MEASURES AND INDEFINITES

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ABSTRACT

In this paper I explore the function of prefixes as verb-internal operators that have distinct semantic effects on the interpretation of nominal arguments. I will focus on the Russian prefix *na-* used in its cumulative sense of approximately *a {relatively/sufficiently/exceedingly} large quantity (of)*, and to a lesser extent on its converse, namely, the delimitative/attenuative *po-*. Such prefixes have one notable and neglected property: namely, they systematically require that nominal arguments targeted by them have a non-specific indefinite interpretation, regardless whether the verb they form is perfective or imperfective. I will argue that the semantics of such prefixes is to be assimilated to that of measure phrases and propose an additional novel role for them: namely, as morphological markers of a particular mode of composition that is available for semantically incomplete nominal arguments that have a non-specific indefinite interpretation. If this analysis is correct, then it precludes measure prefixes in Slavic languages from being analyzed as overt morphological exponents of the perfective operator, contrary to the majority of current analyses which take this to be the main or the only function of Slavic prefixes as a whole class. Instead, this analysis enforces the view on which measure prefixes function as modifiers of eventuality types expressed by 'aspectless' verbal predicates.

Reference and Quantification: The Partee Effect. Festschrift for Barbara Hall Partee.

1. BACKGROUND AND LEADING IDEAS

One research area that is central to Barbara Partee's work regards the structure and interpretation of expressions of quantification. In addition to quantification expressed by means of determiner quantifiers, she draws attention to quantification expressed by other means: namely by adverbs of quantification like *usually, always*, originally studied by Lewis (1975), by 'floated' quantifiers, auxiliaries and verbal affixes, among others (see Partee et al. 1987, Partee 1991, 1995). This shift in research focus led to a number of studies on typologically distinct languages, many of which have received little attention in contemporary linguistic studies, raised new questions about quantification, syntax-semantics mappings as well as language typology (see Bach et al. 1995 and references therein). Of special interest are word-internal morphemes that function as operators over domains restricted by common nouns with which they are not contiguous on the syntactic surface.

In this context, Partee (1991, 1995) examines verbal affixes that can be used to express various kinds of quantificational and closely related meanings like measure, distributivity, totality, exclusivity or exhaustiveness, for example. She illustrates this point with verbal affixes from Warlpiri and Gun-djeyhmi (Australian aboriginal languages), and from Czech (a West Slavic language). Let us consider the Czech prefix *po-* in (1b)[1]:

(1) a. Maloval^{I} hesla (na stěnu). Czech
paint.PAST.3SG slogan.PL.ACC (on wall)
'He painted (the/some) slogans (on the wall).'

b. **PO-**maloval^{P} stěnu hesly / *hesla na stěnu.
TOT-paint.PAST.3SG wall.SG.ACC slogan.PL.INST / *slogan.PL.ACC on wall.SG.ACC
'He covered the wall with slogans.' / *'He covered (the/some) slogans on the wall.'

Po- can be applied to an imperfective verb that belongs to a class of verbs that take objects of creation (1a) or affected objects. It derives a new perfective verb, as we see in

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[1] The superscripts 'I' and 'P' on a verb stand for the imperfective and perfective aspect. The following abbreviations are used in the glosses: NOM = nominative, GEN = genitive, DAT = dative, ACC = accusative, PART = partitive, NEUT = neuter, SG = singular, PL = plural, COND = conditional, PRES = present tense, PAST = past tense, CM = cumulative, DEL = delimitative, ITER = iterative, TERM = terminative, ATN = attenuative, COMPL = completive, ATN = attenuative, TOT = totality, IPF = imperfective suffix.

(1b), that takes as its direct object the optional locative complement of the base verb and prohibits any overt expression of the direct object of the base verb. The meaning of the perfective verb *pomaloval* in (1b) is 'he wrote all over X' or 'he covered X with writing'. Hence, the prefix *po-* is here used with the meaning of completeness, totality, exclusivity or exhaustiveness, "(...) which is in a certain sense quantificational but is certainly to be captured at a lexical rather than a syntactic level" (Partee 1995, p.559).

Clearly, lexical operators of this type are neither determiners nor sentence-level syntactic operators, and Partee (1991, 1995) observes that they are distinguished by three salient properties: First, they are directly applied to a verb, and may have morphological, syntactic, and semantic effects on the argument structure of the predicate. Second, their effects are strictly local, limited to a verb and its arguments, excluding optional adjuncts, and they are directed to a specific argument or arguments of a verb. Third, their meanings are often not purely quantificational, and their semantic values may be associated with a variety of adverbial meanings. Partee (ibid.) also emphasizes that verbal affixes of this type differ from prototypical cases of A-quantification, namely quantification expressed by means of adverbs of quantification like *usually* and *always*, in so far as they never involve unselective binding and syntactic (or topic/focus) basis for determining what is being quantified over. As a working hypothesis, operators expressed by verbal affixes and other morphemes that are directly applied to a lexical predicate and that have quantificational or closely related meanings are best viewed as a subtype of operators of its own kind within the large and heterogeneous class of A-quantifiers.

Assuming this general research agenda set by Partee et al. (1987) and Partee (1991, 1995), I will analyze Russian verbal prefixes that have semantic effects on nominal arguments comparable to those of weak (cardinal) quantifiers like *a little, a few, a lot (of), many, much* or of measure phrases like *a {relatively/sufficiently/exceedingly} {large/small} quantity (of)*. Such prefixes systematically require that nominal arguments targeted by them have a non-specific indefinite interpretation, regardless whether the verb they form is perfective or imperfective. Hence, their analysis also bears on the research domain of noun phrase interpretation and type-shifting principles, much of which directly builds on Partee's (1987) paper with the same title.

A paradigm example of the class of Russian prefixes to be analyzed here is the prefix *na-*, as used in (2b)[2].

(2) a. V kotelke on varenye **varil**^{I}**.**
in pot he jam.SG.ACC cook.PAST.3SG
(i) 'In the pot, he cooked (the/some) jam.'
(ii) 'In the pot, he was cooking (the/some) jam.'
(iii) 'He used to cook jam in the pot.'

b. On kak-to varenya **NA-varil**^{P} - z čerešni
he somehow jam.SG.GEN **CM-**cook.PAST.3SG - from cherry.SG.GEN
- žut' kak mnogo: desjat' veder.
- horror how much: ten bucket.PL.GEN
'He made / cooked up a (relatively) large quantity of jam - from cherries – boy, did he make a lot of it: ten buckets!'

The prefix *na-* is applied to the imperfective verb *varil* 'he cooked', 'he was cooking', which can be used transitively, as in (2a), or intransitively, and derives a new perfective verb *na-varil*, which is transitive, and its direct object occurs in the genitive case, as we see (2b), but also in the partitive and accusative case (see Section 2.2).

In addition to the change in aspect and argument-structure, the prefix *na-* in (2b) accomplishes two closely related functions: First, *na-* has direct effects on the interpretation of the bare nominal argument 'jam', related to its quantitative and referential interpretation. Second, by *directly* measuring the volume of jam, *na-* *indirectly* measures the cooking event. Hence, in this indirect way, the prefix *na-* functions as a modifier of the eventuality type expressed by the verb stem and its subcategorized arguments. Its adverbial function as a modifier of verbal meanings is evident in the observation that *na-* also has a temporal and manner meaning of 'graduality': namely, (2b) strongly suggests that the quantity of jam was 'accumulated' in a gradual manner during the cooking process.

As far as the first point is concerned, the interpretation of 'jam' here approximately amounts to 'a lot of jam' or to 'a (sufficiently/exceedingly) large quantity (of) jam'. In traditional Aktionsart classification of prefixal uses, this use of *na-* is dubbed 'cumulative' (see Isačenko 1962, for example), here glossed 'CM'. Moreover, 'jam', or better its interpretation as 'a lot of jam' (approximately) here, has the hallmark properties of a non-specific indefinite. This is highly significant given that Russian, like most Slavic languages, has no overt articles, and hence the presence of overt articles or their contrastive absence cannot contribute to the (non-)specificity interpretation of nominal arguments.

[2] The example is taken from Vitalii Babenko, *Povest' vremennych let* [*Tale of the interim years*].

The second point amounts to saying that a delimited quantity of jam corresponds to a 'delimited quantity' of event during which the jam was cooked, put in the simplest terms. Formally, this is standardly implemented by homomorphically mapping the part-whole structure of the quantity of jam (measured by *na-*) onto the part-whole structure of the cooking event. Such homomorphic mappings between the (part-whole structures of the) denotations of nominal arguments and (the part-whole structures of) the event argument are the defining properties of the Incremental Theme relation (following Krifka 1998 and Dowty 1991), and its predecessor, the Gradual Patient relation (Krifka 1986, 1992). The same general type of relation is also known as the ADDTO relation (Verkuyl (1972, 1993, 1999), the 'measuring-out' relation (Tenny 1987, 1994), or the 'structure preserving binding' relation (Jackendoff 1996).

In contrast, the imperfective verb *varil* 'he cooked', 'he was cooking' in (2a) imposes neither quantitative nor referential constraints on the interpretation of the bare argument 'jam'. It allows for 'jam' to have a variety of interpretations: namely, the specific definite, non-specific indefinite or the generic one, depending on the linguistic and extra-linguistic context in which (2a) is used[3]. Consequently, even though 'jam' stands in the Incremental Theme relation to the imperfective verb, it cannot on its own 'measure' or delimit the eventuality described by (2a), because on its own it merely denotes a property of jam.

To summarize, since the crucial difference between (2a) and (2b) lies in the prefix *na-* in (2b), the difference in the quantitative and referential interpretation of 'jam' in (2a) versus (2b) must be attributed to the prefix *na-*.

Now, the correlation of the *perfective verb* with the *non-specific indefinite* interpretation of its direct object in (2b) is problematic for most analyses that have so far been proposed for the influence of Slavic verbal aspect on the interpretation of nominal arguments. Many linguists (see Krifka 1986, 1992, Verkuyl 1993, 1999, Schoorlemmer 1995, Borer 2004, among many others) analyzing the data in this domain accept what is

[3] Imperfectives have a range of contextually determined interpretations: 'progressive', completive, iterative, generic and 'simple denotative' (or 'constative general factual'). The 'simple denotative' or 'constative general factual' use is meant to cover the use of imperfectives in situations when "the speaker is simply interested in expressing the bare fact that such and such an event did take place, without any further implications, and in particular without any implication of progressive or habitual meaning; sentence-stress falls on the verb" (Comrie 1976, p.113).

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traditionally taken to be a general tendency for perfective aspect to correlate with referentially specific direct objects[4]. A case in point are examples in (3a-b):

(3) a. **VY**-pil^{P} konjačok.
COMPL-drank.3SG brandy.DIM.SG.ACC
'He drank up (all) the brandy.'
[i.e., the whole portion of brandy]

b. **DO**-pil^{P} konjačok.
TERM-drank.3SG brandy.DIM.SG.ACC
'He finished (drinking) (all) the brandy.'

Here, the bare mass noun 'brandy' is interpreted as 'the brandy', possibly in combination with the universal quantifier 'all' or some expression of totality like 'whole', as in 'the whole portion of brandy'. For example, in Borer's (2004) recent proposal, which partly builds on Filip (1996 and 1993/99), perfectivity is defined as the presence of a (set of) head features which assign the quantity range within a dedicated syntactic (functional) structure: ASP_Q, with 'Q' standing for 'quantity'. (See also previous proposals by Benua and Borer 1996, also Schmitt 1996, among others.) In Slavic languages, the relevant head features are morphologically spelled out by verbal prefixes, according to Borer. Through specifier–head agreement, the quantity value of the prefix transfers to the syntactic configuration corresponding to the nominal argument in the specifier of the ASP_Q node. This mechanism predicts that all the bare nominal arguments in perfective sentences like (3) and (4) are uniformly assigned a 'strong' interpretation: namely, an interpretation corresponding to DP's with the definite article *the* or to indefinite DP's with *a* with the widest scope, given that the prefix is here the sole assigner of the quantity range to all the open variables within the ASP_Q structure (see Borer ibid., Chapter 15, (38)). However, this prediction is only borne out for direct objects in (3), but not for those in (4). The latter have a non-specific indefinite interpretation, under the most natural reading of (4a,b), despite the fact that examples in (3) and (4) will be associated with the same syntactic representation, on Borer's account.

[4] As far as traditional approaches to Slavic aspect are concerned, we may mention Wierzbicka (1967), Forsyth (1970) and Chvany (1983), to name just a few. Chvany (1983) observes that "[a]nother well-known correlation in Russian is that of definite direct objects with perfective aspect, accusative case and holistic interpretation, while imperfective aspect, genitive case and partitive interpretations associate with indefiniteness" (p.71). Similarly, Forsyth (1970) states for Russian: "[...] verb plus object in such a sentence as *on pil* [ipf, HF] *čaj* 'he drank tea' or 'he was drinking tea', may be looked upon as a coalesced unit in which the object has no specific reference, whereas in *on vypil* [pf, HF] *čaja* or *čaj* the object is specific - 'he drank the tea'" (p.92). With respect to the Polish perfective sentence *On zjadł[* pf, HF] *oliwki* - 'He ate (up) all the olives', Wierzbicka (1967) observes that what is at issue is "one object (a certain, definite, group of objects – the olives)" (p.2237). In the corresponding imperfective sentence *On jadł* [ipf, HF] *oliwki* - 'He ate/was eating olives' we are considering 'the continuum of olives'(ibid.). Wierzbicka also proposes that the direct object of perfective verbs in Polish includes two elements in its semantic structure: " ... the number (one thing, or one set of things) and the quantifier (all, whole). In contrast, "[I]n the object of the imperfective verb neither of these elements are present" (p.2240), and "[i]n a sentence with an imperfective verb the object is treated as an endless 'continuum', as a 'substance without form'" (p.2237).

(4) a. **NA**-pilsja^{P} konjačka.
CM-drank.3SG brandy.DIM.SG.GEN
'He drank a lot of brandy.'
'He got drunk on brandy.'

b. **PO**-pil^{P} konjačok/konjačka.
ATN-drank.3SG brandy.DIM.SG.ACC/GEN
'He drank some/a little brandy.'

The main verbs in (3) and (4) are all perfective, and based on the same imperfective root 'drink'. However, they are each derived with a different prefix, each associated with distinct lexical semantic properties, and each with a distinct impact on the interpretation of the bare mass noun *konjačok* 'brandy'. It is the differential semantic contributions of the prefixes that here induce the differences in the interpretation of 'brandy': namely, differences in (i) its referential properties, specific definite vs. non-specific indefinite, *and* (ii) its quantificational and measurement interpretation amounting approximately to 'all', 'some', 'a little', 'a lot of'. The elements from these two interpretive dimensions co-occur, but they are orthogonal to each other.

The fundamental problem in most accounts proposed for the influence of perfective verbs on the interpretation of nominal arguments is the assumption that the morphological category of perfectivity, however defined, is to be correlated with the properties (syntactic and/or semantic) of direct objects in a direct and uniform fashion. The general strategy pursued is to provide a uniform characterization for the contribution of the perfective aspect to the semantic and/or syntactic structure of sentences, with verbal prefixes as a class taken to mark perfectivity on the verb. Hence, their contribution is assimilated to that of perfectivity. Subsequently, some mechanism is defined that 'transfers' the relevant 'aspectual' properties from the perfective verb onto the designated nominal argument. The disadvantage of this strategy is that the varied and rich contributions of individual prefixes to the quantitative and referential interpretation of nominal arguments are not (properly) taken into account.

In contrast, I will argue that in order to explain the influence of Slavic verbs on the interpretation of their nominal arguments more fully we have to appeal to factors that go well beyond the simple and uniform correlation of perfectivity, and also imperfectivity, with direct objects. The proper treatment of such verb–noun interactions must also include the sublexical constituents of a verb, its root/stem and affixes. We will also see that such interactions depend on (i) the count/mass properties and morphologically encoded number of the relevant argumental NP/DP, (ii) the determiner quantifiers, numerals and various quantity and measure expressions they may contain, and on (iii)

their thematic relation to the verb. (The importance of (i) – (iii) is also emphasized in Filip 1993/99, 1996.)

The paper is structured as follows. In Section 2, I will review the main data and empirical evidence for the claim that the Russian cumulative *na-* has direct semantic effects on certain nominal arguments, and the same is taken to hold for the attenuative/delimitative *po-*. In Section 3.1, I will introduce the general semantic framework of event semantics within which my analysis is couched. The rest of the paper will be devoted to the analysis of the Russian *na-* and *po-*, and focus on deriving the observed non-specific indefinite interpretation of nominal arguments they target. It will be derived by independent principles of interpretation related to those that govern the interpretation of indefinite determiners (see Landman 2000, 2001, 2004) and non-specific indefinites (see mainly Carlson 2003a,b). The main steps of the suggested analysis can be outlined as follows:

i. First, I will argue that we can straightforwardly capture the quantitative criterion inherent in the cumulative *na-* and the attenuative/delimitative *po-* by assuming that they have the semantics of a measure phrase based on an extensive measure function.
ii. Assimilating such prefixes to (semantic) measure phrases leads me to proposing that a given measure prefix forms a semantic constituent with the denotation of the nominal argument it targets, or with some other semantic predicate that provides a suitable part-whole structure for its measurement. This is also motivated by the general assumption that extensive measure functions inherent in measure phrases cannot be directly applied to (properties of) eventualities in the denotation of verbs (see also Krifka 1989, 1998).
iii. I will adopt the semantics of measure phrases independently proposed by Landman (2000, 2001, 2004). On Landman's view, nominal measure phrases and, more generally, indefinite determiners are of the same type as intersective adjectives, and combine with nouns by intersection. Hence, *na-* and *po-* analyzed as measure phrases first combine with a property-denoting nominal argument (of type $<e,t>$) by intersection to form a measure predicate (of type $<e,t>$).
iv. The resultant measure predicate (of type $<e,t>$) is combined with a verb base by means of a verb restricting mode of composition defined by Carlson (2003b). This mode of composition is reserved for verbs, taken as denoting properties of eventualities, and their non-specific indefinite arguments. Their argument interpretation is derived via Existential Closure. The effect of Carlson's non-saturating mode of composition for non-specific indefinites is similar to the effects of *Restrict* in Chung and Ladusaw (2003) and to *Unification* in Farkas and de Swart (2003).

Consequences:

i. The analysis amounts to proposing a novel role for measure prefixes: namely, as morphological flags of a particular mode of composition that is available for semantically incomplete nominal arguments that have a non-specific indefinite

interpretation. Hence, they can be added to the inventory of other morphological devices with just this function, as discussed in Carlson (2003b), Chung and Ladusaw (2003) as well as in Farkas and de Swart (2003).

ii. The proposed analysis precludes measure prefixes in Slavic languages from being analyzed as overt morphological exponents of the perfective operator. Instead, it enforces the view on which measure prefixes function as modifiers of eventuality types expressed by 'aspectless' verbal predicates. In other words, the semantics of a measure prefix and the aspectual semantics of a fully formed prefixed verb (perfective or imperfective) are clearly separate. Rejecting the claim that Slavic prefixes as a whole class are exponents of the perfective operator also follows if we assume Carlson's (2003a,b) independent proposal that non-specific indefinites are interpreted as property-denoting arguments and combined with verbs at the level of event semantics, a level of semantic interpretation that crucially relies on eventuality types (or Aktionsart) and corresponds to the syntactic V' level. It lies 'below' the interpretive level of propositional semantics, and the associated syntactic IP level, at which the perfective and imperfective operators, and other context-sensitive operators, are interpreted. Now, this result is intriguing, and unexpected, given that the majority of current analyses of Slavic prefixes take them, as a whole class, to be paradigmatic examples of overt exponents of the operator posited for the interpretation of the perfective aspect.

2. REVIEW OF THE MAIN DATA

2.1 Verbal prefixes in Russian

Prefixes[5] derive new perfective verbs when attached to imperfective verbs (5a-b) or perfective verbs (6a-b). Prefixes can also be iterated in certain combinations, and some

[5]Isačenko (1962, p.357) lists the following Russian prefixes: *v- (vo-), vz- (vs-, vzo-), vy-, do-, za-, iz- (is-, izo-), na-, nad- (nado-), o- (ob-, obo-), ot- (oto-), pere-, po-, pod- (podo-), pri-, pro-, raz- (ras-, razo-), s- (so-), u-*. Since each prefix has a number of contextually determined meanings, they are listed here without any translation, due to space limitations.

can be applied to already prefixed perfective verbs (6b-c). Prefixes are not predictably tied to perfectivity, because they also occur within imperfective verbs (5c).

(5)	a.	kurit'^{I}	→	b.	**PO**-kurit'^{P}	→	c. **PO**-kuri-**va**-t'^{I}
		smoke.INF			**DEL**-smoke.INF		**DEL**-smoke-**IPF**-INF
		'to smoke',			'to smoke for a while'		'to take / to be taking
		'to be smoking'					repeated drags'
(6)	a.	skazat'^{P}	→	b.	**PERE-**skazat'^{P}	→	c. ne-**DO-PERE-**skazat'^{P}
		say.INF			**ITER-**say.INF		NEG-**TERM-ITER-**say.INF
		'to say', 'to tell'			'to say again', 'to retell'		'to stop short of (re)telling'

'**ITER**' here stands for 'iterative' and designates one or more repetitions of the eventuality type designated by the verb base.

Prefixation in Slavic languages is a derivational process[6]. As is typical of derivation, not all prefixes attach to all verbs, one prefix can be applied to different (classes of) verbs, with different semantic effects; conversely, different prefixes can be attached to one verb base so that to one and the same base we often get a cluster of prefixed perfective verbs, rather than just one prefixed verb. Each prefix is associated with a range of contextually determined meanings, and prefixes manifest polysemy and homonymy. The meaning of a 'prefix + verb base' combination is not always transparently compositional, but is often partially or fully lexicalized. Prefixes have morphological, syntactic, and semantic effects on the argument structure of verbs.

Attaching a prefix to a verb base results in rich lexical modifications, which have traditionally been classified into *Aktionsart*[7] classes in Slavic linguistics, or 'sposoby dejstvija' in Russian studies[8]. They concern modifications related to space, time, manner, distributivity, iterativity (or plurality of events), quantification (including frequentativity, i.e., notions similar to those expressed by adverbials like *often, many times*), and a variety of affective connotations, among others. A number of prefixes is used with meanings related to measure in some dimension of the described eventuality: what is commonly measured are participants, a property related to a given participant, temporal trace, path, or the number of eventuality occurrences. It may also concern a number of affective connotations like the effort and intentionality with which the participants engage in the event, their effectiveness, emotional involvement, and the like. In each case, the quantity or relevant property degree is measured with respect to a certain contextually determined

[6]For a discussion of verbal prefixation in Slavic languages and its derivational nature see Spencer (1991) and Filip (2000, 2004), for example.

[7] The German term *Aktionsart* (lit.: 'manner of action') was coined by Agrell (1908) in this connection.

[8]See Maslov (1959), Isačenko (1960, 1962), Forsyth (1970), Bondarko (1995), Comrie (1976 and references cited therein), Paducheva (1996), Petručina (2000), and many others.

scale and some standard or subjective expectation value. A few representative Aktionsart classes are given in (7)[9]:

(7)

ATTENUATIVE:	*PO-priderž*at'^{P}	'to hold on to lightly'
	PRI-glušit'^{P} *radio*	'to turn down the radio a little'
	PRI-sypat'^{P}	'to pour some more'
	POD-mërznyt'^{P}	'to freeze slightly'
	POD-gnit'^{P}	'to rot slightly', 'to begin to rot'
	NAD-lomit'^{P}	'to break partly', 'to crack'
DELIMITATIVE:	*PO-kurit'*^{P}	'to smoke for a while'
PERDURATIVE:	*PRO-spat'*^{P} *vsju noč*	'to sleep through the whole night'
CUMULATIVE:	*NA-rubit'*^{P} *drov*	'to chop a large/sufficient quantity of wood'
SATURATIVE:	*NA-kurit'sja*^{P}	'to smoke one's fill'
	ZA-govorit'sja^{P}	'to get carried away by a conversation', 'to rave', 'to ramble'

In what follows I will mainly draw on the cumulative use of the prefix *na-* glossed with ***CM*** and its converse, namely the attenuative and delimitative use of the prefix *po-*, here glossed with ***ATN*** and ***DEL***. While *na-* is commonly used as a measure over stuff and pluralities of individuals, *po-* is rare in this use and typically occurs in certain conventional combinations. Both the prefixes have other Aktionsart meanings, which I will disregard for the purposes of this paper.

1.2 Case marking

Nominal arguments targeted by verbal prefixes like the cumulative *na-* often occur in the genitive case, as in (2b), or the partitive (genitive) case, as in (8a). Notice that the verb form in (8a) is in the 3rd person singular neuter form, which is the default verb form, if there is no subject in the nominative case that can trigger verb agreement. However, the nominative case on the subject argument, as in (8b), and the accusative case on the direct object, as in (8c), can also be found. In spoken Contemporary Standard Russian (CSR),

[9]The Aktionsart labels and examples are taken from Isačenko (1962 p.394, 408-412) and Forsyth (1970, p.21).

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the accusative and nominative case are preferred by younger speakers (see Polinsky 1994, for example).

(8) a. **NA-**valilo^{P} snyegu. Isačenko 1962, p.395[10]
CM-fall.PAST.3SG.NEUT snow.SG.PART.GEN
'A lot of snow fell.'

b. S ulicy **NA-**bežali^{P} rebjata. adapted from Polinsky 1994
from street **CM-**run.PAST.3PL child.PL.NOM
'A lot of children ran in from the street.'

c. Zapuskaem^{I} ustanovku i idyom^{I} pit'^{I} čaj -
start.up.PRES.1SG computer and go.PRES.1SG drink.INF tea.SG.ACC -
čaj **PO-**pil^{P}, idyot^{I} desjatyj čas.
tea.SG.ACC **ATN-**drink.PAST.1SG go.PRES.3SG ten o'clock
'I start up the computer and go drink tea – I had some tea, it's shortly before ten.'
http://openoffice.ru/pipermail/oo-discuss/2001-December/018099.html, Evgenij M.Baldin

1.3 Co-occurrence restrictions

The Russian prefix *na-* in its cumulative use imposes specific restrictions on the syntactic and semantic type of the argument that specifies the domain of entities forming its sortal basis. The constraints regard the count/mass properties and morphologically encoded number as well as determiner quantifiers, numerals and various quantity and measure expressions the relevant argumental NP/DP may contain. Such restrictions clearly suggest that the cumulative *na-* has an inherent meaning related to some quantitative criterion, and that it in fact shares a number of properties with measure phrases. The observations made for *na-* in this section apply to other prefixes that have a use related to measure[11].

First, the Russian cumulative *na-* is incompatible with DP's that contain strong ('true') quantifiers like 'each', as is illustrated in (9a-b). Neither can it co-occur with the weak universal determiner quantifier 'all', as we see in (10a-b). (Examples are taken from Polinsky 1994, ex. 63-64.) Similarly, in English, measure phrases (pseudopartitives) with strong quantifiers and 'all' are excluded as ungrammmatical: cp. **a basket of each apple, *a basket of most / all apples*.

[10] Cp. Also Isačenko's (1962, p.395) German translation: 'Es fiel (in großen Mengen) Schnee.'

[11] For comparable examples with the cognate cumulative prefix *na-* in Czech, see Filip (1992) and Filip (1993/1999, Chapter 5).

(9) a. V sad **NA-**letelo^{P} *<u>každoj</u> saranči.
in garden **CM-**fly.PAST.3SG.NEUT *each.SG.GEN locust[COLL]SG.GEN
'Each locust invaded the garden.'

b. V sad **NA-**letela^{P} *<u>každaja</u> saranča.
in garden **CM-**fly.PAST.3SG.FEM *each.SG.NOM locust[COLL]SG.NOM
'Each locust invaded the garden.'

(10) a. Na zemlju **NA-**padalo^{P} *<u>vsex</u> jablok.
on ground **CM-**fall.PAST.3SG.NEUT *all.PL.GEN apple.PL.GEN
'All apples fell to the ground.'

b. Na zemlju **NA-**padali^{P} *<u>vse</u> jabloki.
on ground **CM-**fall.PAST.3PL.NEUT *all.PL.NOM apple.PL.NOM
'All apples fell to the ground.'

Second, *na-* excludes singular count nominal arguments and welcomes mass and plural ones in the argument slot it targets for its effects. While (11a) is unacceptable with the singular count argument 'a nice doll', the corresponding sentence (11b) without *na-* is perfectly acceptable with the same argument.

(11) a. **NA-daril**^{P} ej <u>xorošix kuklov</u> / <u>xorošije kukli</u> / *<u>xorošuju kuklu.</u>
CM-give.PAST.3SG her <u>good doll.PL.GEN</u> / <u>good doll.PL.ACC</u> / *<u>good doll.SG.ACC</u>
'He gave her a lot of nice dolls.'

b. **Daril**^{I} ej <u>xorošuju kuklu.</u>
give.PAST.3SG her <u>good doll.SG.ACC</u>
He gave / was giving her a nice doll.'

The incompatibility with singular count nominals is one of the hallmark properties of *na-*, which it shares with nominal measure phrases: cp. **one pound of (an) apple* vs. *one pound of apples/sugar*.

Third, the cumulative *na-* is compatible with any additional specification of quantity in the NP/DP it targets that matches its inherent quantity entailment of 'a (relatively, sufficiently, exceedingly) large quantity', and consequently, what is simply considered to count as 'a lot' in a given context. For example, as (12) shows, it is compatible with *kuča podarkov* 'a pile of presents':

(12) **NA-**daril^{P} Marte kuču podarkov.
CM-give.PAST.3SG Martha.DAT heap.SG.ACC present.PL.GEN
'He gave a pile of presents to Martha.'

The cumulative *na-* is also compatible (and often preferred to co-occur) with DP's with vague quantifiers like *mnogo* 'many', 'a lot' or *nemalo* 'not a few/little', as in (13a). In contrast, *na-* is incompatible with quantifiers denoting a relatively low quantity of entities like *malo* 'a few/little' in (13a) and *dve* 'two' in (13b):

(13) a. Na zemlju **NA-**padalo^{P} mnogo / nemalo / *malo jablok.
on ground **CM-**fell.3SG.NEUT a.lot / not.a.few / *a.few apple.PL.GEN
'A lot of / not a few apples fell to the ground.'
b. **NA-**daril^{P} Marte ??dve kukli.
CM-give.PAST.3SG Martha.DAT ??two doll.PL.ACC
'He gave two dolls to Martha.'

Fourth, a nominal argument that specifies a cardinality or a measure is acceptable only if it is interpretable as an estimate, as in (14a) or (14b). However, it is odd or unacceptable, if it is specific, as in (14c), and hence suggests that a precise count of the relevant entities was taken.

(14) a. Za etot sezon Ivan **NA-**begal^{P} pjat'sot kilometrov. Isačenko 1962
in this season Ivan **CM-**run.PAST.3SG five hundred kilometers
'During this season he managed to run up five hundred kilometers.'[12]
b. to ya uprosil otca ostanovit'sya i svoimi rukami **NA-**rval^{P} celuyu gorst' dikih vishen,
'so I begged my father to stop and with my own hands I picked a whole fistful of wild cherries, …'[13]
c. Za etot sezon Ivan **NA-**begal^{P} ?pjat'sot i tridcat' pjat' kilometrov.
in this season Ivan **CM-**run.PAST.3SG ?five hundred and thirty-five kilometers
'During this season he managed to run up five hundred and thirty-five kilometers.'

1.4 Non-specificity

The nominal argument targeted by a prefix with a use related to measure or quantity introduces a referential argument in episodic sentences. Most importantly, there are no wide-scope or specific readings available for it; it is scopally inert, and in fact, both the prefix and the relevant targeted argument must take scope with the predicate, and hence, cannot take scope over any other scope taking operator or quantifier in a sentence. This

[12] The example is taken from Isačenko (1962, p.395), who gives the following German translation: 'Er hat es in dieser Saison auf 500 Kilometer im Laufen gebracht.'
[13] Sergej Timofeevich Aksakov, *Detskie gody Bagrova-vnuka* [*The Childhood Years of the Bagrov Grandchild*] 1982.

behavior is generally taken to be characteristic of non-specific indefinites, including those that are incorporated (see Sadock 1980, Van Geenhoven 1998, Bittner, 1994, Chung and Ladusaw 2003, Farkas and de Swart 2003). In (15), this behavior is illustrated with negation.

(15) NEG > (CM- + NP), NOT: (CM-+ NP) > NEG
Ne **NA-**kupil^{P} on na vse den'gi knig, no tol'ko sladostei.
NEG **CM-**buy.PAST.3SG he on all money book.PL.GEN but only sweet.PL.GEN
'He did not spend all his money on [*a (large) quantity of*] books, but only on [*a (large) quantity of*] sweets.'
NOT:'There was *a (large) quantity of* books on which he did not spend all his money, …'

The non-specific indefinite nature of the relevant nominal argument is also evident in its behavior with respect to the information structure (or theme-rheme structure) and word order[14]. It can freely occur post-verbally, and it is unacceptable, odd or strongly dispreferred in a pre-verbal position. This point can be best illustrated with examples like (16) and (17) which contain a one-place predicate whose only argument is targeted by *na-*[15]. (Examples are adapted from Polinsky 1994 / ex. (65).)

(16) a. Na daču po-**NA-**exalo^{P} p'janyx gostej.
on weekend-cottage DIST-**CM-**go.PAST.3SG.NEUT drunk.PL.GEN guest.PL.GEN
'There were many/a lot of drunk guests who gradually arrived at the dacha.'

[14] Information structure (or theme-rheme structure) has traditionally been associated with word order in Slavic languages, in particular by the Prague School and the work of Vilém Mathesius, one of its major figures. For the view of information structure that includes the Prague School see Sgall et al. (1986), Hajičová, Partee and Sgall (1998).

[15] Native Russian speakers suggest that (16) and (17) sound more natural if the main verb contains the distributive prefix *po-* in addition to the cumulative prefix *na-*. The prefix *po-* here distributes the property expressed by the verb root (i.e., the property of going or arriving) to separate (subgroups of) individuals and to separate running times. It allows the distribution of this property to *each* atomic individual (*total distributivity*) or to *each* smallest sum of individuals (*intermediate distributivity*) into which the domain of interpretation can be divided, modulo the constraints imposed by the meaning of the main lexical predicate, the relevant discourse and nonlinguistic information. For discussions of distributivity see Katz (1977, p. 127), Link (1991, 1998, p. 52ff.), Schwarzschild (1996, p. 63ff.), Lasersohn (1998), for example. The distributive prefix *po-* in Czech is discussed in Filip and Carlson (2001).

b. ?/#<u>P'janyx gostej</u> po-**NA**-exalo^{P} na daču.
drunk.PL.GEN guest.PL.GEN DIST-**CM**-go.PAST.3SG.NEUT on weekend-cottage
'Many/a lot of drunk guests gradually arrived at the dacha.'

(17) a. Na daču po-**NA**-exali^{P} <u>p'janye gosti</u>.
on weekend-cottage DIST-**CM**-go.PAST.3PL drunk.PL.NOM guest.PL.NOM
'There were many/a lot of drunk guests who gradually arrived at the dacha.'

b. #<u>P'janye gosti</u> po-**NA**-exali^{P} na daču.
drunk.PL.NOM guest.PL.NOM DIST-**CM**-go.PAST.3PL on weekend-cottage
'Many/a lot of drunk guests gradually arrived at the dacha.'

In Russian non-emotive speech, theme (and 'given') generally precedes rheme (and 'new'). (See also Krylova and Khavronina 1988, p.12, for example.) The theme is often identified with the first noun group in the sentence (or clause), and precedes its main verb. The rheme tends to occur post-verbally, and often in the sentence-final position. If a bare nominal argument occurs pre-verbally, there is a strong tendency to interpret it as a specific definite NP, *ceteris paribus*[16]. Now, we see that *p'janyx gostej* (plural genitive) and *p'janye gosti* (plural nominative) are both bad in the sentence-initial position of (16b) and (17b), respectively. This can be motivated if we assume that they cannot be interpreted as specific definite, because they are linked to the prefix *na-* that excludes this interpretation. A sentence like (16b) with the genitive argument is judged worse than (17b) with the nominative one[17]. In contrast, (16a) and (17a) are perfectly acceptable, with the same arguments occurring in the sentence final position. Assuming that *na-* requires them to be interpreted as non-specific indefinites, then it is unsurprising for them to occur in the position independently taken to be the natural locus of non-specific indefinites in a sentence.

Now, if we slightly modify the above sentences by omitting *na-*, as in (18a), or using a directional prefix, as in (18b), we see that the bare subject arguments here freely occur in the sentence-initial position and have the default specific definite interpretation. This clearly suggests that the constraints on the post-verbal placement and non-specific indefinite interpretation of bare plural arguments in (16-17) must be due to the prefix *na-*.

(18) a. <u>P'janye gosti</u> exali^{I} na daču.
drunk.PL.NOM guest.PL.NOM go.PAST.3PL on weekend-cottage.SG.ACC
'The guests traveled / were traveling to the dacha.'

b. <u>P'janye gosti</u> kak-to **DO**-exali^{P} na daču.
drunk.PL.NOM guest.PL.NOM somehow **DIR**-go.PAST.3PL on weekend-cottage.SG.ACC
'The drunk guests somehow managed to arrive in their cars at the dacha.'

[16] For Russian information structure see Bailyn (1995), King (1995), Junghanns and Zybatow (1997), to give just a few among the more recent studies.

[17] This difference in acceptability is possibly related to the general tendency for nominative subjects to occur pre-verbally, and for subjects in other cases than the nominative (if they indeed can count as subjects) post-verbally.

Finally, we can support the obligatory non-specific nature of the nominal argument that provides the sortal basis for *na-* by the observation that it cannot be realized by a specific NP like a personal pronoun or an NP containing a demonstrative, as we see in (19):

(19) a. Ivan **NA-**daril^{P} Marte ??etu kuču podarkov.
Ivan **CM-**give.PAST.3SG Martha.DAT ??this.SG.ACC heap.SG.ACC present.PL.GEN
'Ivan gave this pile of presents to Martha.'

b. Ivan **NA-**daril^{P} ??ix Marte
Ivan **CM-**give.PAST.3SG ??they.PL.GEN Martha.DAT
'Ivan gave them to Martha.'

1.5 Thematic selectivity

As far as the type of a nominal argument targeted by the cumulative prefix *na-* in Russian is concerned (and other prefixes expressing some quantitative criterion related to individuals), it can be characterized in thematic terms: namely, it is a *nominal predicate introduced by an argumental {Incremental/Holistic} Theme DP/NP.* 'Incremental Theme' and 'Holistic Theme' are here used in the sense of Dowty (1991), the latter with reference to a moving entity and defined with respect to the Incremental (Path) Theme.

In our initial example (2b), the prefix *na-* targets the individual variable introduced by the Incremental Theme argument 'jam'. In (20a), the prefix *na-* only targets the individual variable introduced by the direct object argument, here the bare plural argument 'nice dolls', standing in the Holistic Theme relation to the verb. That is, 'My relatives gave children a lot of nice dolls' is the only meaning that (20a) can have.

(20) a. Moji rodstvenniki **NA-**darili^{P} rebjatam xorošije kukli.
my relative.PL.NOM **CM-**give.PAST.3PL child.PL.DAT good doll.PL.ACC
'My relatives gave the children a lot of nice dolls.'
NOT: '*A lot of my relatives* gave the children (some) nice dolls.'
'My relatives gave nice dolls to *a lot of children*'.

b. Moji rodstvenniki **NA**-darili[P] rebjatam *<u>xorošuju kuklu.</u>
my relative.PL.NOM **CM**-give.PAST.3PL child.PL.DAT *good doll.SG.ACC
'My relatives gave the children a nice doll.'

c. Ivan **NA**-guljalsja[P] po gorodu.
Ivan **CM**-walk.PAST.REFL around town
(i) 'Ivan covered a long distance by walking around the town.'
(ii) 'Ivan spent a lot of time walking around the town.'
(iii) 'Ivan walked a lot / enough / to his heart's content around the town…'

Other logically possible meanings do not seem to play a role here. For example, (20a) cannot mean '*A lot of my relatives* gave the children nice dolls' or 'My relatives gave nice dolls to *many / a lot of children'*. This means that *na-* cannot target the individual variable introduced by the subject (Agent) or indirect object (Recipient) argument.

Moreover, (20a) would not seem to be necessarily/readily understood as 'There were *many/frequent (separate) occasions* on which my relatives gave nice dolls (but not necessarily many nice dolls on each occasion) to the children', which indicates that *na-* does not here necessarily/readily function as an adverb of quantification that binds the event variable introduced by the main episodic predicate 'give'[18]. However, the appearance of the event argument being targeted by *na-* in (20a) derives from the observation that (20a) can have a distributive interpretation, whereby the property of giving of presents can be distributed to each individual child (total distributivity) or to each relevant sum of individuals (intermediate distributivity). The distributive interpretation generates a reference to a plurality of giving events distributed over temporally separate occasions of giving. This may then give the appearance of *na-* only or mainly measuring the plurality of such a plurality of events. However, (20a) does not require this type of an interpretation, as it can also have a collective interpretation, but what is invariable across all the possible interpretations that (20a) can have is the requirement that a relatively large quantity of dolls is involved in each. Hence, we may conclude that *na-* here necessarily measures the referent of 'nice dolls', the Holistic Theme argument.

A further piece of support for this claim can be seen in the ungrammaticality of (20b), which minimally differs from (20a) in having the Holistic Theme argument realized by a singular count argument. As we have already seen above (see Section 2.3), singular count arguments are incompatible with *na-*. If *na-* could be here linked to some other argument of a verb, apart from the one introduced by the Holistic Theme direct object,

[18] A similar point can be made with respect to our initial example (2b): Here, *na-* necessarily measures the quantity of jam, and is underdetermined with respect to the length of time the cooking event took. Moreover, the quantity of jam and the temporal trace associated with the cooking event are independent of each other: You can certainly cook up a large quantity of jam in a short amount of time, and vice versa, you can spend a lot of time cooking, and as a result there need not be a lot of jam cooked.

then we would expect that the ungrammaticality of (20b) could be avoided and other logically plausible interpretations activated. However, this is not the case, and (20b) cannot mean, '*A lot of my relatives* gave a nice doll to the children', 'My relatives gave a nice doll to *many children*' or 'My relatives *often/many times* gave a nice doll to the children', for example.

With verbs of motion, as in (20c), it is the length of the path covered that lends itself naturally to providing the suitable part-whole structure to be measured by the prefix. Apart from the Incremental Path Theme, a type of the Incremental Theme, the prefix *na-* can here also measure the temporal trace associated with the described event, yielding a meaning of approximately 'to walk for a long time'. It may also mainly concern the degree of satisfaction with the event by its participants. (A discussion of such readings of (20c) is also given in Filip 2000.)

It is important to emphasize that the choice of the thematic argument that provides the appropriate part-whole structure for measurement by the prefix *na-* will depend not only on the lexical semantics of the base verb with which the prefix combines, but also will vary with the linguistic and extra-linguistic context, and it may also be determined by convention and our understanding about the prototypical course of events in the world. For example, an event of giving, as expressed by (20a), is naturally measured by the quantity of the presents, denoted by the Holistic Theme argument, transferred (or at least intended to be transferred) to the recipient, and not the path covered by the presents from the giver to the recipient in the concrete spatial domain or some abstract domain of change of possession. When it comes just to moving in space, the path covered provides the typical part-whole structure for measurement, in the simplest case at least, that is, when the moving individual (Holistic Theme) on its own cannot, as in (20c). However, in (16)-(17), we have seen that the plural Holistic Theme argument provides the right part-whole structure for measurement by the prefix *na-*: namely, what here matters is the number of guests who arrived, rather than the path they each individually or collectively covered in the described event of arriving.

It is also worth mentioning that 'Incremental Theme' is here (as in Dowty 1991), reserved only for those cases in which it is entailed by the meaning of the predicate itself, and in which the relevant nominal argument linked to it is singular, because only such cases are relevant for argument selection. The plural Holistic Theme arguments in (16) and (17) only appear to be linked to the Incremental Theme, because they are here combined with an inherently distributive verb 'arrive'. This combination generates a

reference to a plurality of individual motion events, one for each atomic individual in the denotation of the plural Holistic Theme argument, hence it could be understood homomorphically: namely, the macro-event (which consists of all these individual events) would have subparts corresponding to the atomic individuals in the denotation of the plural subject.

The Incremental Theme and Holistic Theme can be lexicalized as the subject argument of an unaccusative verb or the direct object argument of a (di)transitive verb. That is, I do not assume that the association of the (internal) direct object with these thematic properties is a necessary one (see also Dowty 1991, p.610 and elsewhere). As is common, I assume that *direction of motion* verbs like FALL (see (8a)), including agentive direction of motion verbs like ARRIVE (see (16-7)), are unaccusative[19].

2. SUGGESTED ANALYSIS

2.1 Background assumptions

I presuppose the general framework of event semantics with lattice structures. The framework minimally comprises an ontology with individuals $\mathcal{I}$, times $\mathcal{T}$ and eventualities $\mathcal{E}$ as basic entities ('eventualities' in the sense of Bach 1981, 1986). Each ontological domain has the structure of a complete join semilattice, and is (partially) ordered by the part relation '$\leq$'. (See proposals in Link 1983, 1987; Bach 1981, 1986.) Verbs denote properties of eventualities, i.e., they have as a part of their interpretation some member of the set $\mathcal{E} = \{E_1, E_2, \ldots\}$, where each E_n is classified as belonging to the set of *states, processes* or *events*. (See Bach 1981, 1986 for the characterization of this tripartite distinction.) In general, specifying the lexical meaning of a verb consists of identifying a new node in the lattice of eventuality types and localizing it with respect to other members of $\mathcal{E}$ (see also Carlson 2003a,b).

The meaning of a common noun is a property of individuals (of extensional type $\langle e,t\rangle$, intensional type $\langle s, \langle e,t\rangle\rangle$): namely, some member drawn from a set of properties $P = \{P_1, P_2, \ldots\}$, with $[\![N]\!] = P_n$. Phrasal projections of nouns can shift

[19] However, on Dowty's (1991) view, agentive direction of motion of verbs would be classified as unergative. Dowty (1991, p.606ff. and 614) argues that Proto-Agent and Proto-Patient are the two (fuzzy) categories of arguments that semantically characterize unergatives versus unaccusatives, to the extent that the distinction has any clear semantic characterization. There are two entailments, each from a different proto-role, which are the most important for the unergative/unaccusative contrast: 'volition' (and hence sentience) from the list of Proto-Agent properties, and 'Incremental Theme' from the list of Proto-Patient properties. Although Dowty's (1991) view of the unergative versus unaccusative distinction is compelling, adopting it here would lead to a less uniform statement of the thematic type of an argument targeted by a measure prefix. In the absence of further independent evidence that would directly bear on the issues discussed in this paper, I will assume the common (though not uncontroversial) view that agentive direction of motion verbs are unaccusative, with Holistic Theme (the latter understood as including reference to a moving entity and defined with respect to the Incremental Theme) as its only argument.

meaning through available type shifting operators into the argumental types *e* and <<*e,t*>,*t*>, as summarized in (21). In the DP analysis of noun phrases, this means that NP's are of type <*e,t*> and DP's of type <*e*> or <<*e,t*>, *t*>, with determiners facilitating the type-shifting operations. In general, I build on the flexible type-theoretic framework developed by Partee (1987), and its elaborations in Chierchia (1998) and Dayal (2004). The use of the sigma operator σ for Slavic languages is independently motivated in Filip (1996, 2004), based on independent proposals in Bittner and Hale (1995).

(21)

∃	$\lambda P \lambda Q \exists x[P_s(x) \wedge Q_s(x)]$	
Nom $^{\cap}$	$\lambda P \lambda s\, \iota x[P_s(x)]$	Chierchia (1998)
iota ι	$\lambda P\, \iota x[P_s(x)]$	
sigma σ	$\lambda P\, \sigma x[P_s(x)]$	Sharvy (1980), Link (1983)

2.2 Russian verbal prefixes and measures

In our initial example (2b), we have seen that the cumulative *na-* measures the volume of 'jam', and yields the interpretation of a nominal measure phrase, approximately 'a (relatively, sufficiently) large quantity of jam'. The prefix *na-* also patterns with nominal measure phrases like *one liter (of)* in so far as it takes homogeneous predicates as its input (see Section 2.3 above). In general, extensive measure functions like *LITER* are directly applied to individual variables and yield nominal measure phrases (or pseudo-partitives), as is represented in (22):

(22) direct measurement of individuals: $x \rightarrow \mu(x)$
$[\![$*one liter of wine*$]\!] = \lambda x[\text{WINE}(x) \wedge \text{LITER}(x) = 1]$, where LITER: measure function

One liter of wine generates telic predicates when applied to predicates that are not telic, provided it is linked to the Incremental Theme argument and assuming the standard rules of aspectual composition (see Krifka 1986, 1992 and Dowty 1991). This is exemplified by (23).

(23) John drank <u>one liter of wine</u> in an hour / ?for an hour.

In short, *one liter (of)* directly measures individuals, and indirectly events via the homomorphic mappings that define the Incremental Theme relation. Similarly, in our initial example (2b), the prefix *na- directly* measures the volume of jam, and *indirectly* the cooking event via the denotation of 'jam' which is linked to the Incremental Theme relation.

In examples like (20c), the quantitative criterion expressed by *na-* can be associated with the event's temporal trace, with (20c) then being understood as 'Ivan walked around the town for a long time'. Now, to the extent that *na-* in (20c) may contribute to conveying what amounts to the durative temporal phrase *for a long time*, we may accept the same argument made by Krifka (1989) for temporal measure phrases. Krifka argues that *for an hour* in *John walked for an hour*, for example, cannot directly measure the walking event, because events have no measurable temporal extent. Instead, *for an hour* indirectly measures the walking event by measuring its run time. We construct temporal measure functions for eventualities by using the temporal trace function τ (Link 1987, Krifka 1989, 1992, 1998). It maps eventualities (the extension of $\mathcal{E}$) to their run times (the extension of $\mathcal{T}$). As defined in (24a), it is a homomorphism with respect to the sum operations for eventualities and times: The run time of the sum of two events *e, e'* is the sum of the run time of *e* and the run time of *e'*. The output of the temporal trace function then serves as an input into the temporal measure function expressed by *for one hour*, as shown in (24b). We 'standardize' temporal functions for events by requiring that $\text{HOUR}(\tau(e)) = \text{HOUR}(e)$ for all temporally contiguous eventualities.

(24) a. <u>temporal trace function</u> τ: $\mathcal{E} \rightarrow \mathcal{T}$ Link 1987, Krifka 1989, 1992, 1998
$\forall e,e'[\tau(e \oplus_E e') = \tau(e) \oplus_T \tau(e')]$
[The run time of the sum of two events *e, e'* is the sum of the run time of *e* and the run time of *e'*.]
'$\oplus$': binary sum operation, a function from U×U to U, idempotent, commutative, associative.

b. $\mu_T(\tau(e))$, where μ_T is a free variable over temporal measure functions
Standardization: $\mu_T(\tau(e)) = \mu_T(e)$ [i.e., $\text{HOUR}(\tau(e)) = \text{HOUR}(e)$]

(20c) can also be understood as meaning 'Ivan covered a long path by walking around the town' (expressed in somewhat non-idiomatic English), that is, *na-* here measures the path trace implicit in the PP *po gorodu* '(all) around the town'. The measures over paths associated with eventualities can be constructed by means of the path trace function π (Lasersohn 1995, Krifka 1998). The path trace function π maps eventualities to the paths covered during the described eventuality, the extension of $\mathcal{L}$ (the set of locations, a type of individuals). It is defined in (25a).

(25) a. path trace function π: $\mathcal{E} \rightarrow \mathcal{L}$ Lasersohn 1995, Krifka 1998
$\forall e,e'[\pi(e \oplus_E e') = \pi(e) \oplus_L \pi(e')]$
[The path trace of the sum of two events *e, e'* is the sum of the path trace of *e* and the path trace of *e'*.]

b. $\mu_L(\pi(e))$, where μ_L is a free variable over path measure functions
Standardization: $\mu_L(\pi(e)) = \mu_L(e)$ [i.e, $\text{MILE}(\pi(e)) = \text{MILE}(e)$]

Measure phrases like *for one hour* or *one mile* apply to times and paths, respectively. They generate telic predicates when applied to atelic ones, because they set upper bounds to events, via the relevant homomorphic relations. This is illustrated in (26):

(26) a. $[\![\textit{walk for an hour}]\!] = \lambda x,e[\text{WALK}(x,e) \wedge \text{HOUR}(e) = 1]$
$e \rightarrow \tau(e) \rightarrow \text{HOUR}(\tau(e))$

b. $[\![\textit{walk a mile}]\!] = \lambda x,e[\text{WALK}(x,e) \wedge \text{MILE}(e) = 1]$
$e \rightarrow \pi(e) \rightarrow \text{MILE}(\pi(e))$

There is a range of functions that homomorphically map eventualities to part-whole structures appropriate for their measurement. Such part-whole structures are based on concrete objects like apples, temporal traces or path structures, for example, all of which can be modeled as topological one-dimensional directed path structures, as Krifka (1998) proposes. The selection of the appropriate homomorphism will depend on the lexical semantics of the main verbal predicate and its semantic arguments in a given predication, on the linguistic and extra-linguistic context, and it may also be determined by convention and how we understand the normal or prototypical course of the described event in the world. This idea can be then schematically represented as in (27)[20]:

(27) indirect measurement of events: $e \rightarrow h(e) \rightarrow \mu(h(e))$
h: free variable over functions from eventualities to part-whole structures (e.g., temporal trace function τ, path trace function π)

[20] Nakanishi (2003) distinguishes between 'direct measure functions', which apply to individuals, and 'indirect measure functions', which apply to the output of a homomorphic function which maps eventualities to run times or paths associated with eventualities.

μ: free variable over measure functions (e.g., HOUR, MILE)

We have seen that there are close intuitive parallels between the semantics of the cumulative prefix *na-* and the semantics of measure phrases that delimit the volume of some stuff (see also Flier 1985, p.50, 55)[21]. In order to represent such parallels in the most direct way, it is reasonable to propose that the cumulative prefix *na-* be assimilated to the class of measure phrases. The same holds for the attenuative/delimitative *po-* and other measure prefixes. This amounts to the proposal that they introduce a measure function into the logical representation. Now, if we accept this view, and also the assumption that eventualities can only be indirectly measured via some suitable part-whole structure, we are also forced to assume that measure prefixes cannot be directly applied to the event argument introduced by the verb stem to which they are attached, but rather they are applied to the individual argument, the temporal trace or path trace, for example, which are associated with the event argument by the relevant homomorphic mapping. In other words, the cumulative *na-* and the attenuative/delimitative *po-*, when they measure individuals introduced by nominal arguments, are semantically composed with these arguments, even if they do not form syntactic constituents with them. Semantically, the result of such a combination can be treated in a similar way in which we treat nominal measure phrases like *at least three pounds* as in *at least three pounds of jam*[22].

[21] Flier (1985, p.50, 55) compares the delimitative prefix *po-* to nominal measures like *čaška čaju* 'a cup of tea', *kusok saxaru/saxara* 'a piece of sugar', *buxanka xleba* 'a loaf of bread', etc. According to him, *poxodit'* can be viewed as a bit (a while's worth) of walking, *posalit'* as a bit of being mischievous and *porubit'* as a bit of chopping. The activity is measured in terms of time, just as mass nouns are measured in terms of volume, whereby X unit of time's worth of the activity is roughly analogous to X cupsful of sugar, Y buckets of water.

[22] This proposal is in the spirit of Spencer and Zaretskaya (1998). They argue that a large class of Russian prefixed verbs has essentially the same semantic structure as the resultative construction in English. According to them, prefixation leads to a complex lexeme that has the properties of lexical subordination, where the prefix is semantically primary and the base predicate lexeme secondary. For example, a sentence like *Ona is-pisala svoju ručku* – 'Her pen has run out of ink' (their example (51)) is assigned the following representation: [[CAUSE[ACT(*she*)], IZ(*pen*)], $_{BY}$[WRITE(*she*)]] (their representation (54)), which is intended to convey that "the pen became 'exhausted' (in some sense that is defined in part semantically and in part pragmatically) by virtue of writing activity. This is then completely parallel to the analysis given for *They drank the pub dry*. The main difference is that the adjective *dry* in the English resultative can be semantically more specific than the rather vague prefix in the Russian (…)" (p.17-18).

A related mainly-syntactically motivated proposal is given by Verkuyl (1999). He suggests "connecting the perfective prefix Perf semantically to the information contributed by NP2 [= the internal direct object, HF]. (...) the linear order in which morphemes occur in a complex-word by concatenation is dissociated from the partial order which governs the syntactic structure determining the interpretation. It allows for taking Perf as an operator having the VP in its scope. This makes it possible to define a prefix as putting constraints on the VP. For example, the Polish prefix *prze-* might be taken as requiring that the NP2 be [+SQA], so that the aspectual value at the lower VP level is [+T], after which the VP' receives its plus value as the result of combining Perf and VP. There are several ways to merge the Perf and its V*stem*, one of them being the current generative use of functional nodes" (p.108-9).

The semantics of measure phrases here builds on the proposal in Landman (2000, 2001, 2004), which is couched within his *Adjectival Theory of Indefinites.* There is a natural fit between the framework presupposed here and Landman's, because both assume the theory of plurality originating in the work of Sharvy (1980) and Link (1983). In general, a measure phrase consists of three semantic ingredients: μ measure, *r* numerical relation, *n* number, as is schematically represented in (28):

(28) Compositional structure of a measure phrase
$\lambda x[\mu(x)\ r\ n]$

symbol	semantic type	example
μ measure	$<e,n>$ function from objects to numbers	*pound* → POUND C(ardinality) → ∅
r numerical_relation	$<n,<n,t>>$ relation between numbers, it takes a natural number as an input and yields a set of numbers of type $<n,t>$	*at most* → ≤
n number	*n* number	*three* → 3

According to Landman, the measure phrase is built by *applying* a numerical relation *r* of type $<n,<n,t>>$ to a number *n* of type *n* forming a numerical phrase *(r(n))* of type $<n,t>$, and *composing* the numerical phrase with a measure μ of type $<e,n>$: (i) *at most three* → APPLY(≤,3) = (≤(3)) (of type $<n,t>$) = $\lambda n.n \leq 3$ = {0,1,2,3} (on the domain of natural numbers); *at most three* is a numerical phrase, it denotes a set of numbers of type $<n,t>$; (ii) COMPOSE[(r(n)), μ] = (r(n)) o μ = $\lambda x.([r(n)]([\mu(x)]))$, where *r* is a relation between *μ(x)* and *n*: $\lambda x.\mu(x)\ r\ n$. The numerical phrase composed with the measure yields a measure phrase with the interpretation of an intersective adjective of type $<e,t>$.

Measure phrases like *at least three pounds* as in *at least three pounds of jam* pattern with numerical phrases like *at least three* in *at least three boys* in so far as their semantics is intersective. For example, *three* intersectively picks out three-membered pluralities, and *three boys* denotes (sums of) boys with three atoms. Similarly, *at least three feet of snow* denotes (sums of) snow to the amount of at least three feet: $\lambda x[\text{FOOT}(x) \geq 3] \cap \text{SNOW} = \lambda x[\text{SNOW}(x) \wedge \text{FOOT}(x) \geq 3]$. The assumption that measure phrases, numerical

phrases, and more generally, indefinites are semantically intersective adjectives[23] is at the core of Landman's *Adjectival Theory of Indefinites*, whose main tenets are summarized in (29):

(29) a. *Principle A: Indefinites have the semantics of intersective adjectives.*
Indefinite determiners are interpreted at type $<e,t>$, the type of sets of individuals. It is the same type as that of adjectives, and semantically indefinite determiners combine with the noun by intersection, as is standardly assumed for intersective adjectives.

b. *Principle B: The Existential Closure.*
Argument interpretations of indefinite noun phrases are derived from predicative interpretations through type lifting with Existential Closure.

In order to represent the semantics of the Russian cumulative *na-* and attenuative/delimitative *po-*, we need to enrich the general structure of a measure phrase in given in (28) with two additional elements. First, the measure function μ in their logical structure instantiates an *extensive measure function*[24]. Second, we need to require that they generate *maximally separated entities*. Extensive measure functions have two main properties: they must be additive, and can only be applied to homogeneous predicates. The relevant mereologically-based definitions following Krifka (1989, 1998) are given in (30) and (31).

(30) μ is an extensive measure function for a given part structure iff:
μ is additive: If $\neg x \otimes y$, then $\mu(x \oplus y) = \mu(x) + \mu(y)$
[The sum of the measure of non-overlapping elements is the measure of their sum.]
'⊗': the overlap relation: $x \otimes y \leftrightarrow \exists z \in U\ [z \leq x \wedge z \leq y]$
'≤': part relation: $\forall x,y \in U[x \leq y \leftrightarrow x \oplus y = y]$

(31) An extensive measure function μ is applied to homogeneous predicates.
a. $HOM(P) \leftrightarrow DIV(P) \wedge CM(P)$
b. $DIV(P) \leftrightarrow \forall x,y[P(x) \wedge y<x \rightarrow P(y)]$

[23] The assumption that measure phrases have the semantics of intersective adjectives (i.e., predicates of the intersection sets, or simple properties) naturally motivates the observation independently made by Jackendoff (1977) and Klooster (1972, p.18ff.) that the quantifier in a nominal measure phrase must be weak: cp. **most feet of snow vs. three feet of snow*.

[24] Cartwright (1975) introduced the notion of 'measure function' into the semantics of measure phrases, according to Krifka (1989). The requirement that the cumulative *na-* expresses an extensive measure function separates this use of *na-* from what is labeled the 'saturative' use of *na-* in traditional Aktionsart classification of prefixal uses (see Section 2.1). In the 'saturative' use of *na-,* the quantitative criterion inherent in *na-* mainly concerns properties that form the basis for non-extensive measure functions like various affective connotation regarding intensity, persistency, satisfaction with the event, and the like.

[A predicate *P* is *divisive* if and only if whenever *P* applies to *x*, then it must also apply to any *y* that is properly included in *x*.]
'<': proper part relation: $\forall x,y \in U\ [x<y \leftrightarrow x \leq y \wedge x \neq y]$

c. $CM(P) \leftrightarrow \forall x,y[P(x) \wedge P(y) \rightarrow P(x \oplus y)] \wedge \exists x,y[P(x) \wedge P(y) \wedge \neg x = y]$
[A predicate *P* is *cumulative* if and only if, whenever *P* applies to any *x* and *y*, it also applies to the sum of *x* and *y*, and *P* should apply to at least two distinct entities.]

d. $QUA(P) \leftrightarrow \forall x,y[P(x) \wedge P(y) \rightarrow \neg y<x]$, where $x \neq y$
[A predicate *P* is quantized iff, whenever it applies to *x* and *y* (where $x \neq y$), *y* cannot be a proper part of *x*.]

For example, weight measured in ounces is additive: If a gold chain weighs two ounces and a gold pendant attached to it weighs one ounce, then they make up a necklace that weighs three ounces. In contrast, temperature measured in degree Celsius is not additive: If a quantity of water has sixty degree Celsius and another quantity of water has twenty degree Celsius, they do not add up to a quantity of water that has eighty degree Celsius. Hence, degree Celsius is a non-extensive measure function. The difference between *extensive* and *non-extensive* measure functions is evident in their differential behavior with respect to nominal measure (or pseudopartitive) constructions (32) and to compounds (33), as Krifka (1989, 1998) and Schwarzschild (2002), for example, observe.

(32) nominal measure construction
a. two pounds of oranges
b. *sixty degrees Celsius of water

(33) compound construction
a. *two pound(s) oranges
b. sixty degree Celsius water

The mereological property of homogeneity is defined in (31) as a conjunction of divisivity and cumulativity[25]. For example, *sugar* is homogeneous, because *any* proper part of some quantity of *sugar* will count as sugar (disregarding certain minimal or smallest 'parts'), and adding sugar to sugar amounts to something that again falls under the denotation of *sugar.* The same holds for bare plurals like *oranges.* The homogeneity

[25]The definition of homogeneity follows some suggestions in Moltmann (1991) and Kiparsky (1998). The definition of cumulativity in (31c) is based on Krifka (1986 and elsewhere) and the notion of 'cumulative reference' is due to Quine (1960, p. 91).

requirement excludes extensive measure phrases and singular count nouns as inputs of extensive measure phrases: cp. **hundred grams of five meters of fabric, two pounds of a book*[26]. (See also Section 2.3 above.) Predicates that are not homogeneous are quantized, as defined in (31d).

The second specific requirement on the representation of Russian measure prefixes concerns the maximality requirement. As Filip (2000) shows, perfective verbs with such prefixes fail to be telic, in the sense of Krifka's quantized property defined in (31d), because they fail to be *either* cumulative *or* divisive. Nevertheless, they pattern like perfective verbs that are clearly telic with respect to most standard distributional tests. To illustrate this point, let us take *nagulját'sja*^{P} in the sense of 'to walk for a long time', as in (20c) above. If six hours of walking is considered to be walking for a long time in a given context (event *e*), then in the same context walking for five hours (event *e'*), may be as well, but not walking for one hour (event *e''*). This means that there are events like *e* (walking for six hours) in the denotation of *nagulját'sja*^{P} 'to walk for a long time' that have a proper subpart like *e'* (walking for five hours) which is also an event in the denotation of this verb. Therefore, *nagulját'sja*^{P} fails to be quantized, according to (31d), and it qualifies as cumulative, according to (31c), as the sum of two events like *e* and *e'* or *e* and *e''* will count as walking for a long time. The converse of *nagulját'sja*^{P} 'to walk for a long time', namely *pogulját'*^{P} in the sense of 'to walk for a (short) time' fails to be cumulative, according to (31c), but it is divisive, according to (31b).

In this respect, as Filip (2000) also observes, perfective verbs with measure prefixes behave like nominal measure phrases with vague extensive measure expressions: cp. *a large/small quantity of jam*. They fail to be quantized, when analyzed in isolation as predicates, nevertheless they behave like uncontroversial quantized noun phrases with respect to aspectual composition and temporal adverbials in so far as they induce the telic interpretation of complex predicates they form. (This problem has been noticed by many, including Partee (p.c.) with respect to nominal measure phrases, and also with respect to DP's with certain vague quantifiers and singular count nouns like *a ribbon, a fence*; see L. Carlson 1981, p. 54, Mittwoch 1988, p. fn.24, Dahl 1991, p. 815, Moltmann 1991, Zucchi and White 1996, Krifka 1997, Rothstein 2004, among others.) For example, *a large/small quantity of jam* behaves like *an apple* with respect to aspectual composition, i.e., when it serves as an Incremental Theme argument of a verb, it generates complex

[26] An alternative formulation of these two constraints on extensive measure functions has recently been proposed by Schwarzschild (2002): (i) The measure function μ must be monotonic relative to the denotation of the host noun x, which means that if x is a proper subpart of y, then $\mu(x) < \mu(y)$; (ii) the host noun must have a part-whole structure. Intuitively, weight is a monotonic property relative to the part-whole structure of a necklace, for example, because any subpart of a necklace will weigh less than the whole necklace itself. Darkness is non-monotonic since there is no guarantee that any subpart of a lump of gold will be less dark than the lump itself. Measure functions that are not extensive are based on non-monotonic properties like color saturation or temperature.

telic predicates: cp. *Ivan ate an apple/a large quantity of jam in five minutes / ??for five minutes*.

It is reasonable to require that nominal measure phrases with vague extensive measure expressions like *a large/small quantity of jam* and Slavic perfective verbs with measure prefixes are semantically treated like singular count nouns like *an apple* in so far as they denote entities that are clearly separated from one another and do not overlap spatially and temporally. This can be accomplished with the notion of 'maximal separated entity' (MS), based on the notion of adjacency[27], proposed by Krifka (1997):

(34) a. MS(P)(x), x is a maximal separated entity of type P if P(x), and for all y with P(y) and x<y, it holds that every z with z<y and $\neg x \otimes z$ is not adjacent to x.

b. Standardization: MS#(P)(x) = 1 if MS(P)(x)
Generalization: $\forall x,y[\neg x \otimes y \rightarrow MS\#(P)(x \oplus y) = MS\#(P)(x) + MS\#(P)(y)]$
'#' is the atomic number function, a kind of extensive measure function:
If At(x), then #(x) = 1; if $\neg x \otimes y$, then $\#(x \oplus y) = \#(x) + \#(y)$.

Given the above observations, the interpretation schema for Russian verbal prefixes that express a measure function over individuals can be then given as in (35). The interpretation for the cumulative use of the prefix *na-* and the attenuative use of the prefix *po-* are given in (36a) and (36b), respectively. (A similar proposal can also be found in Filip 1992, 2000.)[28]

(35) PREFIXμ → $MS\{\lambda x[\mu_C(x) = n_C]\} \wedge n_C \; r \; C_C$
C_C: free variable over contextually determined standards of comparison

(36) a. NA_{CM} → $MS\{\lambda x[\mu_C(x) = n_C]\} \wedge n_C \geq C_C$
Presupposition: C_C is considered to be a high estimate.

b. PO_{ATN} → $MS\{\lambda x[\mu_C(x) = n_C]\} \wedge n_C \leq C_C$
Presupposition: C_C is considered to be a low estimate.

[27] The topological notion of 'adjacency' is to be understood in the following way: "adjacent elements do not overlap, and (...) if an element *x* is adjacent to an element *y* that is a part of an element *z*, either *x* is also adjacent to *z*, or *x* overlaps *z*" (Krifka 1998, p.203).

[28] Piñón (1994) also proposes that the cognate Polish cumulative prefix *na-* can be semantically analyzed as a measure function.

[a.-b.: Maximally separated sums of x to the amount of some contextually specified number n_C such that there are n_C of contextually specified measure units μ_C and n_C meets/exceeds (36a) or meets/falls short of (36b) the contextually specified standard of comparison C_C.]

The measure function μ_C varies with the context, it can be instantiated by some standard measure of volume (LITER); it may be realized by some non-standard amount of measure based on containers like *a bucket(ful)*, or understood in terms of vague classifier-like measures such as *a unit, a portion, a piece, a quantity.* Applied to an individual x, the measure function μ_C yields some positive real number n_C as a value. Since the prefixes *na-* and *po-* used as extensive measures are vague, all we can say is that the cumulative prefix *na-* requires that this contextually determined number n_C meet or exceed some contextually determined standard of comparison C_c, which in turn must be a high estimate in the case of *na-;* the attenuative prefix *po-* requires that C_c be a relatively low estimate, and that n_C meet or fall short of it. Similarly as in the case of cardinal quantifiers like *a lot (of)* or *many*, measure prefixes are context-dependent in so far as the standard of comparison C_c varies with the context.

The quantizing (and hence ultimately telic) effect of a measure prefix does not come from the standard of comparison C_c, because we would still have problems with divisivity (in the case of *na-*), according to (31b), and with cumulativity (in the case of *po-*), according to (31c). Rather, it is due to the assumption that a measure prefix generates reference to maximally separated entities. All predicates denoting maximally separated entities must be quantized, according to (31d).

Now, going back to our initial example (2b), the prefix *na-*, semantically analyzed as a measure phrase and based on (36a), is directly composed with the bare mass noun 'jam' (of type $<e,t>$) by intersection to yield a measure predicate of type $<e,t>$:

(37) a. On kak-to varenya **NA-varil**^{P}. [= (2b)]
he somehow jam.SG.GEN **CM-**cook.PAST.3SG
'He made / cooked up a (relatively) large quantity of jam.'

b. $\check{}[\![NA]\!](\check{}[\![varenye]\!]) \rightarrow$
$(MS\{\lambda x[\mu_C(x) = n_C]\} \wedge n_C \leq C_C) \cap$ JAM $=$
$MS\{\lambda x[JAM(x) \wedge \mu_C(x) = n_C]\} \wedge n_C \geq C_C$ (of type $<e,t>$)
[Maximally separated sums of jam to the amount of some number n_C of measure units μ_C that exceeds the contextually specified standard of comparison C_C.]

The denotation of the combination the measure prefix *na-* with the bare mass noun 'jam' is a measure predicate of type $<e,t>$, it picks out maximally separated sums of jam to the amount of some contextually specified number of measure units that exceed some contextually determined standard of comparison.

A measure prefix can combine by intersection only with homogeneous predicates. However, in Section 2.3, we have seen that a measure prefix like *na-* can also target an

argument introducing a predicate that is not homogeneous into the logical representation. In general, the relation between a measure prefix and the {Incremental/Holistic} Theme argument that is not homogeneous is a type of semantic agreement, and subject to a different mode of composition than simple intersection. The two can be combined just in case their quantity specifications match. For example, the cumulative *na-* is compatible with DP's that contain vague weak determiner quantifiers like *mnogo* 'many', 'a lot' or *nemalo* 'not a few/little', and also with certain nominal measure phrases like *kuča podarkov* 'a pile of presents', based on non-standard measures of amounts like *kuča* [fem. sg. nom.] 'a pile', 'a heap'. What such DP's/NP's share is that they fail to be homogeneous, because they fail to be divisive. Take *kuča podarkov* 'a pile of presents', for example, as in (12), repeated here in (38):

(38) **NA-**daril^{P} Marte kuču podarkov. [=(12)]
CM-give.PAST.3SG Martha.DAT heap.SG.ACC present.PL.GEN
'He gave a pile of presents to Martha.'

Kuča podarkov 'a pile of presents' fails to be divisive, because not every proper part of its extension will be describable with *kuča podarkov* 'a pile of presents'. It is cumulative: If *a* can be described as *kuča podarkov* 'a pile of presents', and *b* is, as well, then the sum of *a* and *b* is describable by *kuča podarkov* 'a pile of presents'. The attenuative prefix *po-* is compatible with measured and quantified NP's/DP's that fail to be cumulative, but are divisive.

2.3 Non-specific indefinites and event semantics

So far we have derived a measure predicate with a semantic interpretation equivalent to properties, that is, it is of type $<e,t>$. As is standard in Discourse Representation Theory since the work of Kamp (1981) and Heim (1982), some and perhaps all indefinite DP's have semantic interpretations equivalent to properties. Property-denoting indefinites cannot be directly composed with a predicate that requires an argument of type *e*, because of the type-mismatch between the predicate requirement and the type of the expression provided for composition in the relevant argument position. There have been several proposals recently made for resolving this type mismatch and composing property-

denoting indefinites directly with predicates. There are also several proposals specifically for indefinites that are scopally inert, i.e., necessarily take narrow scope with respect to other operators and quantifiers in a sentence.

Farkas and de Swart (2003) argue that non-specific indefinites with only narrow scope properties (which they call 'incorporated') do not introduce a discourse referent, but only a predicative condition involving a thematic argument. Such nominals combine with a predicate by a construction rule called *Unification*, which replaces the relevant thematic argument of the predicate by the thematic argument of the common noun.

According to Chung and Ladusaw (2003) indefinites that are scopally inert compose with a verb by the *Restrict* mode of composition. It is a new mode of predicate-argument composition, which separates semantic saturation from syntactic saturation. *Restrict* does not saturate the argument position, instead a property-denoting argument is interpreted as a restrictive modifier of the predicate[29].

Here, I will adopt Carlson's (2003a,b) proposal. The main reason for this choice is that it allows us to establish a link between the non-specific effect of prefixes in the domain of nominal reference, on the one hand, and their function as lexical modifiers of verbal predicates with effects on the eventuality type of a verbal predicate, on the other hand. Carlson (2003b) proposes that there are three successive 'stages' of semantic interpretation, each clearly distinguished by its own elements and structures. At the lowest level is lexical meaning. Lexical meanings are projected homomorphically onto a higher level of meanings of phrasal expressions, which largely corresponds to the syntactic V' (or VP) level, at which denotations of verb-headed expressions are specified in terms of their eventuality types (or Aktionsarten) in a context-free fashion. This domain of interpretation is projected homomorphically onto the highest level of propositional semantics, the level of meanings associated with the syntactic IP level. Interpretations at this level make reference to context, speech act information, possible worlds, tense, modality, sentential negation, quantification, genericity, perfective and imperfective grammatical aspect, for example.

One of Carlson's (2003a,b) main innovations is the proposal that there is a distinct level of phrasal interpretations, the level of V' domain, different from both the domain of lexical and sentential meanings. It is the level at which a scopally inert indefinite (that necessarily takes narrow scope with respect to various operators and quantifiers in a sentence) must be interpreted and directly combined with a verb. All other types of arguments must be interpreted within the propositional representation corresponding to the IP domain: namely, definite descriptions, specific indefinites, DP's with strong quantifiers, partitives, demonstratives, proper names, for example. This, of course,

[29] "Assuming that the predicate is interpreted as a function *f*, the result of restricting the predicate with property *p* is the original function with its domain restricted to the subdomain of its original domain to elements that have the property *p*" (Chung and Ladusaw 2003, p.6).

corresponds to Diesing's (1992) *Mapping Hypothesis*[30]. However, what is new about Carlson's proposal is an attempt at providing a semantic motivation or reinterpretation for the intriguing behavior of non-specific indefinites. His proposal boils down to two main reasons, given in (39):

(39) a. Only non-specific indefinites, interpreted as property-denoting arguments, have a type of meaning that conforms to the structure of V' denotations in so far as they preserve the lattice structure of eventualities, when combined with denotations of verbs.
Example: ˇ⟦*plants freeze*⟧ ≤ ˇ⟦*freeze*⟧, where '≤' is a mereological part relation.

b. A situation of type e_1 with a property instantiation introduced by a non-specific indefinite NSI_1 is automatically redescribable as being of type e_2 with a property instantiation introduced by a non-specific indefinite NSI_2, whereby $e_1 \leq e_2$ and ˇ⟦NSI_1⟧ ≤ ˇ⟦NSI_2⟧. No reference to context, times, worlds and other elements that play a role at the propositional level of semantics is necessary.
Example: ˇ⟦*John fed (five) dogs*⟧ ≤ ˇ⟦*John fed (five) animals*⟧
ˇ⟦*John fed every dog*⟧ vs. ˇ⟦*John fed every animal*⟧

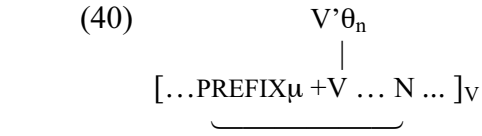
That a non-specific indefinite preserves the lattice structure of eventualities means that when combined with a denotation of a verb it restricts the verb's denotation by generating a more specific eventuality type: namely, an eventuality type whose extensions will be some subset (or a mereological part) of the extensions of the eventuality type defined by the verb alone: cp. ˇ⟦*plants freeze*⟧ ≤ ˇ⟦*freeze*⟧. This also means that the denotation of ˇ⟦*plants freeze*⟧ is within the denotation type of a verb, rather than being a truth value, true or false, and hence an element of the lattice structure of eventuality types $\mathcal{E}$ just like the denotation of the base verb ˇ⟦*freeze*⟧ is.

[30] According to the *Mapping Hypothesis*, the material from the VP is mapped into the nuclear scope of a DRT-type tripartite structure and the material from the IP into a restrictive clause. The restrictive clause is presuppositional, and consequently any NP/DP that is presuppositional in nature must be in the IP to be interpretable: namely, quantified DP's with strong quantifiers, definite descriptions, demonstratives, proper names, specific indefinites, partitives, for example. The nuclear scope is the scope of the obligatory Existential Closure, which unselectively binds all free variables within the VP. It is only non-specific indefinite NP's that must stay within the VP to be assigned the appropriate interpretation.

The second property of non-specific indefinites is closely related to the first one. For example, a situation felicitously describable by a sentence like *John fed five dogs* is automatically redescribable as *John fed five animals*: ˇ⟦*John fed five dogs*⟧ ≤ ˇ⟦*John fed five animals*⟧. Now, this behavior has nothing to do with the upward, downward, or neutral entailing properties of the quantifier used, as Carlson (2003a) emphasizes, but rather only with determining whether a situation of type e_1 is automatically redescribable as being of type e_2: $e_1 \leq e_2$, without reference to context, times, worlds and other elements that play a role at the propositional level of semantics. In contrast, from *John fed most dogs* or *John fed every dog*, it does not follow that John fed most animals or every animal. In order to evaluate the truth of *John fed every dog*, you need more information than is given by the eventuality type alone and rely on the relevant contextual information, namely information about all the dogs that there are in the relevant domain of universe.

Now, with this background in place, let us go back to our Russian examples like the initial one in (2b). The mode of composition between a prefixed verb and the nominal argument is here schematically represented in (40)[31]:

(40)

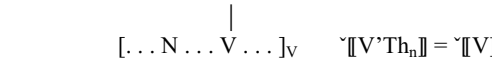


Condition: Iff θ_n is Theme {Incremental/Holistic},
then ˇ⟦V'θ_n⟧ = ˇ⟦V⟧θ_n(ˇ⟦PREFIXμ⟧ (ˇ⟦N⟧)).
'...': possible morphemes
'‿‿': linking relation

(41) ˇ⟦*NA*⟧(ˇ⟦*varenye*⟧) → MS{λx[JAM(x) ∧ μ_C(x) = n_C]} ∧ $n_C \geq C_C$ (of type <*e,t*>) [= (37b)]

Linking Relation. In (40) "‿‿" indicates a 'linking' relation between a measure prefix and a property-denoting argument with which the prefix forms a measure predicate, as given in (37), and repeated here for convenience in (41). The term 'linking' is here borrowed from Aissen (1984, p.5) and it is meant to establish a relation between a lexical operator and a nominal argument that restricts its domain, whereby the lexical operator

[31] The schema follows Carlson's (2003b) proposal for the structure and interpretation of phrases at the V' level, and is based on his schema (11), p. 13. Carlson's (2003b) schema is intended to cover non-specific indefinites in incorporation structures (approximately like *fish-buy*) and syntactic constructions with non-specific indefinites that are not incorporated like *buy (a) fish*. The sequence '. . . ' indicates possible morphemes.



ˇ⟦V'Th_n⟧ = ˇ⟦V⟧Theme(ˇ⟦N⟧)

and the nominal argument 'linked' to it are not contiguous on the syntactic surface and do not form a syntactic constituent[32].

Condition. The linking relation is imported by a prefixed verb from the lexicon. It can only be established with respect to the thematic argument structure of a prefixed verb as a whole. The information that a given measure prefix can only be related to the Incremental or Holistic Theme argument cannot be derived from the semantics of a measure prefix, or its combination with the nominal argument to which it is linked. Prefixes are notoriously polysemous and homonymous (see also Section 2.1), and prefixed verbs are often not transparently compositional. For example, we cannot predict that the prefix *na-* will have the cumulative meaning in *navarit'* (pf.) 'to cook (up) a large quantity of' but not in *napisat'* (pf.) 'to write (up)'. Moreover, the argument structure possibilities of a prefixed verb are not always predictable from the argument structure of a verb base and the lexical properties of a prefix, even in those cases in which a prefixed verb has transparent compositional semantics. In short, assuming that lexicon is the level at which verb meanings are built and verbs are formed with derivational devices like prefixes, a verb with a measure prefix will be taken to constitute a single lexical unit, albeit with two morphological parts, to which the nominal argument, which is linked to the prefix, stands in the thematic relation of the Incremental or Holistic Theme, and in the standard syntactic relationship of a direct object or a subject. Building the verb meaning out of the meanings of the two main derivational components, the verb stem and the prefix, can be achieved by means of a function composition (as Chris Barker, p.c. suggests, see also Kratzer's 2000 composition of stative participles, for example) in such a way that it subsequently allows the result to be combined with the individual variable introduced by the (Incremental) Theme argument, along the lines outlined here.

In so far as the nominal arguments targeted by measure prefixes are linked to {Incremental/Holistic} Theme relation and behave like non-specific indefinites that are scopally inert, they are semantically close to incorporated nominals. In languages that manifest typical cases of incorporation, this argument often stands in the Theme relation

[32] Aissen (1984) uses the term 'linkage' in the following way: "The term 'linkage' will be used to refer to the relation between *7ep* ['many', 'a lot', preverbal quantifier in Tzotzil, HF] and the nominal that names the argument *7ep* binds. In surface structure *7ep* is not contiguous to the linked nominal, and (...)*7ep* and the linked nominal never make up an NP. Thus, they must be linked by a rule whose consequence is to quantify over the domain restricted by the linked nominal" (p. 5).

to the verb (see Woodbury 1975, for example). However, it is not clear why exactly this type of thematic relation should be prominent in incorporation(-like) phenomena across typologically diverse languages. (For a discussion of this point see Farkas and de Swart 2003, for example.)

Predicate restricting mode of composition via thematic functions. The V' level is the level at which lexical elements are syntactically combined to form phrases. Lexical specifications of nouns and verbs lack any combinatorial properties. Nouns, as lexical items, have semantic interpretations equivalent to properties, that is, they are of type $<e,t>$. Verbs have as a part of their interpretation some eventuality type. Hence, the verb, as a lexical item, has no functional meaning, i.e., no 'argument slots', and it cannot compose with nominals by means of the standard function application. Following algebraic definitions in property theory (Bealer 1982 in particular), Carlson (2003a,b) defines a new mode of combining properties, which operates over instantiations of properties (i.e., extensions) and relies on composing verbs with nominals via thematic roles. Thematic roles are functions on extensions of NP meanings and fulfill a double role: (i) they map each property instantiation (or individual viewed as a property-instantiation) onto the token eventualities it participates in, in the particular way defined by the thematic role, and (ii) they intersect such token eventualities with the set of token eventualities defined by the extension of the verb. For example, combining *plants* with *freeze*, we get $\text{THEME}(\check{}[\![plants]\!]) \cap \check{}[\![freeze]\!] = \check{}[\![plants\ freeze]\!]$, which amounts to a set of freezing token eventualities where some plants or other function as the THEME. The general idea behind this mode of composition is for a property-denoting argument to restrict the verb's denotation by generating a more specific eventuality type. Thematic roles also play a prominent role in the Unification mode of composition between predicates and non-specific indefinites that are scopally inert in the proposal of Farkas and de Swart (2003).

In our case, a prefixed verb is inserted as a single lexical item into a syntactic tree and imports from the lexicon the relevant linking relation. Once the linking relation between the prefix (here *na-*) and the appropriate nominal argument (here *varenye* 'jam') is established, the two are composed by intersection to yield a measure predicate (type $<e,t>$, a property-denoting expression). The resultant measure predicate is then composed with an eventuality type denoted by a verb stem via the thematic role assigned to the bare nominal argument. The verb base is typically an imperfective simplex, and denotes a (set of) processes. Much less frequently, it is a perfective simplex, and just like all perfective verbs of this type it denotes a (set of) events[33]: cp. *kupit'* (pf.) 'to (finish) buy(ing)' → *NA-kupit'* (pf.) 'to buy up (a number or quantity of)'.

[33] The term 'events' is here understood in the technical sense used by Bach (1981, 1986) or Parsons (1985, 1990) and opposed to processes and states in the tripartite classification of eventuality types.

Finally, existential closure will apply to saturate the predicate on the individual variable introduced by the bare mass noun 'jam' yielding the appropriate 'local scope only' indefinite interpretation. The representation of the VP/V' in (42a/2b) will correspond to (42b):

(42) a. On kak-to varenya **NA-varil**^{P} [= (2b)]
he somehow jam.SG.GEN **CM-**cook.PAST.3SG
'He made a lot of / a (relatively large) quantity of jam.'

b. $^{\vee}[\![\text{COOK}]\!]\text{IncTheme}(\text{MS}\{\exists x[\text{JAM}(x) \wedge \mu_C(x) = n_C]\} \wedge n_C \geq C_C)$

The behavior of Slavic measure prefixes described here clearly presents a problem for the semantic compositional analysis, no matter whether we choose the predicate restricting mode of composition advocated here, or some other mode of compositon. The truth conditions of sentences like (42a) cannot be computed in a systematic and straightforward way by applying compositional semantic rules to independently motivated syntactic structures. Slavic measure prefixes pose a challenge to strict compositionality along with other word-internal operators that are used for the expression of quantification and related notions like measurement. The most intriguing puzzles in this domain are certainly raised by polysynthetic languages (see Bach et al. 1995).

Morphology and patterns of semantic interpretation in the domain of nominal reference. Continuing with Carlson's (2003b) general strategy of building up meanings of sentences headed by an episodic verb endocentrically from the verb, the meanings from the V' level, which are specified in terms of eventuality types (among others), are homomorphically projected onto the highest level of propositional semantics, the level of meanings associated with the syntactic IP level. Verbs at this level of interpretation have meanings corresponding to *n*-place functions, and compose with individual-denoting arguments by function application to yield truth-values.

Nominal arguments that are presuppositional in nature are taken to appear at the IP level, which means that they do not correspond to nominal arguments at the V' level and cannot be directly linked to the appropriate thematic role, their thematic role remains 'unfilled'. Here is where the presence of overt morphology plays a crucial role, according to Carlson (2003b): It enables the construction of a propositional representation with IP arguments, which are outside the V' domain of thematic roles, to

be associated with the appropriate thematic roles in the 'lower' V' representations. In English, for example, the definite article *the* may select for this mode of composition for the resulting DP at the level of IP. While an article must occur in a NP (or a DP) headed by a singular count noun in the absence of quantification, it may be omitted (or null) if the count noun appears in the plural. Although the absence of morphology with bare plural arguments appears to indicate non-specificity, it is just a side-effect of the fact that the unmarked nominal argument may occur *in situ* within the V'. Thus, it is not the lack of morphology that does any real job here, but rather its presence. As a general hypothesis, Carlson (2003b) proposes that it is the presence of morphology, in languages with a contrastive omission of morphology, that is correlated with certain patterns of semantic interpretation, and not its absence[34].

That determiners may select for a particular mode of composition for the resulting DP has also been proposed by Chung and Ladusaw (2003) for Maori. The indefinite determiner *tētahi* signals that the indefinite is composed via the type-shifing mode *Specify*, which derives indefinites that may have narrow or wide scope with respect to other operators. In contrast, the indefinite determiner *he* signals that the indefinite is composed via the non-saturating mode *Restrict*, which is reserved for non-specific indefinites taking exclusively narrow scope with respect to other scope taking operators in a sentence.

In Slavic languages, the function comparable to that of the Maori determiner *he*, for example, can be fulfilled by affixes on verbs, I propose. The measure prefix *na-* in *NA-varil* 'he cooked (a lot of, a quantity of)' in (2b) serves to signal the verb restricting mode of composition available for the measure predicate that the prefix *na-* forms with the property-denoting argument *varenye* 'jam'. This mode of composition is only available to non-specific indefinites in the domain of V' meanings and mediated via thematic roles. This can be supported by the observations made in Sections 2.3 and 2.4. There, it has been shown that nominal arguments targeted by the Russian cumulative *na-* cannot include any D-level elements like strong quantifiers, demonstratives or pronouns, hence they cannot be projected as DP's and occur at the IP level.

In contrast, the lack of derivational morphology on the imperfective root verb *varil* 'he cooked', 'he was cooking' in (2a) can be taken as an unmarked case, making a variety of contextually dependent interpretations available to the inherently property-denoting argument 'jam': namely, it can be interpreted as a (non-specific) indefinite, it can undergo a type-shift into a specific definite interpretation via the sigma operator (see (21) above), or have a generic interpretation.

Now, against this analysis it could be objected that it is not the measure prefix on a verb, but the case suffix on the nominal argument, which serves as a morphological flag for the non-specific indefinite interpretation and the relevant mode of composition. As

[34] Carlson credits the work of Steven G. Lapointe for inspiring this hypothesis.

has already been observed, verbs with the measure prefixes *na-* and *po-* often select genitive arguments. Some support for such an alternative proposal could be seen in the independently made claims that the genitive case suffix on a noun indicates its non-specific interpretation (Jakobson 1936/71, Švedova 1964, p.315, Babby 1980) or a low(er) degree of individuation (cf. also the genitive of open quantification in Timberlake 1975, p.127, 133). However, matters are more complicated than that, and among the various hedges and problems, let me briefly mention just two. First, the genitive case marking is possible with specific NP's, as Partee and Borschev (2002) point out. For example, even negated existential sentences with *byt'* 'to be' commonly allow the genitive of negation with proper names, as in (43a), and specific NP's formed with possessive pronouns, as in (43b), that function as subjects:

(43) a. V Moskve net Koli.
in Moscow NEG.BE Kolja.GEN
'Kolja isn't in Moscow.'

b. Na stojanke net našej mašiny.
in parking lot NEG.BE our car.SG.NOM
'Our car isn't in the parking lot.'

Second, as far as the nominal argument of a verb formed with a measure prefix like *na-* or *po-* is concerned, younger speakers of Contemporary Standard Russian (CSR) preferably use it in the accusative/nominative case, rather than in the genitive or the partitive case (see (8c) above and Polinsky 1994). Most importantly, even if this argument is in the accusative or nominative case, it will still be systematically interpreted as a non-specific indefinite, as we have seen in (8b,c), (11a) and (17a,b). Even without going into further details, an alternative proposal that places the burden of explanation for the non-specific indefinite interpretation on the genitive case suffix rather than on the measure prefix is empirically problematic, and would also face theoretical problems.

2.4 Implications for the status of Slavic verbal prefixes

If the analysis proposed here for perfective verbs with measure prefixes and their nominal arguments is correct, then it has the following intriguing theoretical implication: namely, it precludes such prefixes from being analyzed as overt morphological exponents of the perfective operator. This result sheds considerable doubts on the common view of Slavic prefixes, which takes this to be the main or the only function of Slavic prefixes as a

whole class. The argument is constructed in the following way:

First, Russian measure prefixes have non-specific indefinite effects on nominal arguments, which are directly related to the lexical semantics of prefixes formally characterized in terms of an extensive measure function, as I have shown.

Second, non-specific indefinites must compose with verbs in the domain of V' phrasal interpretations, as Carlson (2003a,b) argues. The mode of composition and resulting interpretations at this level are specified with reference to the information that is given by the denotation of nominal and verbal predicates and make no reference to truth, context, times, and possible worlds, which may enter into the calculation of propositional meanings at the highest IP (or S) level. Assuming that all linguistic expressions that depend on contextual factors for their interpretation invoke possible worlds (see Stalnaker 1978, among others), all contextually-dependent elements must be located at the IP level to be interpretable. These are operators that require a restrictor clause in the DRT-type tripartite structure, which is 'filled in' by information from the context, and include tense, modality, genericity and crucially perfective and imperfective operators, which correspond to the categories of the grammatical aspect.

Third, it then follows that Russian measure prefixes are restricted to the domains of interpretation at the lexical and phrasal levels, and cannot be projected to the higher domain of IP/S and the corresponding level of propositional meanings. Only then can we motivate their non-specific indefinite effects on nominal arguments. They must be located at the level of V' interpretations, i.e., at the semantic level of composition that is below the propositional level of aspectual operators, perfective and imperfective. Hence, the semantic contribution of measure prefixes cannot be assimilated to the semantics of perfectivity, and they cannot be treated as overt morphological exponents of the perfective operator.

This result implies a clear separation between the semantics of a prefix and the aspectual semantics of a fully formed prefixed verb. One piece of independent supporting evidence for this separation comes from secondary imperfectives in which a measure prefix co-occurs with the imperfective suffix *–(y)va-*[35], and the two are subject to mutual constraints and interactions. This is shown with the attenuative prefix *po-* and the cumulative *na-* in (44), and the attested examples in (45) and (46). In (44), we see that the prefix is first applied to the imperfective verb stem, and the resulting prefixed perfective form serves as an input into the imperfective suffix.

[35] The imperfective suffix, glossed here with 'IPF', is manifested in a variety of allomorphs, the notation *–(y)va-* is here intended as an abstraction over its allomorphic variants.

(44)

simple imperfective	→	prefixed perfective	→	secondary imperfective
pit'^{I}		**PO-pit'**^{P}		**PO-pivat'**^{I}
drink.INF		ATN-drink.INF		ATN-drink.IPF.INF
'to (be) drink(ing)'		'to have a (small) drink', 'to drink a little'		'to have multiple (small) drinks', 'to take multiple sips'
		NA-pit'sja^{P}		**NA-pivat'sja**^{I}
		CM-drink.INF		CM-drink.IPF.INF
		'to have a lot to drink', 'to get drunk'		'to have a lot to drink', 'to get drunk' [on multiple occasions]

(45) Celyje dva časa čuvstvoval^{I} on sebja počti sčastlivym
entire.PL.ACC two hours feel.PAST.3SG he himself almost happy.SG.INST
i **PO-pival**^{I} konjačok.
and **ATN-drink.IPF.PAST.3SG** brandy.DIM.SG.ACC
'For two whole hours he felt almost happy, and sipped (at) the brandy.'
[i.e., took a number of small sips from the brandy]
Fyodor Mikhailovich Dostoevsky, *The Brothers Karamazov*

(46) Obyknovenno ja **NA-pivajus'**^{I} tak odin raz v mesjac.
usually I **CM-drink.IPF.PRES.1SG** so one time in month
'I usually get drunk about once a month.' Anton P. Chekhov, *Uncle Vanya*

Secondary imperfectives with measure prefixes have the following striking property: They exclude a progressive interpretation (see also Forsyth 1970, p.21 and Flier 1985, p. 41, examples in (3)), and instead they have an iterative or a generic (habitual) interpretation, at least under the most normal circumstances. In (46) the presence of the generic adverbial *usually* enforces the generic (habitual) interpretation, while in (45) the iterative interpretation is selected, given that the generic (habitual) interpretation is excluded by *for two whole hours*, which restricts the temporal trace of the described event to a single time span. The measure prefixes *po-* and *na-* here provide the individuation criterion for what counts as the relevant singular instance: namely, a singular atomic event. For example, in (45), the measure prefix *po-* measures the volume of brandy (i.e., 'a small quantity of brandy') and *indirectly* individuates the singular atomic event within the iterated macro-eventuality in (45). (See also below.)

Secondary imperfectives like (45) and (46) serve as indirect evidence for the claim that the semantic contribution of measure prefixes to the meaning of a sentence is separate from that of aspectual operators in general. The Slavic imperfective suffix is a piece of inflectional morphology and an uncontroversial morphological exponent of the aspectual imperfective operator IPF. It is interpreted as a compositional operator that takes scope over telic or atelic semantic structures (see also Filip 1993/99, 2000, 2003b). On the account proposed here, it is interpreted at the level of propositional meanings, which corresponds to the syntactic IP (or S) level, in Carlson's (2003a) terms. Furthermore, assuming, as is standard, that the imperfective and perfective operator are two complementary members of the same category of aspect, and assuming that the imperfective operator must be located at the propositional level of semantic description, above the level of event semantics at which telicity of verbs and predicates is defined, so must be the perfective operator.

First notice that the progressive interpretation is freely available if the prefix forming a secondary imperfective entails no extensive measure function or other quantitative criterion. This is shown in (45'), where the secondary imperfective verb *dopival* 'he finished/was finishing drinking' is derived with the terminative prefix *do-*. It focuses on the final phase of the described event, but entails no measure and/or other quantitative criterion with respect to the referent of 'wine'.

(45') Poka Karpov **DO-pival^{I}** vino, Ivan snova podnyalsya i zatyanul novuyu istoriyu.[36]
while Karpov **TERM-drink.IPF.PAST.3SG** wine.SG.ACC Ivan again got.up and started new story
'While Karpov was finishing drinking (the) wine, Ivan again got up and launched into a new story.'

Second, sentences with simple (underived) imperfectives with argumental DP's that contain a measure expression (47a), a quantifier (47b) or some totality expression like 'whole/all' (47b) are also subject to the constraint on the progressive interpretation. Jakobson (1936/71), Paducheva (1998), among others, observe that (47a) is acceptable only when interpreted iteratively or generically (habitually). That is, (47a) would most likely not be used to mean 'Ivan is drinking a glass of water', but rather to describe a habit 'Ivan drinks a glass of water (everyday, usually, etc.)'.

(47) a. Ivan p'et^{I} stakan vody.
Ivan drink.PRES.3SG bottle.SG.ACC water.SG.GEN
'Ivan drinks a glass of water.' (# '… is drinking …')

b. Ivan est^{I} tri gruši / ves' sup.
Ivan eat.PRES.3SG three pear.PL.ACC / whole.SG.ACC soup.SG.ACC
'Ivan eats three pears / the whole (portion of) soup.' (# '… is eating …')

[36]Example adapted from Evgenii Proshkin, 2002. "Evakuaciya." *Zvezdnaya doroga.* [Star Road] *Žurnal sovremennoj fantastiki*. [Journal of contemporary science fiction] http://www-lat.rusf.ru/starroad/archiv/2002_5_6/proshkin.htm.

Unlike in (45) and (46), where both imperfectivity and measure are expressed by verbal morphology, in (47) the verb only encodes imperfectivity, while the direct object NP/DP separately expresses measure (47a), and also quantification (47b) and totality (47b). Assuming that prefixes like the attenuative/delimitative *po-* in (45), for example, can be semantically analyzed as measure phrases, and hence are semantically close to overt vague (non-standard) nominal measure phrases like *stakan* 'a glass (of)', as in (47a), then the constraint on the progressive interpretation will arise under the same conditions: namely, in the presence of an argumental DP that (i) is measured or quantified, *and* that (ii) stands in the Incremental Theme relation to its governing verbal predicate. Both the conditions (i) and (ii) must simultaneously hold. In (48a,b) the progressive interpretation is possible, because the Incremental Theme argument is bare. Similarly, in (45'), we have seen that the progressive interpretation is sanctioned, because the prefix *do-* has no measurement or quantificational entailment with respect to the bare direct object 'wine'. (49) allows the progressive interpretation, because the measured (and quantified) DO-DP does not stand in the Incremental Theme relation to the verb.

(48) a. Ivan p'et^{I} vodu.
Ivan drink.PRES.3SG water.SG.ACC
'Ivan drinks/is drinking water.'

b. Ivan est^{I} grušu / sup.
Ivan eat.PRES.3S pear.SG.ACC / soup.SG.ACC
'Ivan eats/is eating an/the/some pear / soup.'

(49) Ivan vidit^{I} tri gruši / stakan vody.
Ivan sees three pear.PL.ACC / glass.SG.ACC water.SG.GEN
'Ivan (right now) sees three pears / a glass of water.'

In English, and other languages that are taken to exhibit the object-marking strategy for the expression of telicity, examples like *Ivan drank a glass of water*, *Ivan ate three pears, Ivan ate the whole cake* represent paradigm cases of telic VP's. The direct object DP is linked to the Incremental Theme relation and contains an extensive measure phrase (e.g., *a glass of*), a definite cardinal quantifier (e.g., *three*) or an expression of totality (e.g., *whole*). Standardly, the influence of such Incremental Theme NP's/DP's on the telicity of VP's is accounted for by the principle of aspectual composition proposed by Krifka (1986, 1992) and Dowty (1991): namely, by homomorphically mapping the part structure of the Incremental Theme argument denotation into the part structure of the event

argument, and vice versa. Given such mappings, measured and quantified Incremental Theme arguments generate telic verbal predicates. In the case of measure NP's this follows, because measure NP's denote maximally separated entities, and hence are quantized (see Section 3.2). Quantized Incremental Theme arguments can be used to define quantized verbal predicates. Quantized verbal predicates are telic. 'Quantization' is a stricter notion than 'telicity', because all quantized predicates are necessarily telic, but not every telic predicate is quantized (see Krifka 1998, p.207).

The same principle of aspectual composition also applies in Slavic imperfective sentences like (47), with simple (underived) imperfective verbs that take measured and quantified Incremental Theme arguments. Claiming that it does not hold would imply that either (i) Slavic nominal measure NP's like *stakan vody* and quantified DP's like *tri grušɨ* have denotations different from the denotations of *a glass of water* and *three pears*, respectively, in English; or (ii) that such Slavic NP's/DP's stand in a very different relation to a predicate like DRINK or EAT than they do in English. Both (i) and (ii) are highly implausible, and their inclusion into the Slavic grammar would be associated with a high cost and very low explanatory gains.

Now, I propose that the measure prefix *po-* and 'brandy' in (45) form a measure, and hence quantized, predicate (see Section 3.2 above). Given that 'brandy' here stands in the Incremental Theme relation to the prefixed verb, when combining the measure predicate $(PO_{small\text{-}quantity}(brandy))$ with the bare aspectless predicate DRINK, we will rely on the same general homomorphic mappings that motivate the telic interpretation of English VP's like *drink a small quantity of brandy*, and of Russian VP's in (47). It is thus an expected consequence of (i) the semantics of measure expressions, including measure prefixes, and of (ii) the standard principles of aspectual composition that a measure prefix will generate a telic verbal predicate together with the Incremental Theme argument it is linked to and the aspectless verb base.

Notice also that the imperfective aspectual semantics does not enter into the semantic composition at the level at which the telic interpretation of (45) and (47) is computed. In (45), it is marked by the imperfective suffix in *popival* 'he took multiple sips', 'he had multiple (small) drinks, while in (45) it is incorporated in the stem of *p'et* 'he drank', 'he was drinking' in (47). (See also below.) As we have seen above, when the imperfective operator IPF is applied to a telic predicate that contains a measure or quantified Incremental Theme argument, the resulting combination cannot receive the progressive interpretation, or the progressive interpretation requires significant interpretive effort and embedding in the appropriate. A similar situation obtains in English progressives: If they contain an Incremental Theme argument with some totality expression like 'whole' or 'all', they are odd (50a) (see Kearns 1991, p.290 and Zucchi 1999, p.205, fn.15). Progressives with a quantified Incremental Theme argument (50b) have a restricted range of readings, which require considerable interpretive effort and the appropriate context to be acceptable (see Mittwoch 1988, Zucchi 1999).

(50) a. #John was eating the whole cake when I arrived.
b. John was drinking three cups of tea when I arrived.
c. John was carrying three cups of tea when I saw him.

According to Mittwoch (1988), (50b) may mean that John was simultaneously drinking three cups of tea when I arrived, or that John intended to drink three cups of tea when I arrived (the futurate reading). However, it cannot mean that John was in the midst of drinking of 'one out of what later turned out to be three cups of tea', one after the other (but see Zucchi 1999 for a different view). In contrast, the quantified DO-DP not linked to the Incremental Theme argument does not pose any problems for the progressive interpretation of (50c), which means that John was simultaneously carrying three cups of tea, of course.

While the intriguing semantics of progressives like (50a,b) is beyond the scope of this paper, the main point to be made here is that we observe interactions and constraints between the semantics of the progressive aspect on the one hand, and quantified, measured or 'total' Incremental Theme arguments, on the other hand; the suitable progressive interpretation may be impossible or hard to access. If we compare Russian examples like those in (47) with English progressives in (50a,b), we see that different interpretive strategies are activated. Russian imperfectives can easily shift between the singular progressive interpretation and the generic (habitual) or iterative interpretation without supporting morphological change. For imperfectives like (47), only the latter interpretation is unproblematic and easy to activate for native Russian speakers. Hence, this may be the reason why Russian speakers judge the progressive interpretation of imperfectives like (47) as odd or even ungrammatical, and avoid or even exclude it in favor of the unproblematic iterative or generic (habitual) interpretation. The telic predicate under the IPF specifies the singular instance of the iterated situation or generalization. In (47), it is the extensive measure phrase *a glass of* that supplies the individuation criterion for what counts as the relevant instance, a singular atomic event. Extending the same line of reasoning to (45), here, it is the measure prefix *po-* that individuates the single atomic event. This also implies that the semantic contribution of the imperfective suffix in Russian and in other Slavic languages *does not* amount to the 'neutralization' of the telicity implication of a predicate when it takes scope over it,

contrary to Kratzer's (2004) suggestion. In general, when the imperfective operator takes scope over telic predicates, both morphologically and syntactically constructed ones, their telicity is not affected (see also Filip 2000, and elsewhere).

In contrast, English progressives are not commonly used for the expression of iterative or generic (habitual) statements. Hence, if the unmarked progressive interpretation of a sentence is odd as in (50a), we only have certain highly marked interpretations at our disposal. For example, as Zucchi (1999, p.206, fn.15) observes, (50a) is acceptable with an affective complaint intonation *Look! He is eating the whole cake!* Similarly, the generic version of (50a) *You are always eating the whole cake by yourself!* requires a special emphasis (of an exasperated complaint) to be acceptable.[37] In examples like (50a,b), the English PROG takes scope over telic predicates of complete events, as also Zucchi (1999) argues (see p.205 in particular).

Secondary imperfectives in which a measure prefix co-occurs with the imperfective suffix shed light on Slavic imperfectivity in general. First, the fact that secondary imperfectives with the overt imperfective suffix and measure prefixes, as in (45) and (46), either do not allow the progressive interpretation at all or strongly disprefer it (see also Forsyth 1970, p.21 and Flier 1985) and, instead, naturally have an iterative or a generic (habitual) interpretation constitutes one of the strongest arguments against treating the semantics of the imperfective suffix in Russian and in other Slavic languages on a par with the English PROG, contrary to Zucchi (1999) and Borer (2004), to mention just the most recent proposals along these lines. Second, the similarities in the semantic and pragmatic behavior between sentences with secondary imperfectives (45) and (46) and sentences with simple (underived) imperfectives (47) with quantified and/or measure Incremental Theme arguments provide independent support for the claim that the two types of imperfectives form a uniform semantic class, contrary to Borer (2004).[38] Given also that generally sentences with simple (underived) imperfectives and with secondary imperfectives have the same potential range of contextually determined interpretations (see fn.3 above), I propose that both types of imperfectives, simple (underived) and secondary ones derived with the imperfective suffix, introduce the imperfective operator into the logical representation: It is overt in secondary imperfectives and covert in simple (underived) imperfectives. Even if the latter are not marked by overt imperfective

[37] From the cross-linguistic point of view it is puzzling why the progressive interpretation of Russian examples like (47a) is strongly dispreferred or prohibited, while *Ivan is (right now) drinking a glass of water* is acceptable in English. Why this should be the case must be left for future research. It is also unclear how we should account for the oddity of sentences like (50a) *#John was eating the whole cake when I arrived*, see also Zucchi (1999, p.206, fn.15).

[38] Unlike Borer, Zucchi (1999) takes the PROG to be present in the logical representation of simple (underived) imperfectives, where it has no overt morphological exponent, implying that simple (underived) imperfectives and secondary imperfectives belong to the same aspectual class.

morphology, it does not mean that the aspectual imperfective meaning is not present in its semantic make up[39].

(51) $[\![\text{IPF}(e, P)]\!] = 1$, iff $\lambda P \lambda e \exists e'[P(e') \wedge e \leq e']$

The imperfective is a relation between eventualities and eventuality types, whereby the latter are sets of eventualities (see Landman 1992 and Carlson 2003a,b). The part relation '≤' ("not necessarily proper part of") covers a variety of contextually determined interpretations of imperfectives, including progressive and completive. The possibility of the completive interpretation of imperfectives makes the treatment of the imperfective operator as an intensional operator less imperative than it is in the case of the English progressive operator. Also for the sake of simplicity in exposition, the imperfective operator is here treated in extensional terms. With respect to the generic (habitual) interpretation conveyed by imperfective sentences, it is important to emphasize that the imperfective semantics is compatible with the generic (habitual) interpretation, but genericity is a category *sui generis*, formally and semantically independent of the category of aspect, as Filip and Carlson (1997) argue. Genericity cannot be subsumed under imperfectivity (contrary to common proposals, see Dahl 1985 and Comrie 1976, among others). Genericity (habituality) may be represented by means of the generic operator GEN, which is independently motivated for the quantificational structure of sentences in Krifka et al. 1995, Partee 1991, 1995, Carlson and Pelletier 1995, and references therein), and which takes scope over the aspectual operators, imperfective and perfective.

To sum up, Russian examples like (45-46) support the claims independently made elsewhere (see Filip 1993/99, 1996, 2000, for example) that a strict line is to be drawn between the contribution of prefixes which modulate eventuality types (or Aktionsart),

[39] This strategy is not unusual in the literature on aspect. For example, Zucchi (1999), proposes that simple (underived) imperfectives in Russian, such as *pisat'* 'to write'/'to be writing', contain the PROG operator in their logical representation just like secondary imperfectives derived with the imperfective suffix. (Although I agree with Zucchi (1999) that simple (underived) imperfectives and secondary imperfectives derived with the imperfective suffix constitute a uniform semantic class, I here argue that their aspectual semantics cannot be assimilated to that of the English PROG.) According to Landman (1992), the uninflected predicate *build a house* has in its denotation complete events of building a house. The aspectual contribution of the English simple past is the identity function. That is, the English simple past is taken to have an aspectual contribution, which is not marked by an overt morpheme on the verb.

including the telicity of verbal predicates, on the one hand, and the grammatical category of aspect, here the imperfective aspect, on the other hand, which is here expressed by the inflectional imperfective suffix. Indirectly, this result can be taken as providing additional evidence for the independence of the semantics of measure prefixes from the semantics of perfectivity. It would follow if we assume that the imperfective and perfective operators are two complementary members of the same category of aspect.

If Russian measure prefixes, and Slavic measure prefixes in general, cannot be viewed as overt morphological exponents of a function posited for the interpretation of the perfective operator, we may want to ask which uses of Slavic prefixes, if *any*, have this function. Certainly, the presence of any prefix on a verb is not a sufficient formal indicator of the perfective status of that verb, because there are prefixed verbs that are imperfective, as we have seen in (44-46). Neither is it a necessary formal indicator, because there are perfective verbs that are not prefixed, such as the Russian *dat'* 'to give'. Moreover, there is *no* single prefix solely dedicated to the expression of the 'perfective' meaning and *no* other meaning in *all* of its occurrences. For example, Slavic verbal prefixes are not consistently linked to the expression of telicity[40], or to any other single notion used for the characterization of the semantics of perfectivity. In short, Slavic verbal prefixes as a whole class have no constant aspectual, or other, meaning in all of their occurrences, semantically they constitute a highly heterogeneous class exhibiting considerable lexical idiosyncracies. They exhibit all the hallmarks characteristics of derivational morphemes, which are difficult to reconcile with the common view of perfective and imperfective aspect in Slavic languages as grammatical categories (but see Dahl 1985). If this view also implies that it is an inflectional category, then prefixes would be derivational and simultaneously inflectional devices, "a contradiction in terms", as Spencer (1991 p. 196) observes. Such considerations, among others, led me to reject the assumption that Slavic verbal prefixes as a class are morphological exponents of the perfective operator (see Filip 2000, 2003a,b, 2004).

If this is the case, and if we have no perfective morpheme(s) that are consistently dedicated to the expression of the 'perfective' meaning and *no* other meaning in *all* of its/their occurrences, the question arises about the status of the perfective category in the Slavic aspectual system. Traditionally, the perfective category is the marked member and the imperfective one the unmarked member in the Slavic aspectual opposition. One of the reasons traditionally adduced for regarding imperfectives as unmarked is their lack of the semantic feature(s) that distinguish(es) perfectives. At the same time, many Slavicists agree that the "stalking [of] the wild invariant" [i.e., uniform semantic characterization for perfective verbs, HF], as Timberlake (1982, p. 305ff.) puts it, is "extremely frustrating" (ibid.) and/or that all the candidate notions proposed (see Comrie, 1976, p. 16ff.) are inadequate, because there can always be found classes of verbs that constitute

[40] The same point is made with respect to verbal prefixation and telicity in German by Kratzer (2004).

exceptions to any of them. Now, only the imperfective, but not the perfective, category comes with the dedicated overt morphological marker with consistent semantic contribution to the meaning of a verb in all of its occurrences: namely, the imperfective suffix, as I argue (ibid. and also Filip 1993/99). If we take this observation along with the observations made about prefixes and perfectivity here, we may arrive at a very different view of the Slavic aspectual opposition from the traditional one. We might explore the possibility that perfectives are semantically unmarked, and constitute the basic category in the aspectual opposition, and imperfectives are marked. Similar proposals, although based on different arguments, are made by Wierzbicka (1967), and Paducheva (p.c.) in the context of the Moscow semantic school.

The question also arises to what extent is the present proposal concerning measure prefixes in Slavic languages extendable to other prefixes that have distinct semantic effects on particular nominal arguments. For example, many prefixes have uses with the meanings of completeness, totality, exclusivity or exhaustiveness, as we have seen in Partee's (1995) initial example (1b), and also in (3a,b). A number of such examples is also given in Spencer and Zaretskaya (1998). Take (3b), for example. Here, the Russian terminative prefix *do-* in *DO-pil* 'he finished drinking' enforces the specific and totality interpretation of the bare mass noun *konjačok* 'brandy', which approximately amounts to 'all the (remaining) brandy' (apart from contributing to the completive interpretation of the described event). Hence, it could be proposed that *do-* here serves as a morphological flag for the composition by means of the type-shifting operator sigma σ (see the diagram in (21) above). The sigma operator is used for plural definite descriptions, as in Link (1983), and also for mass definite descriptions so that $\sigma x \phi[x]$ translates 'the individuals that ϕ' and 'the stuff that ϕ', where x is true of pluralities and masses, respectively. The sigma operator σ characterizes a constant function to a contextually anchored maximal entity: $<e,t> \Rightarrow e$. Nominal arguments that are referentially specific must appear at the IP level, following Carlson's (2003a,b) and Diesing's (1992) proposals, which means that they do not correspond to nominal arguments at the V' level and cannot be directly linked to the appropriate thematic role, according to Carlson (2003b). Notice also that bare arguments targeted by verbal prefixes like *do-*, which signal the composition by means of the type-shifting operator sigma, do not preserve the lattice structure of eventualities: a situation that can be described by 'he drank up all the remaining brandy', as in (3b), is

not automatically redescribable with 'he drank up all the remaining alcohol', for example. If *do-* is linked to the bare mass noun *konjačok* 'brandy', its presence can be taken as enabling it to be associated with the appropriate thematic role in the 'lower' V' representations. In other words, its functionality would resemble that of the definite article *the* in English, as proposed by Carlson (2003b).

3. CONCLUSION

In this paper, I have argued for a novel function of Slavic verbal prefixes, namely as word-internal operators with direct semantics effects on nominal arguments, taking Barbara Partee's (1991, 1995) observations as my point of departure. I have focused on Russian verbal prefixes that occur on perfective verbs and (yet) enforce a non-specific indefinite interpretation of nominal arguments they target. In so far as such verbal prefixes can be viewed as morphological flags for a particular mode of composition made available for arguments with which they form a semantic constituent, as I argue, their functionality resembles that of determiners within DP's. Hence, this paper bears on the general discussion regarding the cross-linguistic variation in the semantics (and syntax) of NP's/DP's, and the semantic typology of indefinites in particular (see Farkas 2002, Chung and Ladusaw 2003, Farkas and de Swart 2003, Carlson 2003b, to name just a few recent studies). Once this role of Slavic verbal prefixes is fully acknowledged, then the common view on which they uniformly express the function posited for the interpretation of the perfective aspect turns out to be based on a misconception. This analysis points to new directions in the study of Slavic verbal prefixes by taking them out of the domain of 'aspectual markers', their typical locus of inquiry, and into the general research domain of word-internal operators that interact with phrasal syntax/semantics and have direct impact on the interpretation of nominal arguments as well as on the quantificational structure of sentences (for the latter see also Filip and Carlson 2001). Since many questions still remain open, a full-fledged formal account would certainly be premature. My goal has been to provide a framework in which to pose questions and to set directions for future research.

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