, riding, etc.) that distinguish between motion in a single direction (like a stream) and other motion (like a puddle), as well as corresponding Perfective verbs for expressing complete individual actions (like a discrete object). The odd part about this is that the distinction between Directed motion and Non-Directed motion is relevant only for Imperfective aspect; this distinction disappears when a motion verb is Perfective. However, the parallel to solid objects and fluid substances makes it obvious why this should be the case. Only fluid substances can both stream (showing directed motion) or be stagnant (not showing directed motion). That option is not relevant for solid objects. Examples (6)–(10) show how this works for the set of verbs meaning ‘walk’.

- (6) Perfective *pošla* ‘walked, went’  
*Na drugoj den’ ona vse-taki pošla v školu.*  
 [Irina Smirnova. Prosti ego – ja znaju, ty sumeeš?...// “Daša”, 2003]  
 ‘But the next day she **went** to school.’
- (7) Imperfective Directed Motion *šla* ‘walked, went’  
*Ja šla v školu i dumala ob odnom: segodnja končatsja moi mučenija.*  
 [Irina Povovarova. Prevrščenie farforovoj svinki (1986)]  
 ‘I **walked** to school thinking about just one thing: today my suffering will end.’
- (8) Imperfective Non-Directed Motion (Multiple Round Trips) *xodila* ‘walked, went’  
*Kogda ja xodila v školu – u nas forma byla objazatel’noj.*  
 [kollektivnyj. Forum: Školnaja forma. Za i protiv (2007–2010)]  
 ‘When I was in school (**was going** to school) – we had to wear uniforms.’
- (9) Imperfective Non-Directed Motion (Multidirectional) *xodila* ‘walked, went’  
*Žena smotrela televizor i xodila po magazinam.*  
 [Sergej Dovlatov. Čemodan (1986)]  
 ‘My wife watched television and **went** shopping (**went** from store to store).’
- (10) Imperfective Non-Directed Motion (Capacity) *xodila* ‘walked, went’  
*Sašen’ka uže xodila, no ee vvezli v kresle.* [Jurij Azarov. Podozrevaemyj (2002)]  
 ‘Sašen’ka **was walking** already (i.e., was already able to walk), but they brought her in on a wheelchair.’

In Example (6), a young mother has hesitated about sending her daughter to school for the first time, keeping her home one day. The next day, the mother relents and the girl goes to school (*pošla* ‘walked, went’). This is a single event, with properties parallel to those described above with respect to the use of Perfective *s’el* ‘ate’ in Example (1). Examples (7)–(10) all involve Imperfective verbs and demonstrate the difference between Directed motion, as in Example (7), and various options

for Non-Directed motion, as in Examples (8) (10). Example (7), like Example (6), also refers to a single event of walking to school, but instead of describing it as a discrete event-object, the Directed motion Imperfective verb (*šla* ‘walked, went’) describes a flow of movement in one direction, parallel to the streaming of a fluid substance, with the girl walking and thinking as she follows the path, but no focus on completion. Example (8) continues the theme of going to school, this time, however, summing up many repeated roundtrips to school that are seen as a mass, much like a puddle of fluid, and for this reason the Non-directed motion Imperfective verb (*xodila* ‘walked, went’) is used. This Non-directed motion Imperfective verb can also express motion in many different directions, as with the shopping in Example (9), or the mere ability to walk, regained after injury in Example (10).

Another peculiarity of Russian is the proliferation of atelic Perfectives, combined with the formation of telic Imperfectives. In many aspect systems, telicity is a defining characteristic of Perfectives, while Imperfectives are atelic. While telicity is prototypically associated with Perfectives in Russian as well, the source domain for the Russian metaphorical model of aspect makes way for non-telic Perfectives and telic Imperfectives by means of reference to the *convertibility* of matter. Recall that one can fill up a container (such as a box) with a fluid substance (such as sand). When the lid is closed, the result is a discrete solid object that contains a fluid substance. In a parallel fashion, certain Russian verbal prefixes make it possible to perfectivize virtually any atelic state or activity, by building a temporal box that is filled up and closed off as a discrete event-object. A common way of doing this is by making delimitative Perfectives that mean ‘do X for a while’. There are two examples of how this works in Example (1): *pošatalsja* ‘wandered about for a while’ is built by adding the prefix *po-* (which serves as the metaphorical “box”) to the atelic Imperfective *šatalsja* ‘wandered’ (which fills the box like sand), and similarly *posidel* ‘sat for a while’ is built by adding the same prefix to the atelic Imperfective *sidel* ‘sat’. In Example (1), we see that these atelic Perfectives sequence events just like any other Perfectives (for example, *zašel* ‘stopped by, entered’). Another prefix with a similar, but slightly different function is *pro-*, which denotes not just a (short) period of time, but the filling up of an entire (usually specified) period, as in Example (11).

- (11) Perfective Atelic *proplakal* ‘cried all through X’

*Ja proplakal vsju noč', xotja nikogda ne byl raspoložen k slezam.*

[Vjačeslav Fetisov. Overtajm (1997)]

‘I cried all through the night, even though I have never been given to tears.’

A further option for converting fluid substances into discrete solid objects is by plucking out a single particle and viewing it up close like a unique individual. Russian has two means for creating semelfactive Perfectives that do just that,

extracting a single action from an atelic series of cycles: both the prefix *s-* and the suffix *-nu* can denote ‘do X just once’, as illustrated in Examples (12) and (13).

- (12) Perfective Semelfactive *sglupil* ‘did one stupid thing’  
*On i sam ponjal, čto sglupil, no bylo uže pozdno.*  
 [I. Grekova. Na ispytanijax (1967)]  
 ‘He knew himself that he **had done a stupid thing**, but it was too late already.’
- (13) Perfective Semelfactive *čixnula* ‘gave a single sneeze’  
*Monaxinja tak moščno čixnula, čto ee vstavnaža čeljust’ vyletela v okno.*  
 [Dina Rubina. Okna (2011)]  
 ‘The nun **gave** such a violent **sneeze** that her lower denture flew out the window.’

The atelic Imperfective verbs *glupit’* ‘do stupid things’ and *čixat’* ‘sneeze’ denote chains of repeated actions; the prefix *s-* and the suffix *-nu* remove a single cycle from each chain to depict a unique event referenced by a Perfective verb.

Of course *convertibility* can go in the opposite direction, namely from discrete solid objects to fluid substances as well, and again there are two ways for this to be achieved, either by grinding discrete objects down to dust (a fluid substance), or perceptually by piling up a large quantity of similar discrete objects and viewing them from a distance as a mass (also a substance). Both operations are possible in the Russian aspect system, and both can be performed on telic Perfectives, yielding telic Imperfectives describing either processes (like the dust resulting from grinding) or series of repetitions (like a pile of actions). Examples (14) and (15) illustrate both conversions using the single verb *izmenjat’sja* ‘to change, be transformed’.

- (14) Imperfective Telic Process *izmenjajutsja* ‘change’  
*Formy bukv, podobno jazyku, s tečeniem vremeni medlenno izmenjajutsja.*  
 [A. A. Zaliznjak. Lingvistika po A. T. Fomenko // “Voprosy jazykoznanija”, 2000]  
 ‘Just like language, the shapes of letters slowly **change** over time.’
- (15) Imperfective Series of Telic Repetitions *izmenjaetsja* ‘changes’  
*A verno to, čto odin i tot že zvuk vseгда izmenjaetsja odinakovo v odinakovyx uslovijax.*  
 [V. A. Plungjan. Počemu jazyki takie raznye (1996)]  
 ‘And it is the case that the very same sound always **changes** in the same way under the same conditions.’

The Imperfective *izmenjat’sja* ‘change, be transformed’ is built by adding the suffix *-ja* to the telic Perfective *izmenit’sja* with the same meaning, with the result that the Imperfective retains the telicity of the original. The resulting telic Imperfective can then express an ongoing change as a process, as in (14), or a generalization over a whole set of changes, as in (15).

These few examples suffice to demonstrate the value of recognizing the metaphorical model that underlies the Noun → Verb Analogy. Interested readers can find further illustrations, also for the properties of matter not elaborated upon here, in Janda 2003 and 2004. In the next section, I outline a further ramification of the Noun → Verb Analogy, namely the fact that verbal prefixes behave in a way that is consistent with noun classification systems.

### 3. Classifiers for spatial and temporal objects

The second study explores the parallels between classifier systems for nouns (which are reasonably well understood) and classifier systems for verbs (which have received less attention in linguistic scholarship). In noun classifier systems (traditionally referred to as numeral classifier systems), nouns that refer to substances can be combined with classifiers that give them a countable identity, usually by specifying a shape. In Russian, simplex verbs which are typically Imperfective (the temporal equivalents of masses) can be combined with prefixes that perfectivize them, specifying event-objects of a given temporal “shape”. Thus the perfectivizing prefixes are the verbal equivalent of noun classifiers, and both are associated with quantification, via number for nouns and via aspect for verbs. The classifier analogy is likewise complex, extending to both sortal and mensural classifiers, and again the parallels between nouns and verbs are compelling. In this section, I give some examples and details of how this part of the Noun → Verb Analogy works, and refer the interested reader also to Janda 2012, Chapter 8 of Janda et al. 2013, and Dickey and Janda 2015.

In order to set up this part of the Noun → Verb Analogy, it is best to begin with a review of how numeral classifiers work before exploring the parallels relevant to Russian verbs. Numeral classifier systems are virtually unknown among European languages, but are fairly common in Asian and Central American languages. Lucy (2000: 329) gives examples from Yucatec Mayan, some of which are reproduced in Table 1.

**Table 1.** Examples of constructions using numeral classifiers in Yucatec Mayan (from Lucy 2000: 329 and 1992: 74)

<i>'un-tz'íit kib'</i>	[one <b>long-thin</b> wax]	'one candle'
<i>'un-tz'íit che'</i>	[one <b>long-thin</b> wood]	'one stick'
<i>'un-tz'íit nal</i>	[one <b>long-thin</b> corn]	'one ear of corn'
<i>'un-tz'íit há'as</i>	[one <b>long-thin</b> banana]	'one fruit of the banana'
<i>'un-wáal há'as</i>	[one <b>flat</b> banana]	'one banana leaf'
<i>'un-kúul há'as</i>	[one <b>planted</b> banana]	'one banana tree'
<i>'um-p'íit há'as</i>	[one <b>little-bit</b> banana]	'a little bit of banana'



All of the examples in Table 1 share the same structure: a numeral (*'un'* 'one') followed by a classifier (*tz'ít* 'long-thin', *wáal* 'flat', *kúul* 'planted', *p'ít* 'little-bit') followed by a noun (*kib* 'wax', *che* 'wood', *nal* 'corn', *há'as* 'banana'). Similar constructions exist in other so-called "classifier languages", although of course the order of items as well as other characteristics may vary. In such languages, bare nouns (in the absence of classifiers) as a rule behave as mass nouns for which plural marking is absent or non-obligatory. The classifiers serve to identify units associated with each noun, often by signaling the shape of a typical unit (for more on this as well as other features signaled by classifiers, see Aikhenvald 2000). For example, in the top row of Table 1, the noun in question is *kib* 'wax', and the most typical unit made of wax is a candle, which happens to be a long thin object. The purpose of the classifier *tz'ít* 'long-thin' is to group together noun referents that are long and thin. While classifiers are mostly associated with constructions containing numerals, they can appear in other constructions as well, often serving functions such as marking definiteness and/or salient referents (for more on the functions of classifiers, see Bisang 1999: 116). The term "numeral classifier" is thus a misnomer on two counts: (a) classifiers can appear without numerals, and (b) the function of classifiers is to classify nouns, not numerals. A more accurate term would be "noun classifier" or even "noun unitizer", since a classifier specifies units of the referent of nouns. A numeral classifier system in effect sorts the lexicon of substantives into groups according to the typical characteristics of their units. However, despite its inadequacy, we retain the original term "numeral classifier" since it is standard in linguistics.

Note that noun classification does not result in a one-to-one match of classifiers to nouns, nor does it result in mutually exclusive classes of nouns. Some nouns, like *há'as* 'banana' in Table 1, can take multiple classifiers, in which case the classifiers also serve to productively extend the lexicon, providing the means to express a range of units associated with the referent of a given noun. The meanings of classifiers are typically relatively abstract, and as a result classifiers are also often highly polysemous. For example, the Thai classifier *tua* might be glossed as 'limbed', but any single definition obscures the complexity of its semantics (Deepadung 1997). Prototypically *tua* refers to four-footed animals, and this concept gets extended in various directions, yielding a radial category that includes four-footed pieces of furniture and then by extension all furniture, limbed garments (shirts and trousers) and then by extension all clothing, plus items that mimic the shape of animate beings, such as ghosts, dolls, and certain letters and numbers.

In Table 1 we observe a difference between the examples in the first six rows and the one in the last row. In the first six rows, the classifiers refer to the shape or position of inherent units. In other words, a candle, a stick, an ear of corn, a banana, a banana leaf, and a banana plant are all individual objects that have their own characteristic shape and/or position. In the last row, however, a bit of banana fruit

does not have the same status as an inherent unit. Instead, in this case an arbitrary unit has been externally imposed on a mass. The result is still a unit, but it is a unit in the way that a glass of water or a cup of sugar is a unit. For this reason, many linguists recognize two types of numeral classifiers: sortal classifiers like those in the top six rows of Table 1 vs. mensural classifiers that classify according to quantity like Yucatec Mayan *p'ít* (this distinction is treated differently by different linguists; for more discussion see Dickey and Janda 2015). It is not uncommon for a single classifier to serve both sortal and mensural functions, as we see in these three examples of Mandarin Chinese *pian* 'slice' from Zhang (2013: 41–43):

- (16) Mandarin Chinese *pian* 'slice' used as a sortal classifier  
*san pian shuye*  
 [three CL:slice leaf]  
 'three leaves'
- (17) Mandarin Chinese *pian* 'slice' used as a mensural classifier  
*shi pian luobo*  
 [ten CL:slice carrot]  
 'ten slices of carrot'
- (18) Mandarin Chinese *pian* 'slice' used as a mensural classifier  
*yi pian qiche*  
 [one CL:slice car]  
 'one group of cars'

Leaves are pre-packaged as inherent pieces in the shape of slices, motivating *pian* 'slice' as the natural choice for a classifier when one needs to count leaves, as in Example (16). Carrots do not come in slices, but can be sliced up, as in Example (17). Example (18) shows an extension of the mensural meaning, here referring to a group of cars that are co-located on a single plane of a parking-lot as a "slice".

In addition to classifiers that are specific to a narrow range of nouns, there are also general classifiers that can be used when a new noun is encountered or for some reason the specifics of another classifier are not needed. For example, Mandarin Chinese uses the classifier *ge* with any noun that does not fall into a more specialized classifier category and also as a replacement for more specialized classifiers in casual conversation (Gao and Malt 2009: 132). Yucatec Maya has two such classifiers, *p'él*, which can reference any 3-dimensional unit, and *túul*, which can refer to any animate being (Lucy 1992: 76). It is even possible for a general classifier to cover both the sortal and the mensural functions, as we see with the Persian classifier *ta*.

Now that we have sketched out the functions and typical characteristics of noun classification systems, we can make the leap to verb classification. McGregor (2002) detailed numerous verb classification systems, thereby bringing attention to this understudied phenomenon. Although McGregor's work is based on Australian

languages, he concludes that verb classifiers are probably rather common among world languages, but have merely been overlooked (McGregor 2002: 404). Both Majsak (2005: 339–345) and Plungjan (2011: 413–416) have acknowledged that verb classification is observed in Slavic languages, but have not elaborated on this idea. Here I limit the discussion to four parallels involving the behavior of Russian verbal prefixes and their roles as unitizers that sort the lexicon, display polysemy, and can have sortal, mensural and also general functions. Here I make each of these parallels explicit and offer some illustrations of how Russian prefixes fill these roles.

*Unitizing.* As detailed in Section 2, Russian Imperfective verbs like *pisat'* 'write' refer to the temporal equivalents of fluid substances. Thus Imperfective verbs are parallel to nouns in the absence of classifiers in languages with numeral classifiers, because Russian Imperfective verbs and the bare nouns in classifier languages do not refer to discrete units. Temporal units can be specified when a perfectivizing prefix is added to a verb, defining the temporal boundaries of a discrete event-object, as in the verb *napisat'* 'write'. Table 2 and Examples (19) and (20) illustrate this parallel.

**Table 2.** Comparison of bare noun vs. noun with classifier in Yucatec Mayan with bare stem Imperfective vs. prefixed Perfective verb in Russian

	Bare noun/verb	Noun/verb with classifier
Yucatec Mayan	<i>kib'</i> 'wax' (as a substance)	<i>'un-tz'ütikib'</i> [one long-thin wax] 'one candle' (as a unique discrete object)
Russian	<i>pisat'</i> 'write' Imperfective (as a situation-substance, referring to writing activity in an undifferentiated way)	<i>napisat'</i> 'write' Perfective [on-write] (as a unique event-object)

- (19) Russian *pisat'* 'write' Imperfective describing a situation-substance  
*ja ne vspomnila, na kakom dialekte on pisal*  
 [Perepiska v icq meždu agd-ardin i Koljučij drug 2008.01.17]  
 'I couldn't remember which dialect he wrote in'
- (20) Russian *napisat'* 'write' Perfective describing a unique event-object  
*Mitnik daže napisal roman "Iskusstvo obmana" o xakerax*  
 [Aleksandr Latkin. Demonstrator sovesti. Znamenitomu xakeru razrešili vyxodit' v Internet (2003) // "Izvestija", 2003.01.22]  
 'Mitnik even wrote a novel "The Art of Deception" about hackers'

In (19) the Imperfective verb merely makes a generalization about the way that the subject wrote, in the absence of any indication of a specific act of writing. In (20), however, the same verb with a prefix is Perfective and denotes a unique complete

event that has a result: a book about hackers. Perfectivization provides the parallel to the quantification signaled by numerals in numeral classifier constructions. Independent evidence that Russian aspect is parallel to grammatical number is provided in Section 4.

*Sorting lexicon according to characteristics of typical units.* Just as numeral classifiers sort the nouns in their languages according to the characteristics of typical units associated with those nouns, Russian prefix-classifiers sort the verbs of that language according to the characteristics of the most typical event-units that are associated with them. In Tables 1 and 2 the Yucatec Mayan noun *kib* ‘wax’ appears most typically as a candle when unitized, and thus is classified as ‘long-thin’, and likewise other units are classified according to their shape (or other characteristics). Russian perfectivizing prefixes behave in a similar fashion, matching the temporal contour (metaphorical “shape” of the meaning) of the prefix-classifier to that of the event-object that it unitizes. Some examples are gathered in Table 3.

**Table 3.** How prefix-classifiers sort Russian verbs according to the temporal “shape” of the most typical event-objects in natural perfectives and extend the verbal lexicon with specialized perfectives

	Bare Imperfective verb	Perfective verb with prefix-classifier
Formation of Natural Perfectives (maximal overlap of meaning of verb and prefix-classifier)	<i>rvat'sja</i> ‘tear apart, explode’ <i>krast</i> ‘steal’ <i>lipnut</i> ‘stick, attach’ <i>pisat</i> ‘write’	<i>raz-o-rvat'sja</i> [apart-tear apart, explode] ‘tear apart, explode’ <i>u-krast</i> [away-steal] ‘steal’ <i>pri-lipnut</i> [to-stick] ‘stick, attach’ <i>na-pisat</i> [on-write] ‘write’
Formation of Specialized Perfectives (less overlap of meaning of verb and prefix-classifier)	<i>pisat</i> ‘write’ <i>pisat</i> ‘write’ <i>pisat</i> ‘write’ <i>pisat</i> ‘write’	<i>pod-pisat</i> [under-write] ‘sign’ <i>v-pisat</i> [into-write] ‘insert’ <i>pri-pisat</i> [to-write] ‘ascribe’ <i>pere-pisat</i> [re-write] ‘rewrite’

The Russian Perfective verbs in Table 3 are organized in two groups, labeled Natural Perfectives and Specialized Perfectives. In the formation of Natural Perfectives, there is maximal overlap between the meaning of the unit most typically associated with the bare base verb and the meaning of the prefix-classifier. For example, the base Imperfective verb *rvat'sja* ‘tear apart, explode’ describes an action that can result in parts of an object flying away from each other. The prefix *raz-* has the meaning ‘apart’, most clearly seen in combination with motion verbs, as in *raz-o-jti-s* [apart-walk-reciprocal] ‘walk away from each other in different directions, disperse’, and is also used to classify other base verbs that have meanings compatible with ‘apart’. Because the meaning of the base verb and the prefix-classifier overlap, the meaning of the verb does not change significantly when the prefix-classifier is

added, so both *rvat'sja* and *raz-o-rvat'sja* mean ‘tear apart, explode’, differing primarily in aspect, not in their semantics. The overlap of meaning between the verb and the prefix-classifier creates the illusion of semantic emptiness that has long been standard doctrine concerning “purely perfectivizing” prefixes in Russian, as mentioned in Section 1. When eurocentric linguists first encountered the numeral classifiers in Yucatec Mayan, they similarly assumed that the classifiers were redundant empty markers. Lucy’s work (1992, 2000) was significant in that he recognized the semantic role of classifiers.

The base Imperfective verb *krast’* ‘steal’ describes a removal, making the prefix-classifier *u-* ‘away’ a logical choice for perfectivizing this verb as *u-krast’*, also with the meaning ‘steal’. The ‘away’ meaning of the prefix-classifier is again seen with motion verbs, for which *u-* is the standard way of expressing departure, as in *u-jti* [away-walk] ‘leave (on foot)’. The antonym of *u-* ‘away’ is *pri-* ‘to, arrive’, as in *pri-jti* [to-walk] ‘arrive (on foot)’, making this prefix-classifier the most appropriate for perfectivizing *lipnut’*, a verb that describes attachment by sticking a thing to another item (for example, using glue). The prefix-classifier *na-* ‘on’ is associated with surfaces, and accumulation on surfaces, motivating it as the classifier of choice for *pisat’* ‘write’ since writing takes place on the surface of paper or similar medium.

The second group of perfectivizations presented in Table 3 create Specialized Perfectives for which the meaning of the prefix-classifier does not overlap significantly with the meaning of the verb. Here the role of the classifier is not to identify the most typical unit outcome of the verb, but rather to extend the verbal lexicon. Recall the variety of classifiers that could combine with Yucatec Mayan *há’as* ‘banana’. While the unit that people most typically associate with banana is the fruit, signaled by the *tz’it* ‘long-thin’ classifier, other classifiers make it possible to express a range of other concepts associated with the same noun, such as the banana leaf, the banana plant, etc. Similarly, base Imperfective verbs in Russian can combine with multiple prefix-classifiers which serve to extend the verbal lexicon by specifying various event-objects. Thus the verb *pisat’* ‘write’ can be extended by the prefix-classifier *pod-* ‘under’ to mean ‘sign’ (since one typically signs a document below the text), by the classifier *v-* ‘into’ to mean ‘insert (in text)’, and by the classifier *pere-* ‘re-, again’ to mean ‘rewrite’, and indeed by several other prefixes as well. Note that the prefix *pri-* ‘to’ appears in both parts of the table: this prefix forms both the Natural Perfective *pri-lipnut’* [to-stick] ‘stick, attach’, where its meaning overlaps with that of the verb, creating the illusion of “emptiness”, and the Specialized Perfective *pri-pisat’* [to-write] ‘ascribe’, where the meaning of the prefix is obvious and uncontroversial (cf. the discussion of so-called “empty prefixes” in Section 1).

For both the Natural Perfectives and the Specialized Perfectives in Table 3, we see that the prefix refers to the trajectory of the event-object as movement *raz-* ‘apart’, *u-* ‘away’, *pri-* ‘to’, *na-* ‘on’, *v-* ‘into’, *pod-* ‘under’, *pere-* ‘across’, realized

as literal movement through space in the case of the prefixation of motion verbs. These trajectories are the verbal analog of the shape or position that is typically referenced by numeral classifiers.

*Polysemy of classifiers.* We saw above how the meaning of the Thai numeral classifier *tua* ‘limbed’ is articulated in a radial category including extensions to cover furniture, clothing, and things that simulate limbed beings. The semantics of Russian perfectivizing prefixes show similar polysemy. Here I give some examples for the prefix *raz-*, but refer the interested reader to further details and similar analyses for other prefixes in Chapter 2 of Janda *et al.* 2013 and on this site: [http://emptyprefixes.uit.no/methodology\\_eng.htm](http://emptyprefixes.uit.no/methodology_eng.htm), which lists numerous examples of how prefix-classifiers form both Natural and Specialized Perfectives in Russian.

As described immediately above, the prototypical meaning of Russian *raz-* is ‘apart’, observed also in verbs like *raz-pilit’* [apart-saw] ‘saw apart, saw in pieces’. A number of actions can cause the edges of an object to move away from each other, motivating various submeanings of the prefix-classifier that classify groups of verbs with the following meanings (which can be realized both as Natural and as Specialized Perfectives, although these are all examples of Natural Perfectives):

- ‘crush’, as in *raz-davit’* [apart>crush-crush] ‘crush’
- ‘spread’, as in *raz-vetvit’ sja* [apart>spread-branch out] ‘branch out’
- ‘swell’, as in *raz-puxnut’* [apart>swell-swell] ‘swell’
- ‘dissolve’, as in *raz-tajat’* ‘apart>dissolve-melt’ ‘melt’
- ‘heat up’ (since objects expand when heated), as in *raz-kalit’* [apart>heat up-make red-hot] ‘make red-hot’

In addition, ‘apart’ can be understood as the antonym of ‘together’, motivating a meaning of ‘undo’, as in the formation of *raz-kryt’* [apart-cover] ‘open, uncover, reveal’ from the Imperfective base verb *kryt’* ‘cover’. Both the previous meanings in the bulleted list and this meaning are subject to metaphorical extension as well, as in *raz-šifrovat’* [apart>undo-encipher] ‘decipher’ from the Imperfective base *šifrovat’* ‘encipher’.

*Sortal vs. Mensural classifiers.* All of the examples presented thus far in this section illustrate the use of Russian prefixes as sortal verb classifiers, classifying the event-objects that they unitize according to their inherent characteristics as results. One remarkable property of the Russian aspect system is its capacity to form atelic Perfective verbs. This property was mentioned already in Section 2 and illustrated with the delimitative use of the prefix *po-* in *pošatal’sja* ‘wandered about for a while’ and *posidel* ‘sat for a while’ in Example (1) and with the perdurative use of prefix *pro-* in *proplakal* ‘cried all through X’ in Example (11). A further example, of the cumulative mensural meaning of *na-* is *nagrešit’* ‘do a lot of sinning’ cited in Section 1. Other mensural uses of Russian prefixes involve meanings such as:

- distributive, as in *pere-probovat'* [distributive-try] 'try many things'
- attenuative, as in *pri-tormozit'* [attenuative-brake] 'brake slightly'
- ingressive, as in *za-govorit'* [ingressive-speak] 'begin to speak'
- finitive, as in *ot-sluzhit'* [finitive-serve] 'stop serving (as an officer or a priest)'

In Janda (2007), I suggest the term Complex Act Perfective to refer to Russian Perfective verbs formed by means of prefix classifiers that serve a mensural function, since they impose some kind of quantification or boundary to an action rather than specifying a telic outcome (as is the case for both Natural and Specialized Perfectives). Note in addition that all of the prefixes that have mensural uses are also used as sortal classifiers. In other words, the same prefixes that can have a sortal classifying function when the semantics of the verb make it possible to form a telic Perfective, can have a mensural classifying function when an atelic Perfective is formed. This is similar to what we saw with the Mandarin Chinese classifier *pian* 'slice' in Examples (16)–(18) above, where the classifier has a sortal function when referring to something for which the shape of a slice is inherent, but a mensural function with items that do not share that shape.

*General classifiers.* Parallel to numeral classifiers, there are also some "all-purpose" Russian prefix-classifiers that serve as general classifiers. The most important of these are, arranged according to their historical dominance: *po-*, *s-*, and *za-*. The general prefix-classifier *po-* predominates in normative literary Russian, where it is by far the most common prefix used to form Natural Perfectives as well as the go-to prefix for atelic delimitatives meaning 'do X for a while, do some Xing'. In the twentieth century the prefix *s-*, which is the second most common prefix among Natural Perfectives in literary Russian, also showed signs of expansion, particularly in productivity with loan verbs like *s-komprometirovat'* 'compromise' and in colloquial replacement of other prefixes, such as *iz-peč'* > *s-peč'* 'bake' and *pri-gotovit'* > *s-gotovit'* 'prepare'. However, the present trend seems to be to deploy *za-* as a general perfectivizer. In a study of Russian occasional verbs, Gjervold (2014) found that *za-* was by far the most popular prefix for forming Perfectives such as *za-lajkat'* 'like (as on facebook)'.

In sum, recognizing the parallels between numeral classifiers in languages like Yucatec Mayan and the behavior of perfectivizing prefixes in Russian makes it possible to tie together a whole range of what might otherwise appear to be random facts about Russian aspect. These parallels build directly on the same Idealized Cognitive Model of matter that motivates the metaphorical identification of Perfective verbs with discrete solid objects and Imperfective verbs with fluid substances described in Section 2. In other words, the model of the Russian aspectual system presented here is consistent and multifaceted. In the next section, I show that statistical analyses likewise reveal strong parallels between nouns and verbs, further fleshing out

the Noun → Verb Analogy. This section also reveals evidence that Perfective vs. Imperfective aspect serves as the verbal equivalent of grammatical number as expressed by nouns.

#### 4. Number and aspect as the identifying features of spatial and temporal objects

The third study in this chapter employs the statistical technique of correspondence analysis on the corpus frequency distributions of word forms of nouns and verbs. Correspondence analysis is a means of sorting arrays of numbers into groups. When the relative frequencies of inflected forms of Russian nouns are fed into a correspondence analysis, the result is that the model sorts the nouns primarily according to their affinity to singular vs. plural. In parallel, when the relative frequencies of inflected forms of Russian verbs are fed into a correspondence analysis, the result is that the model sorts the verbs primarily according to their aspect as Perfective vs. Imperfective. In other words, the most salient feature that sorts nouns computationally is number, while the most salient feature that sorts verbs is aspect.

Lyashevskaya 2016 is an in-depth study of the behavior of Russian nouns based on statistical analysis of data from the Russian National Corpus. According to Lyashevskaya, the single characteristic that tells us the most about the behavior of nouns is their relative distribution according to number. In other words, the percentage of singular vs. plural forms of nouns found in a corpus are the “litmus test” that reveals details about the lexical meaning of a noun, including its countability, its animacy, formal constraints on the expression of grammatical number, as well as overall frequency (Lyashevskaya 2016: 324–325).

A crucial tool in Lyashevskaya’s analysis is the grammatical profile, which is the frequency distribution of inflected forms of a lexeme as attested in a corpus. Since grammatical profiles are central to revealing parallels relevant to the Noun → Verb Analogy in this section, it is essential to explain this tool in detail. Let us start with the grammatical profile of the Russian word *gora* ‘mountain’ displayed in Table 4.

**Table 4.** The distribution of forms of *gora* ‘mountain’, listing the case and number features of all paradigm forms (top row), the corresponding paradigm forms (second row), the raw numbers of attestations for each form (third row), and the percentage that each form represents in relation to the total number of attestations (bottom row)

NOM.SG	GEN.SG	DAT.SG	ACC.SG	INS.SG	LOC.SG	NOM.PL	GEN.PL	DAT.PL	ACC.PL	INS.PL	LOC.PL
<i>gora</i>	<i>gory</i>	<i>gore</i>	<i>goru</i>	<i>goroj</i>	<i>gore</i>	<i>gory</i>	<i>gor</i>	<i>goram</i>	<i>gory</i>	<i>gorami</i>	<i>gorax</i>
6	15	2	8	3	7	15	11	2	7	10	31
5.13%	12.82%	1.71%	6.84%	2.56%	5.98%	12.82%	9.4%	1.71%	5.98%	8.55%	26.5%



The data in Table 4 are taken from SynTagRus, which is a morphologically annotated corpus of over one million words of Russian. The morphological annotation in SynTagRus includes the case and number category values for all nouns, and this information has been preprocessed and manually corrected, so SynTagRus is what we call a “gold standard” corpus, meaning that the morphological tagging is virtually error-free. Gold standard tagging disambiguates also forms that are the same on the surface, but can be distinguished by human annotators in context. For example, in Table 4 we see that *gora* expresses three case-number combinations: Genitive Singular, Nominative Plural, and Accusative Plural. Whereas automatic tagging is unable to reliably distinguish among identical forms, human annotators can eliminate such ambiguities by recourse to the context in which they appear. The third row of Table 4 lists the number of attestations found in SynTagRus for each case-number form of *gora* ‘mountain’; for example, there are six Nominative Singular forms, fifteen Genitive Singular forms, etc. The bottom row of Table 4 restates the attestations in terms of their relative distribution, giving percentages of the total number of attestations. There are a total of 117 attestations of forms of *gora* ‘mountain’ in SynTagRus, so the six Nominative Singular forms constitute 5.13% of the total, and the remaining percentages are calculated similarly. It is this last row of Table 4 that shows the grammatical profile of *gora* ‘mountain’.

Converting the raw attestations into percentages for each lexeme makes it possible to compare the grammatical profiles of different nouns since percentages put the relative distribution of forms on the same scale, regardless of the total number of attestations. Each word will have its own unique grammatical profile, and we can use grammatical profiles to explore trends in the behavior of words.

In this study, we show how grammatical profiles can be used as input into a type of statistical model called correspondence analysis. The bottom line of Table 4 is just one grammatical profile, but of course we can build grammatical profiles for other words as well. In so doing it makes sense to set a frequency threshold for inclusion in our study because of the Zipfian (1949) distribution of words in a corpus. Due to Zipf’s law, any corpus contains some high frequency words, but also a large proportion of very low frequency words, and in fact about 50% of unique lexemes represented in a corpus are hapaxes – words that appear only once. Consider for a moment a low frequency word like *isčisljaemost’* ‘countability’, which appears only three times in the entire Russian National Corpus, every time in its Nominative Singular form. However, it would not make sense to state that the grammatical profile of *isčisljaemost’* ‘countability’ is 100% Nominative Singular and then compare this grammatical profile to that of *gora* ‘mountain’ in Table 4. The problem is that we don’t really know what the grammatical profile of *isčisljaemost’* ‘countability’ is because we have too little data. And due to Zipf’s law, if we include all words, the number of low-frequency words for which we have too little data will exceed the

number of words for which we can make a good guess of their grammatical profiles. For this reason, taking into account also the total size of SynTagRus, in Janda and Tyers 2018 we set the frequency threshold at fifty attestations. This frequency threshold yields a fairly large number of nouns, 982, that robustly represent each of the major Russian nominal declension classes.

Here, I present a correspondence analysis of just one portion of the data on Russian nouns, namely the 261 nouns belonging to the feminine *-a/ja* declension (also known as the feminine II declension) that cross the frequency threshold of fifty or more attestations.<sup>3</sup> The input to this correspondence analysis is 261 rows of data like the one at the bottom of Table 4. In other words, each row represents the grammatical profile of a noun expressed as an array of numbers (the percentage of attestations for each of the noun's grammatical forms). Together these rows form a large table, with the case-number combinations that define the grammatical forms of nouns as the columns. A correspondence analysis mathematically measures the distances between both the rows and the columns in this table by setting up a multidimensional space in which the first dimension, labeled "Factor 1" is the mathematical construct that accounts for the largest portion of the variation in the data (with subsequent, lesser dimensions labeled "Factor 2", etc.). Factor 1 is not pre-set and must be subsequently interpreted by the researcher. Furthermore, Factor 1 is centered about a zero line that divides all of the data (both the rows and the columns) into two groups. In other words, a correspondence analysis can be likened to giving a computer a big table of data and asking it to figure out what the most important dimension for sorting that data is and to sort that data into two groups based on the mathematical distribution of data in the table.

Figure 1 is a plot of the first two dimensions of a correspondence analysis of the 261 grammatical profiles of the Russian feminine II nouns that are attested fifty times or more in SynTagRus. The 261 nouns (representing the rows) are plotted in black, while the case-number combinations of their forms are plotted in red. Factor 1 is on the x-axis, and the zero point for Factor 1 is marked with a vertical line. Although many of the nouns cannot be read on this plot, the noun *gora* 'mountain' (spelled *ropa* in Cyrillic) is distinctly visible toward the upper right of the plot, where it is located near "loc.pl", which stands for Locative Plural. This stands to reason since, as we see in Table 4, Locative Plural forms make up 26.5% of the

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3. There are actually 262 nouns belonging to the feminine *-a/ja* declension that cross the frequency threshold of fifty or more attestations in SynTagRus. However, the grammatical profile of one of those nouns, *ramka* 'frame' is so unbalanced due to the predominance of Locative Plural forms (motivated by the grammatical construction *v ramkax* + Genitive 'in the framework of X'), that the inclusion of this noun skews the entire distribution of nouns such that the others fall together in a single clump. For this reason, this single outlier has been removed.

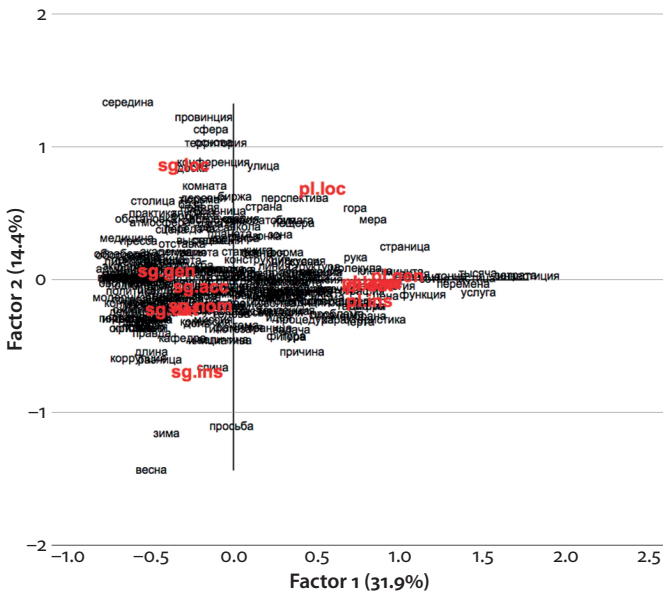


Figure 1. Correspondence analysis of the grammatical profiles of 261 high-frequency Russian nouns belonging to the feminine II declension class (from Janda and Tyers 2018)

grammatical profile of this noun. Similarly, the word *komnata* ‘room’ appears close to the “loc.sg” marker toward the upper left because Locative Singular constitutes 30.77% of that noun’s grammatical profile, and *spina* ‘back’ appears close to the “ins.sg” marker toward the lower left because Instrumental Singular constitutes 40.35% of that noun’s grammatical profile.

The most important thing to notice about Figure 1 is the fact that all of the singular case forms (beginning with “sg.” and plotted in red) appear to the left of the zero line for Factor 1, while all of the plural case forms (beginning with “pl.” and plotted in red) appear to the right of the zero line for Factor 1. Similarly, the nouns that are most attracted to the singular case forms appear to left of the Factor 1 zero line, while the nouns that are most attracted to plural case forms appear to the right of the Factor 1 zero line. Recall that Factor 1 is something that the researcher must interpret post-hoc. However it is not hard to arrive at an interpretation: what the correspondence analysis is trying to tell us is that the most important way to sort nouns is according to their relative affinity for singular vs. plural forms. Number is the most important factor for nouns.

We have carried out correspondence analysis of the grammatical profiles of the remaining four major declension classes for nouns in Russian, the masculine animate, masculine inanimate, neuter, and feminine III (ending in *-b*). In every instance, we got the same result: Factor 1 is interpretable as number, dividing nouns

that are primarily singular from nouns that are primarily plural. This means that we have repeatedly validated our findings and our findings are robust.

How does this behavior of nouns compare with the behavior of verbs? Eckhoff et al. 2017 conducted a series of correspondence analyses of the grammatical profiles of Russian verbs. The study by Eckhoff et al. 2017 is based on data from the manually disambiguated Morphological Standard of the Russian National Corpus (approximately six million words dating to 1991–2012), which is also a “gold standard” corpus. Table 5 reproduces the grammatical profile of the verb *čitat’* ‘read’ from that study.

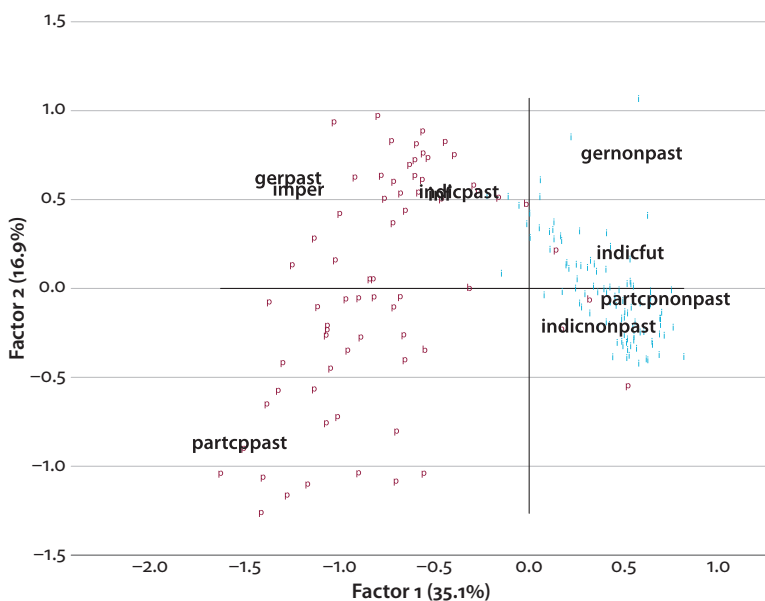
**Table 5.** The grammatical profile of *čitat’* ‘read’ in the sample of journalistic prose Eckhoff et al. 2017

Nonpast gerund	Past gerund	Imperative	Indicative future	Indicative nonpast	Indicative past	Infinitive	Nonpast participle	Past participle
<i>čitaja</i>	<i>čitav</i>	<i>čitaj, čitajte</i>	<i>budu čitat’, budeš čitat’, etc.</i>	<i>čitaju, čitaješ’, etc.</i>	<i>čital, čitala, etc.</i>	<i>čitat’</i>	<i>čitajuščij, čitaemyj, etc.</i>	<i>čitavšij, čitannyj, etc.</i>
2	0	8	1	15	14	22	0	0
3.2%	0%	12.9%	1.6%	24.2%	22.6%	35.5%	0%	0%

In comparison with nouns, the full paradigm of a Russian verb can have many more potential forms, over a hundred if one counts all the forms of the participles. If we distinguish each possible form, the array for each verb is huge, with most cells representing no or very few attestations. For this reason, it makes more sense to gather this data at the level of the subparadigm, collecting, for example, all of the indicative non-past forms under a single heading. In Table 15 we see that fifteen attestations of indicative non-past forms are observed for *čitat’* ‘read’; this is the sum of all attestations for *čitaju* ‘I read’, *čitaes’* ‘you (sg) read’, *čitaet* ‘s/he reads’, *čitaem* ‘we read’, *čitaete* ‘you (pl) read’, and *čitajut* ‘they read’. Similar aggregations have been performed for the imperative, indicative future, indicative past and all participles.

Three equal-sized samples of 0.4 million words were extracted from the Morphological Standard of the Russian National Corpus, representing three genres: Journalistic prose (*publicistika*), Fiction (*xudožestvennaja literatura*), and a combination of *učebno-naučnaja literatura* and *proizvodstvo-texničeskaja literatura* designated as Scientific-Technical prose. In this chapter, I recount in detail only the results for Scientific-Technical prose.

Following the same method as used for the nouns, we set a frequency threshold of fifty attestations or more for inclusion of a verb in this study. For the Scientific-Technical prose sample this meant that grammatical profiles were collected for 172 verbs. Figure 2 shows the correspondence analysis of this data.



**Figure 2.** Correspondence analysis of the grammatical profiles of 172 Russian verbs in a sample of scientific-technical prose (from Eckhoff et al. 2017)

In Figure 2 the labels for the verbs have been replaced by three symbols: “p” for the sixty-four Perfective verbs, “i” for the 103 Imperfective verbs, and “b” for the five biaspectual verbs in this sample. It is important to note that the correspondence analysis was blind to this set of labels, which were superimposed independently after the analysis purely for the purpose of visualizing the result.

How can we interpret Factor 1 for verbs in Figure 2? We note that 62 (97%) of the Perfective verbs land to the left of the zero line for Factor 1, and 98 (95.2%) of the Imperfective verbs land to the right of the zero line for Factor 1. Furthermore, note that the distribution of grammatical markers relative to aspect is also significant (see Janda and Lyashevskaya 2011 for more about which forms in the Russian verbal paradigm are most associated with Perfective vs. Imperfective). The grammatical markers that are most associated with Perfective verbs in Russian, namely past participles and gerunds, the imperative, the indicative past and the infinitive (on Figure 2 the “infin” marker for infinitive is co-located with the “indicpast” marker for the indicative past, making the two hard to discern), all land to the left of the zero line; while the grammatical markers most associated with Imperfective, namely non-past participles and gerunds, indicative non-past and indicative future, all land to the right of the zero line. In sum, all of the evidence is pointing in the same direction: Factor 1 in Figure 2 is interpretable as aspect.

The separation of verbs as Perfective vs. Imperfective according to their grammatical profiles shown in Figure 2 was repeated on two independent datasets, representing Journalism and Fiction, with the same result. Thus this result has been validated. Overall across all three genres, the accuracy of aspectual classification is 93%.

Most remarkably, this level of accuracy achieved by predicting aspect based on grammatical profiles is statistically indistinguishable from the accuracy of prediction of aspect by means of morphological markers for the same dataset. Aspectual morphology is less than perfect in signaling aspect because of deviations from the typical set of assumptions, according to which simplex verbs are imperfective, prefixed verbs are perfective, and suffixed verbs are imperfective. These assumptions are violated, for example, in the case of simplex perfectives (some of which are high frequency, like *dat* ‘give’) and prefixed imperfectives (like *so-suščestvovat* ‘coexist’). Our results show that the grammatical profiles of verbs are just as reliable as a means of recognizing the aspect of a Russian verb as the aspectual prefixes and suffixes.

Taken together, the studies by Janda and Tyers (2018) and Eckhoff et al. (2017) provide a new type of evidence for the Noun → Verb Analogy. Both studies take as their input the grammatical profiles of words based on data from a manually annotated/corrected “gold standard” corpus of Russian. Correspondence analysis takes this data and sorts both nouns and verbs into two groups. For nouns, the sorting is according to attraction to Singular vs. Plural number. For verbs, the sorting is according to attraction to the grammatical forms most typical for Perfective vs. Imperfective aspect. From a “big picture” perspective we can say that both nouns and verbs are organized primarily according to their relationship to quantification, where quantification is realized as number for nouns, but as aspect for verbs. This comparison across the two studies gives independent confirmation for the claim in Section 3 that aspect serves as the verbal equivalent of quantification in the parallel between the numeral classifier constructions and the construction of Perfective verbs with prefix-classifiers.

## 5. Conclusion

A wide variety of types of data and observations all point in the same direction, namely toward the Noun → Verb Analogy. There is a highly articulated, thorough and compelling isomorphism between the properties of matter as discrete solid objects vs. fluid substances and the implications of Russian aspect as Perfective vs. Imperfective. Russian perfectivizing prefixes show numerous parallels to numeral classifiers, justifying consideration of these prefixes as verb classifiers. In their role

as verb classifiers, perfectivizing prefixes unitize situations referenced by verbs into event-objects according to the verbal analog of shape, namely the contour of their trajectories. A statistical sorting of the grammatical profiles of nouns and verbs by means of correspondence analysis yields parallel results. In the case of nouns, the single most telling factor is that of number, since nouns can be divided into two groups according to their relative affinity for singular vs. plural. Similarly, the single most telling factor for grouping the distributions of verbal forms is aspect, distinguishing Perfective from Imperfective and providing independent evidence for the identification of aspect as a marker of quantification.

The Noun → Verb Analogy is well documented and useful, since it provides a coherent framework for making sense of numerous otherwise vexing and seemingly chaotic facts of Russian aspect. Thanks to the Noun → Verb Analogy, it makes sense that the Directed vs. Non-directed distinction exists only for Imperfective motion verbs, since only fluid substances are capable both of flowing or of stagnating. The fact that non-past verb forms refer to future tense when Perfective but present tense when Imperfective is explainable by the fact that two discrete solid objects (a Perfective non-past event-object and my body as the observer at the present moment in the timeline) cannot occupy the same place, but a discrete solid object can be surrounded by a fluid substance (so an Imperfective situation-fluid can surround the observer at the present moment). The distribution of sixteen prefixes to form nearly 2000 Natural Perfectives becomes more rational and orderly when we realize that the prefixes behave as verb classifiers, each attracting the verbs that are most similar in meaning to the given prefix.

The Noun → Verb Analogy is a systematic grammatical metaphor that, like most conceptual metaphors, uses a domain that is more concrete and easier to understand in order to help us gain access to a domain that is harder to make sense of. The referents of nouns are stable over time, inhabiting the domain of space, prototypically as instantiations of matter that we can interact with physically. The referents of verbs are not stable over time, and as such are harder to grasp. The Noun → Verb Analogy brings structure and detail to the temporal domain of verbs, as the data and observations in this chapter show.

## References

- Aikhenvald, A. Y. 2000. *Classifiers*. Oxford: Oxford University Press.
- Andrews, E., Aver'janova, G. N., & Pjadusova, G. I. 2001. *The Russian verb: Form & function*. Moscow: Russkij jazyk.
- Avilova, N. S. 1976. *Vid glagola i semantika glagol'nogo slova*. Moscow: Nauka.
- Bach, E. 1986. The algebra of events. *Linguistics and Philosophy*, 9, 5–16.
- Biber, D., S. Johansson, G. Leech, S. Conrad, & E. Finegan. 1999. *Longman grammar of spoken and written English*. Harlow: Pearson Education.
- Bisang, W. 1999. Classifiers in east and southeast Asian languages: Counting and beyond. In J. Gvozdanović (Ed.), *Numeral types and changes worldwide* (113–185). Berlin & New York: Mouton De Gruyter. <https://doi.org/10.1515/9783110811193.113>
- Bondarko, A. V. 1971. *Vid i vremja russkogo glagola*. Moscow: Prosveščenie.
- Carlson, L. 1981. Aspect and quantification. In P. J. Tedeschi, & A. Zaenen (Eds.), *Syntax and semantics, vol. 14. Tense and aspect* (31–64). New York: Academic Press.
- Čertkova, M. 1996. *Grammatičeskaja kategorija vida v sovremennom ruskom jazyke*. Moscow: Izdatel'stvo Moskovskogo universiteta.
- Childers, J. B., & Tomasello, M. 2006. Are nouns easier to learn than verbs? Three experimental studies. In K. A. Hirsh-Pasek, & R. M. Golinkoff (Eds.), *Action meets word: How children learn verbs*. Oxford Scholarship Online. <https://doi.org/10.1093/acprof:oso/9780195170009.003.0013>
- Cubberly, P. 2002. *Russian: A linguistic introduction*. Cambridge: Cambridge University Press.
- Dahl, Ö. 1985. *Tense and aspect systems*. Oxford: Basil Blackwell.
- Deepadung, S. 1997. Extension in the usage of the Thai classifier /tua/. *Southeast Asian Linguistic Studies in Honour of Vichin Panupong* (49–55). Bangkok: Chulalongkorn University Press.
- Dickey, S. M. 2000. *Parameters of Slavic aspect: A cognitive approach*. Stanford: CSLI Publications.
- Dickey, S. M., & Janda, L. A. 2015. Slavic aspectual prefixes and numeral classifiers: Two kinds of lexico-grammatical unitizers. *Lingua*, 168, 57–84. <https://doi.org/10.1016/j.lingua.2015.09.005>
- Durst-Andersen, P. 1992. *Mental grammar: Russian aspect and related issues*. Columbus, OH: Slavica.
- Eckhoff, H. M., Janda, L. A., & Lyashevskaya, O. 2017. Predicting Russian aspect by frequency across genres. *Slavic and East European Journal*, 64, 844–875.
- Endresen, A., Janda, L. A., Reynolds, R., & Tyers, F. M. 2016. Who needs particles? A challenge to the classification of particles as a part of speech in Russian. *Russian Linguistics*, 40, 103–132. <https://doi.org/10.1007/s11185-016-9160-2>.
- Forsyth, J. A. 1970. *Grammar of aspect*. Cambridge: Cambridge University Press.
- Gagarina, N. 2004. Does the acquisition of aspect have anything to do with aspectual pairs? *ZAS Papers in Linguistics*, 33, 39–61. <https://doi.org/10.21248/zaspil.33.2003.195>
- Galton, H. 1976. *The main functions of the Slavic verbal aspect*. Skopje: Macedonian Academy of Sciences and Arts.
- Gao, M. Y., & Malt, B. C. 2009. Mental representation and cognitive consequences of Chinese individual classifiers. *Languages and Cognitive Processes*, 24, 1124–1179. <https://doi.org/10.1080/01690960802018323>
- Gentner, D. 1982. Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. A. Kuczaj II (Ed.), *Language development: Vol. 2. Language, thought and culture* (301–344). Hillsdale, NJ: Erlbaum.



- Gentner, D., & Boroditsky, L. 2001. Individuation, relativity, and early word learning. In M. Bowerman, & S. C. Levinson (Eds.), *Language acquisition and conceptual development* (215–256). Cambridge: Cambridge University Press.  
<https://doi.org/10.1017/CBO9780511620669.010>
- Gjervold, J. H. 2014. *Prefix variation in Russian. A comparison between occasional verbs and standardized language*. MA Thesis, UiT, The Arctic University of Norway.
- Glovinskaja, M. Ja. 1982. *Semantičeskie tipy vidovyx protivopostavlenij russkogo glagola*. Moscow: Nauka.
- Gvozdev, A. N. 1961. *Voprosy izučeniya detskoj reči*. Moscow: APN RSFSR.
- Isačenko, A. V. 1960. *Grammatičeskij stroj russkogo jazyka v postopavlenii s slovackim – Čast' vtoraja: morfologija*. Bratislava: Izdatel'stvo akademii nauk.
- Jakobson, R. O. 1957/1971. Shifters, verbal categories, and the Russian verb. In *Selected writings II*. The Hague: Mouton, 130–147.
- Janda, L. A. 2003. A user-friendly conceptualization of aspect. *Slavic and East European Journal*, 47, 251–281. <https://doi.org/10.2307/3219946>
- Janda, L. A. 2004. A metaphor in search of a source domain: The categories of Slavic aspect. *Cognitive Linguistics*, 15, 471–527. <https://doi.org/10.1515/cogl.2004.15.4.471>
- Janda, L. A. 2007. Aspectual clusters of Russian verbs. *Studies in Language*, 31, 607–648.  
<https://doi.org/10.1075/sl.31.3.04jan>
- Janda, L. A. 2012. Russkie pristavki kak sistema glagol'nyx klassifikatorov. *Voprosy jazykoznanija* 6, 3–47.
- Janda, L. A., & Lyashevskaya, O. 2011. Grammatical profiles and the interaction of the lexicon with aspect, tense and mood in Russian. *Cognitive Linguistics*, 22, 719–763.  
<https://doi.org/10.1515/cogl.2011.027>
- Janda, L. A., Endresen, A., Kuznetsova, J., Lyashevskaya, O., Makarova, A., Nessel, T., & Sokolova, S. 2013. *Why Russian aspectual prefixes aren't empty: Prefixes as verb classifiers*. Bloomington, IN: Slavica.
- Janda, L. A., & Reynolds, R. J. 2019. Construal vs. redundancy: Russian aspect in context. *Cognitive Linguistics*, 30, 467–497. <https://doi.org/10.1515/cog-2017-0084>
- Janda, L. A., & Tyers, F. M. 2018. Less is more: Why all paradigms are defective, and why that is a good thing. *Corpus Linguistics and Linguistic Theory*, 17(1), 109–141.  
<https://doi.org/10.1515/cllt-2018-0031>
- Lakoff, G. 1987. *Women, fire, and dangerous things*. Chicago: The University of Chicago Press.  
<https://doi.org/10.7208/chicago/9780226471013.001.0001>
- Lakoff, G., & Johnson, M. 1980. *Metaphors we live by*. Chicago: The University of Chicago Press.
- Langacker, R. W. 1987. Nouns and verbs. *Language*, 63, 53–94. <https://doi.org/10.2307/415384>
- Langacker, R. W. 1991. *Concept, image, and symbol: The cognitive basis of grammar*. Berlin & New York: Mouton de Gruyter.
- Langacker, R. W. 2008. *Cognitive grammar: A basic introduction*. Oxford: Oxford University Press.  
<https://doi.org/10.1093/acprof:oso/9780195331967.001.0001>
- Lucy, J. A. 1992. *Grammatical categories and cognition*. Cambridge: Cambridge University Press.  
<https://doi.org/10.1017/CBO9780511620713>
- Lucy, J. A. 2000. Systems of nominal classification: A concluding discussion. In G. Senft (Ed.), *Systems of nominal classification* (326–341). Cambridge: Cambridge University Press.
- Lyashevskaya, O. 2016. *Korpusnye instrumenty v leksiko-grammatičeskikh issledovavijakh russkogo jazyka*. Moscow: Languages of Slavic culture press.

- Majsak, T. A. 2005. *Tipologija grammatikalizaciji konstrukcij s glagolami dviženija i glagolami poziciji*. Moscow: Jazyki slavjanskix kul'tur.
- Martelle, W. 2011. Testing the aspect hypothesis in L2 Russian. Doctoral Dissertation, University of Pittsburgh.
- Maslov, J. S. 1965. Sistema osnovnyx ponjatij i terminov slavjanskoj aspektologii. *Voprosy obščego jazykoznanija*, 1, 53–80.
- McGregor, W. B. 2002. *Verb classification in Australian languages. (Empirical Approaches to Language Typology 25)*. Berlin & New York: Mouton de Gruyter. <https://doi.org/10.1515/9783110870879>
- Mehlig, H. R. 1996. Some analogies between the morphology of nouns and the morphology of aspect in Russian. *Folia Linguistica*, 30, 87–109. <https://doi.org/10.1515/flin.1996.30.1-2.87>
- Mikaelian, I., Shmelev, A., & Zaliznjak, A. 2007. Imperfectivization in Russian. Proceedings of the 3rd International Conference on Meaning Text Theory, Klagenfurt, May 20–24, 315–23. [*Wiener slawistischer Almanach*, 60.]
- Mironova, L. Ju. 2004. *Vid glagola i sootnošenie leksiko-semantičeskix variantov mnogoznačnogo slova*. Tambov: Avtoreferat.
- Morrow, D. G. 1986. Grammatical morphemes and conceptual structure in discourse processing. *Cognitive Science*, 10, 423–455. [https://doi.org/10.1207/s15516709cog1004\\_2](https://doi.org/10.1207/s15516709cog1004_2)
- Mourelatos, A. 1978. Events, processes, and states. *Linguistics and Philosophy*, 2, 415–434. <https://doi.org/10.1007/BF00149015>
- Offord, D. 1996. *Using Russian*. New York: Cambridge University Press.
- Padučeva, E. V. 1996. *Semantičeskije issledovanija*. Moscow: Jazyki russkoj kul'tury.
- Plungjan, V. A. 2011. *Vvedenie v grammatičeskiju semantiku: Grammatičeskije značeniija i grammatičeskije sistemy jazykov mira*. Moscow: Rossijskij gosudarstvennyj gumanitarnyj institut.
- Šaxmatov, A. A. 1952. *Učenie o častjax reči*. Moscow: Učebno- pedagogičeskoe izdatel'stvo.
- Stoll, S. E. 2001. *The acquisition of Russian aspect*. UC Berkeley PhD Disertation.
- Timberlake, A. 2004. *A reference grammar of Russian*. Cambridge: Cambridge University Press.
- Tixonov, A. N. 1964. Čistovidovye pristavki v sisteme russkogo vidovogo formoobrazovanija. *Voprosy jazykoznanija*, 1, 42–52.
- Tixonov, A. N. 1998. Vidovye korrelacii v sovremennom russkom jazyke. In Marina Ju. Čertkova (Ed.), *Tipologija vida: Problemy, poiski, rešenija*, (466–477). Moscow: Jazyki russkoj kul'tury.
- van Schooneveld, C. H. 1958. The so-called 'préverbes vides' and neutralization. *Dutch Contributions to the Fourth International Congress of Slavistics* (159–61). The Hague: Mouton.
- Vey, M. 1952. Les préverbes 'vides' en tchéque moderne. *Revue des études slaves*, 29, 82–107. <https://doi.org/10.3406/slave.1952.1583>
- Vinogradov, V. V. 1972. *Russkij jazyk*. Moscow: Vysšajaškola.
- Zaliznjak, A. A., & Šmelev, A. D. 2000. *Vvedenie v russkiju aspektologiju*. Moscow: Jazyki russkoj kul'tury.
- Zhang, N. N. 2013. *Classifier structures in Mandarin Chinese*. Berlin & New York: Mouton de Gruyter. <https://doi.org/10.1515/9783110304992>
- Zipf, G. 1949. *Human behavior and the principle of least effort*. New York: Addison-Wesley.

