CHAPTER 5

Quantifiers and Verbal Morphology

5.1 Introduction

The quantization properties of the Incremental Theme argument influence the quantization properties of complex verbal predicates. The basic principle that governs this interaction, which can be stated as in (1), was discussed in chapter 3:

(1) <u>aspectual composition</u>: An episodic verb (in a sentence denoting a single eventuality) combined with a quantized Incremental Theme argument yields a quantized complex verbal predicate, while with a cumulative Incremental Theme argument it yields a cumulative complex verbal predicate (see Krifka, 1986, 1989, 1992).

('Incremental Theme' corresponds to 'Gradual Patient' in Krifka's terminology.) There are also converse cases in which verbal aspect and verbal affixes constrain the interpretation of an Incremental Theme argument with respect to its quantificational, definiteness and closely related properties. Such cases will be discussed in this chapter and exemplified with data from Czech. The distribution of quantificational meanings in the Czech verb can be roughly described as follows:

Verbal roots and *stems* encode semantic information associated with aspectual operators. Aspectual operators simultaneously quantify over (parts of) an individual (denoted by the Incremental Theme noun phrase) and (parts of) an event. In the scope of the perfective operator, the Incremental Theme noun phrase is interpreted as meaning approximately *all the* x, *the whole of* x, and in the scope of the imperfective operator it tends to be interpreted as an existentially quantified noun phrase, meaning approximately *part of* x, *some* x, provided there are no other quantificational elements present in a sentence. Such meanings are typically conveyed by determiners that are insensitive to the count-mass distinction.

Verbal affixes combine adverbial meanings (temporal, spatial, directional, manner) with quantificational meanings (cardinality/measure, proportion and distributivity). While in Slavic languages adverbial meanings are also optionally expressed by adverbials and quantificational meanings by determiner quantifiers, in

English the expression of these meanings is more constrained: adverbial meanings are almost exclusively conveyed by adverbials and cardinality/measure, proportion and distributivity are predominantly expressed by determiner quantifiers. In Slavic languages verbal affixes as quantifiers can bind an event variable or a variable introduced by the Incremental Theme NP, or simultaneously both the event and Incremental Theme variable.

For Slavic languages I propose the following generalization concerning the linking of verb arguments to quantifiers that are incorporated in verbal morphology (see Filip, 1992)[1]:

(2) <u>Incremental Theme Hypothesis</u>: aspectual operators and morphological V-operators function as quantifiers over episodic predicates and their arguments. They bind the variable introduced by the Incremental Theme argument. If there is no Incremental Theme argument, quantification is directed at the event variable alone; if there is neither, quantification is undefined.

(2) only applies in sentences denoting single eventualities. The influence of aspectual operators and derivational verbal affixes on the interpretation of nominal arguments has been largely neglected. It is a phenomenon that deserves attention, especially in light of recent studies on the expression of quantification and (in)definiteness by means of verbal morphology (see Bach et al., 1995, for example). This topic is at the heart of the current research in syntax-semantics interface and quantification.

Standard approaches to noun phrase quantification are rooted in logic, mathematics and philosophy of language. Most previous literature on quantification focused on noun phrase quantification by means of determiners like *all, every, most, no.* However, the expression of quantification is by no means restricted only to determiner quantifiers within noun phrases. There is a great variety of means by which languages express quantification, and closely related notions like (in)definiteness. In many languages quantification and related notions are incorporated in verbal morphology, that is, in whole verbal stems/roots and in verbal affixes, preverbs and auxiliary verbs, for example. Although I examine only data from Czech, the phenomena described here have been attested in other Slavic languages, and similar cases seem to exist in such typologically distinct languages as Hindi, Japanese and Australian aboriginal languages, to name just a few.

5.2   Data

5.2.1   Definiteness

Czech, like most Slavic languages, has a full and standard determiner system, with one notable exception: namely, it lacks a set of articles. There is no choice between *a car, the car; cars, the cars, some cars*; *tea, the tea.* This is also true for other Slavic languages, except for Bulgarian and Macedonian. The differences in interpretation that are carried by articles in English, for example, are here inferred through, or expressed by, a variety of morphological, syntactic, prosodic and lexical devices: word order, stress, determiner quantifiers and various lexemes that modify nouns. What has been less frequently noticed in the relevant literature, let alone systematically described, is the influence of verbal aspect on the definite/indefinite interpretation of nominal arguments.

Compelling examples can be found in sentences with undetermined mass and plural noun phrases, that is, noun phrases without any articles or quantifiers. Let us look at the pairs of sentences in (3) and (4), which minimally differ in verbal aspect.

(3) a. Ivan   <u>vy-pil</u>^{P} čaj.
       Ivan   COMPL-drink.PAST   tea.SG.ACC
       'Ivan drank (up) (all) the tea / the whole portion of tea.'

   b. Ivan   <u>pil</u>^{I} čaj.
       Ivan   drink.PAST   tea.SG.ACC
       (i) 'Ivan drank (some/the) tea' (... and then went home)
       (ii) 'Ivan was drinking (some/the) tea' (... when I came)

(4) a. Ivan   <u>s-nědl</u>^{P} jablka.
       Ivan   COMPL-eat.PAST   apple.PL.ACC
       'Ivan ate (up) (all) the apples.'

   b. Ivan   <u>jedl</u>^{I} jablka.
       Ivan   eat.PAST   apple.PL.ACC
       (i) 'Ivan ate (some/the) apples.'
       (ii) 'Ivan was eating (some/the) apples.'

The aspect of a verb is here indicated with a superscript "I" standing for 'imperfective aspect' and "P" for 'perfective aspect'. "COMPL" stands for the semantic contribution of a prefix. Sentences (3a) and (4a) with

the perfective verbs entail that there was some specific quantity of tea and apples in the domain of discourse and all of it was consumed when the denoted event ended. That is, undetermined mass and plural noun phrases 'tea' and 'apples' are here interpreted as noun phrases with the definite article *the* in English, possibly in combination with the universal quantifier 'all' or some expression like 'totality of x', 'whole x'. We can capture this effect of the perfective aspect on undetermined mass and plural Incremental Theme noun phrases with the iota operator. This operator applies uniformly to predicates with non-atomic ('tea') and atomic ('apples') structures (this point will be discussed in section 5.4.3 below):

⟦čaj⟧   =   ιx[**tea'**(x)] (the maximal quantity of tea, the maximal individual that falls under TEA)

⟦jablka⟧ =   ιx[**apples'**(x)] (the maximal group of apples, the maximal individual that falls under APPLES).

Let us now look at the corresponding imperfective sentences (3b) and (4b). The definite reading is only one of the possible readings undetermined mass and plural noun phrases may have here. In imperfective sentences denoting single eventualities, the effect of the imperfective operator on the Incremental Theme noun phrase is that of existential quantification over some unspecified part of the stuff that falls under the denotation of 'tea' and some unspecified part of individuals that falls under the denotation of 'apples'. If (3b) and (4b) have an 'on-going' ('progressive') use, the existential quantification is over some unspecified part of the stuff and individuals that falls under the denotation of 'tea' and 'apples', respectively. That is, in this sense, the imperfective operator functions as a partitive quantifier with respect to the variable introduced by the Incremental Theme noun phrase, its quantificational force is roughly comparable to the English unstressed *some* ('sm') and/or 'some part not necessarily all'. Given that the pairs of sentences in (3) and (4) minimally differ only in verbal aspect, the differences in the interpretation of undetermined mass and plural noun phrases must here stem from the semantics of verbal aspect.

The claim that the perfective operator requires the definite interpretation of cumulative Incremental Theme noun phrases can be supported with the data from Bulgarian, such as (5):

(5) Toj   izpi   *kafe   / kafeto.
     he.NOM   PREF.drink.PAST   *coffee.SG.ACC / coffee.DF.SG.ACC
     'He drank up (all) the coffee.'

In Bulgarian, the use of the enclitic definite article *-to* is in such cases obligatory.

Similarly, in a comparable English construction with the phrasal verb *drink up* the definite article is required. Compare *He drank up wine with *He drank up the wine*. We may assume that the combination of a phrasal verb with the non-progressive has perfective aspectual import.

5.2.2   Measure, Proportion and Distributivity

Derivational morphological processes and affixes that operate on verbs typically restrict the meaning carried by the derivational base, the relevant restrictions concern direction (of motion), degree, intensity, intentionality, modality, distributivity, quantity, universality. In Slavic linguistics there is a rich tradition of analyzing the semantic contribution of affixes to the meaning of verbs and classifying them into Aktionsart classes. (See chapter 4.)

Derivational verbal processes and affixes may just have effects typical of modifiers, as in *řeknout*[P] 'to say', 'to speak' - <u>*u-řeknout*</u>[P] *se* 'to say', 'to speak' (unintentionally)'. Derivational affixes also function as quantifiers. For example, as has been already observed in chapter 4, a large group of perfective verbs is formed from imperfective ones with the semelfactive suffix *-nou-*, whose semantic contribution is comparable to the cardinal adverb 'once'. The imperfective base verb denotes a single or a plurality of eventualities: *vzdychat*[I] 'to be sighing (once)', 'to sigh (repeatedly)', 'to keep sighing' → *vzdych-**nou**-t*[P] 'to sigh (once)'. Another example is the use of the accumulative (ACM) prefix *na-* in sentences like (6). From the imperfective *procházet*[I] *se* 'to take a walk', 'to be taking a walk', the prefix *na-* derives a new verb *na-procházet*[P] *se*, which is perfective and adds to the verb the quantificational sense of 'a lot of' in various ways.

(6)   Ivan   se   **NA-**procházel[P]   po městě.
        Ivan   REFL   **ACM-**walk.PAST   on town
        (i) (a) <u>temporal measure</u>: 'Ivan spent a lot of time taking a
                                    walk around the town.'
             (b) <u>path measure</u>: 'Ivan covered a long distance by taking a
                                    walk/walks around the town.'
        (ii) <u>quantifier</u>: 'There were a number of occasions
                        on which Ivan went for a walk around the town.'
        (iii) 'Ivan walked to his heart's content all over the town.'

In the most general terms, *na-* adds to the verb the meaning of a sufficient or large quantity, or a high degree measured with respect to some contextually determined scale and with respect to some standard or subjective expectation value. Closely related to this basic meaning are strong affective connotations, such as, satiation ('to one's heart's content'; 'to experience a lot of, enough V-ing'; 'to perform V-ing to a state of satisfaction', 'to tire oneself with V-ing', etc.) and high intensity ('to perform V in a protracted, uninterrupted, persistent, intensive manner').

This basic 'accumulative' meaning is manifested in a variety of ways, depending on the lexical semantics of the classes of base verbs with which *na-* combines, and on linguistic and extra-linguistic context. We may distinguish two main groups of meanings: (i) measurements of path and/or time and (ii) cardinal (weak) quantification, where the relevant domain of quantification are events. The quantificational and measurement functions of *na-* are closely related, and often jointly contribute to the meaning of a single verb.

In addition, verbal affixes, which serve to derive aspectually marked verb forms, may function as quantificational operators over a variable introduced by the Incremental Theme argument. In such a case, a verbal affix indicates what sort of quantification is involved in the proposition expressed by a sentence and an Incremental Theme argument denotes the kind of individual the quantification is restricted to range over. Both the verbal affix and the Incremental Theme argument are used to signal that a free variable is introduced into the scope of the quantification. Examples of prefixes that function as quantifiers over Incremental Theme arguments are:

(7) na-:   measure ('some')
    po-, s-, vy-, z-: distributive ('each')
    o-, po-:   all around, affecting the whole surface ('all')
    při-:   additive
    u-:   partitive

Although the accumulative prefix *na-* is directly attached to the verb in (8a), it functions as a vague cardinality quantifier with respect to the variable introduced by the undetermined noun phrase 'rolls'. The prefix *na-* here approximately means 'a lot of', or it may have a measure meaning 'a relatively large quantity/group of'. (8a) cannot be felicitously uttered in a situation in which the bakers baked only two or three rolls and the prefix here targets only the variable introduced by the direct object 'rolls', which is assigned the Incremental Theme role.

(8) a. Pekaři   **NA**-pekli^P housky.
       baker.PL.NOM   **ACM**-bake.PAST   roll.PL.ACC
      'The bakers baked a lot of/a large batch of/quite a few rolls.'

     b. Pekaři   pekli^I housky.
       baker.PL.NOM   bake.PAST   roll.PL.ACC
      (i) 'The bakers baked (some/the) rolls.'
      (ii) 'The bakers were baking (some/the) rolls.'

     c. Pekaři   **U**-pekli^P housky.
       baker.PL.NOM   **COMPL**-bake.PAST   roll.PL.ACC
      'The bakers baked some/the rolls.'

The prefix does not function in (8a) as a modifier or a quantifier over the event argument, that is, (8a) does not mean 'The bakers spent a lot of time/energy baking rolls', for example, or 'The bakers repeatedly baked rolls'. Nor can the prefix *na-* function as a quantifier over the individual variable supplied by the subject or the variables introduced by both the subject and object, that is, (8a) cannot mean 'Many bakers baked (some) rolls'; 'Many bakers baked many rolls', for example. In addition to its weak quantificational contribution, the prefix *na-* also has a modificational adverbial content, contributing the meaning of graduality to the way in which the denoted event was carried out. *Napekli* in (8a) can be paraphrased as 'to create a large/sufficient amount of x in a gradual manner by baking x'.

In contrast, (8b) with the imperfective verb *pekli* and (8c) with the prefixed verb *upekli* (instead of *na-pekli*) do not tell us anything about the quantity of rolls, they assert that some baking event took place during which rolls were baked. Only (8c) with the perfective verb, but not (8b), entails that the denoted event was completed. From the contrast between (8a), on the one hand, and (8b) and (8c), on the other hand, we may conclude that it is the prefix *na-* that contributes the weak quantificational meaning to the interpretation of the Incremental Theme noun phrase.

To illustrate the semantic contribution of the distributive *po-*, let us consider examples in (9). From the imperfective verb *zamykat^I* 'to lock', 'to be locking we derive with *po-* the perfective verb *po-zamykat^P*, which contributes the meanings of distributivity and temporal succession to the meaning of the base verb. *Po-* in (9b) enforces a distributive interpretation, while (9a) allows for either a distributive or a collective interpretation.

(9) a. Zamykal[I]   zásuvky.
        lock.PAST   drawer.PL.ACC
        'He locked each drawer.' / 'He was locking each drawer.'

  b. **PO**-zamykal[P]   (*najednou)   zásuvky.
      DISTR-lock.PAST   (*all.at.once) drawer.PL.ACC
      'He locked each drawer.' [successively, one after the other]

In having the temporal adverbial meaning, approximately 'successively', the distributive prefix *po-* differs from such distributive determiner quantifiers as *each* and *every* in English. It is incompatible with a modifying temporal adverbial like 'all at once'. Other examples of perfective verbs with distributive prefixes are: *vy-mřít* 'to die out (one after the other, successively)', *s-koupit* 'to buy (all, one after the other, all successively).

   The uses of the partitive (and diminutive) prefix *u-* and the additive *při-* are illustrated in (10) and (11):

(10) a. Pil[I]   kávu.   b. **U**-pil[P]   kávu (ze šálku).
        drink.PAST coffee   **PART**-drink.PAST   coffee (from cup)
        'He drank coffee.'   'He took a sip of coffee
        'He was drinking coffee.'   (from a/the cup).'

(11) a. Sypal[I]   cukr do vody.   b. **PŘI** -sypal[P]   cukr do vody.
        pour.PAST sugar into water   ADD-pour.PAST   sugar into water
        'He poured sugar into water.'   'He added some sugar into water.'
        'He was pouring sugar into water.'

The Czech data in (3)-(11) is significant for two reasons. First, the (in)definite interpretation of noun phrases is here constrained by verb aspect, which to a certain extent compensates for the lack of the function category 'article'. Moreover, the quantification over individuals is here expressed by verbal affixes. The second, and more exciting, reason is that similar observations have been made not only in Slavic languages but also in other typologically unrelated languages that lack the closed-class function category 'article' and that have a rich verbal morphology with markers expressing aspectual notions, such as completion, termination, progressivity, but also a variety of quantificational and closely related notions. Among such languages are: Hindi, Japanese, some of the aboriginal languages of Australia, and American Indian languages, as well, like Navajo.

5.3   Previous Approaches

5.3.1   Traditional Slavic Linguistics

The correlation of perfective aspect with definite direct objects and totality interpretation is well-documented in Slavic languages like Czech, Polish and Russian (see Wierzbicka, 1967; Forsyth, 1970; Comrie, 1976; Rassudova, 1977; Chvany, 1983, among others). According to Wierzbicka (1967), 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 the object of the imperfective verb neither of these elements are present" (p.2240). "In a sentence with an imperfective verb the object is treated as an endless 'continuum', as a 'substance without form'" (p.2237).

For Russian, Forsyth (1970) observes, "[...] verb plus object in such a sentence as *on pil 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 čaja* or *čaj* the object is specific - 'he drank the tea'" (p.92). Chvany (1983:71) mentions 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". However, apart from such occasional cursory comments, there has been no attempt to provide a systematic account of such data.

The idea that verbal affixes function as quantifiers over variables introduced by noun phrases is implicit in the copious literature on 'Aktionsart' in its original narrow morphological sense, namely, concerning the lexicalization of various 'manners of action' by means of derivational morphology (see Agrell, 1908; Isačenko, 1960, 1962:385-418; Maslov, 1959). However, it has not been systematically explored. The study of 'Aktionsart' gained in prominence in the structuralist era in connection with the delimitation of the categories of 'aspect' and 'Aktionsart' and related issues, such as specification of aspectual pairs, existence of prefixes that contribute only the invariant 'perfective' meaning, identification of the invariant aspectual meaning. (See chapter 4.) One of the reasons why quantificational, definiteness and similar effects induced by verbal morphology on nominal arguments have not been systematically studied may be seen in the methodological assumptions of structuralism and traditional descriptive approaches, which have dominated Slavic linguistics until recently. The description

of derivationally related verbs has been treated as a matter of isolated words and their formal relations to other isolated words.

5.3.2   Krifka (1986, 1992)

Krifka (1986; 1989:186-189; 1992:49-51) motivates the influence of nominal predicates on the telic and atelic interpretation of complex verbal predicates by defining structure-preserving mapping relations between their denotations, which are modelled as complete join semi-lattices (see chapter 3.3.1). "As the transfer of reference properties works in both directions, we should not be surprised to find the converse case as well, that is, a verbal predicate operator affecting the meaning of a nominal predicate" (Krifka, 1992:49). This is the case in Slavic languages, illustrated by Czech examples in (3) and (4), and also in Hindi, for example.

Krifka's account of the interaction between aspect and definiteness in Slavic languages can be summarized as follows: Perfective predicates are quantized and imperfective ones are (mostly) cumulative. Perfective predicates enforce a quantized interpretation of the Incremental Theme argument and imperfective predicates a cumulative interpretation (see Krifka, 1992:50). Undetermined noun phrases in languages without overt articles are ambiguous between a definite and an indefinite interpretation. This is captured by a syntactic rule 'NP → N' that is associated with two semantic interpretations, a definite and an indefinite one. For example, the undetermined mass noun phrase *čaj* and plural *jablka* are ambiguous between the definite reading 'the tea', 'the apples' and the indefinite reading 'tea', 'apples' (12a,c):

(12) a. <u>čaj</u>:
      (i) indefinite+cumulative: 'tea' $\lambda x[\textbf{tea}(x)]$
      (ii) definite+quantized: 'the tea' $\lambda x[x=FU(\textbf{tea}) \wedge \textbf{tea}(x)]$

   b. <u>jablko</u>:
      (i) indefinite+quantized: 'an apple' $\lambda x[\textbf{apple}(x, 1)]$
      (ii) definite+quantized: 'the apple' $\lambda x[x=FU(\textbf{apple}) \wedge \textbf{apple}(x, 1)]$

   c. <u>jablka:</u>
      (i) indefinite+cumulative: 'apples' $\lambda x[\textbf{apples}(x)]$
      (ii) definite+quantized: 'the apples' $\lambda x[x=FU(\textbf{apples}) \wedge$
$\textbf{apples}(x)]$

In the definite reading mass and plural noun phrases are quantized, in the indefinite reading, they are cumulative. For example, the definite noun phrase *the tea* applies to the fusion (FU) or sum of all tea quantities, which is a tea quantity as well, because *tea* is cumulative. Singular count nouns like *jalbko* can mean either 'an apple' or 'the apple' and it is quantized in both the definite and indefinite reading. Perfective aspect forces a quantized interpretation of a complex verbal predicate, which in turn forces a quantized interpretation of the Incremental Theme argument (Krifka's Gradual Patient). From this it follows that undetermined noun phrases with mass and plural nouns will have a definite interpretation, "as this is the only quantized interpretation" (Krifka, 1992:50). In perfective sentences, "the unwelcome reading [i.e., cumulative reading of inherently cumulative nouns, HF] is excluded by general principles, just as in *rob the bank* the unwelcome readings of *bank* are excluded by the lexical meaning of *rob*" (Krifka, 1992:50).

Krifka provides the first systematic account of the correlation of perfective aspect with definite direct objects. His account is compositional, although the Czech data like (3) and (4) appear not to be. Krifka's account also correctly predicts that perfective and imperfective verb forms only constrain the interpretation of Incremental Theme arguments, but not of other arguments. This is shown in (13), which contains a perfective verb and yet the undetermined plural noun phrase 'voices' retains here its cumulative interpretation, rather than having a definite and quantized interpretation:

(13)   U-slyšel^P (na chodbě)   hlasy.
        COMPL-hear.PAST   (on corridor)   voice.PL.ACC
        'He (suddenly) heard (some) voices (in the corridor).'

Moreover, Krifka's account correctly predicts that the (in)definiteness of singular count noun phrases need not change in dependence on aspect. The problem with Krifka's analysis is that it makes correct predictions only for a part of the relevant data. In addition, the assumption that undetermined noun phrases in Czech are ambiguous between a definite and an indefinite interpretation is empirically unmotivated. In section 5.4, I will return to this point in detail.

5.3.3   D-quantification and A-quantification

Partee, Bach and Kratzer (1987) take a fresh look at the study of quantification and initiate a research that is remarkable both in its empirical scope and in the fundamental theoretical questions they pose.

They suggest that in syntax we may distinguish two distinct strategies for the expression of quantification: *D-quantification* and *A-quantification*. 'D' is mnemonic for Determiner and 'A' for the cluster of adverbs, auxiliaries, verbal affixes, etc., all of which serve to express quantification by other means than those contained in noun phrases. D-quantification is typically expressed in the noun phrase with determiner quantifiers like *every, most*. A-quantification is typically expressed at the level of the sentence or VP with sentence adverbs ("adverbs of quantification", such as *usually, always, in most cases*; see Lewis, 1975), "floated" quantifiers, such as *each*, verbal affixes, auxiliaries, and various argument-structure adjusters.

Partee (1991a) also proposes that D-quantification and A-quantification are associated with different quantificational ontologies: quantification over individuals and quantification over cases, events, or eventualities:

(14)   Individual   Event

	Individual	Event
(a) Category	NP	S
(b) Operator	Det	Adv of Q, Modal, Aux, ...
(c) Sortal	Noun	Verb or verb frame
(d) Predicates in restrictors	Individual-level	Stage-level
(e) Typical restrictors	CNP	*if/when*-clauses
	Relative clauses	focus-frames

D-quantification and A-quantification "are often interchangeable from a purely truth-functional point of view as in English *every* and *always*, but with a different conceptual organization and a clustering of different typical (but not absolute) properties" (Partee, 1991b:448). This is illustrated in (15):

(15)   a. A chocolate bar is *always* sweet.
        b. *Every* chocolate bar is sweet.

Traditional grammars treat adverbs of frequency like *always* as temporal adverbials that indicate the quantity of the relevant times at which some event takes place, that is, adverbs like *always* quantify over times. However, Lewis (1975) proposed that such adverbs of frequency do not just quantify over times (or occasions, events or eventualities), but they also function like quantifiers over individuals. Heim (1982) and de Swart (1993) build on Lewis's (1975) suggestions and treat adverbs frequency and determiner quantifiers essentially in the same way. Heim

(1982) also notices semantic parallels between modal verbs and quantification: cp. *Necessarily, John will be fired* and *John must be fired.*

According to Partee (1991a, 1995), A-quantification is a heterogeneous class that subsumes a variety of phenomena. They can be divided into (i) "true A-quantification, with unselective quantifiers and a syntactic basis for determining, insofar as it is determinate, what is being quantified over, and (ii) lexical quantification, where an operator with some quantificational force (and perhaps further content as well) is applied directly to a verb or other predicate at a lexical level, with (potentially) morphological, syntactic, and semantic effects on the argument structure of the predicate" (Partee, 1995:559).

Partee (1991a, 1995:559) illustrates 'lexical quantification' with data from two Australian aboriginal languages, Warlpiri and Gun-djeyhmi (examples are due to Nicholas Evans), and Czech. In Czech the prefix *po-* can be applied to an imperfective verb that belongs to the family of writing, drawing, and the like (16a), and derives a new perfective verb (16b), that takes as its direct object the optional locative complement of the base verb (what one writes on). The prefixed *po-*verb does not allow any overt expression of the direct object (what is written, etc.) of the base verb. The meaning of the perfective verb *pomalovat* is 'write all over X' or 'cover X with writing', "... which is in a certain sense quantificational but is certainly to be captured at a lexical rather than a syntactic level" (Partee, 1991a, 1995:559).

(16)   a. Maloval[I]   hesla   (na stěnu).   Czech
               paint.PAST   slogan.PL.ACC   (on wall)
               'He painted (the/some) slogans (on the wall).'

        b. **PO-**maloval[P]   *hesla   / stěnu   hesly
               PREF-paint.PAST *slogan.PL.ACC / wall.SG.ACC with slogans
               'He covered *(the/some) slogans / the wall with slogans.'

Warlpiri examples in (17) contain the partitive preverb *puta-* and the iterative prefix *yarda-* 'again', 'another':

(17)   a. Ngapa o-ju   **puta-**nga-nja.   Warlpiri
             water AUX-1SG   **PART-**drink-IMP
             'Just drink some (not all) of my water!'

        b. Warna-ku-yijala kaji-rna-rla   **yarda-**rdipi,
             snake-DAT-TOO COMP-1sg-DAT **REP-**encounter(-noun phraseST)

>   angula-ji ka-rna   pi-nja-rla   nga-rni.
>   that-TOP PRES-1SG-3SG kill-INF-CONTEMP eat-noun phraseST
>   'When I come upon another snake, I kill it and eat it.'

Gun-djeyhmi example (18) contains the prefix *-djangged-* meaning 'to be in a bunch', 'to be in a mob of':

(18)   Guluban   ga-**djangged**-di.   Gun-djeyhmi
        flying.fox   3SG-mob-stand
        'There's a big mob of flying foxes.'

Lexical operators, such as the prefixes in (16)-(18), have one striking feature in common: they are applied directly to a verb at a lexical level and have quantificational force; moreover, they manifest "considerable variation in the 'scope' preferences or restrictions" (Partee, 1991a, 1995:556). Evans (cited in Partee, 1991a, 1995) argues that many of the lexical A-quantifiers expressed by preverbs or verbal prefixes in Warlpiri and Gun-djeyhmi show particular patterns of thematic affinity. He identifies four: actor/subject scope ("acting together, all doing the same thing"), absolutive scope ("completely", "fully"), VP or verb plus object scope ("again / another / repetitive"), and place / time / manner / theme / action scope. Given these observations, Partee, Bach, Kratzer, (1987:21) pose the following question:

(19)   "What are the constraints for associating a quantifier with the
        arguments of a verb?"

I propose that we can provide a uniform account of the apparent variability in the 'scope preferences' of lexical A-quantifiers in Slavic languages if we assume that they bind a variable introduced by the Incremental Theme argument. (See below in section 5.4.)

   The shift of focus from noun phrase quantification to quantification by other means, in particular by verbal morphology, has been accompanied by the shift of focus from English to a host of typologically distinct non-Indo-European languages that have received little attention in theoretical semantic studies. Some of the results of this research can be found in Bach et al. (1995). They shed light on the semantic domains of a particular language and also on the existence and nature of semantic universals. Languages greatly differ in their preferences for D-quantification or A-quantification, and it is unclear whether there is some truly universal type of quantification (see Partee,

1991a). A-quantification seems to be universal, but some languages seem to lack D-quantification (see Jelinek, 1988, 1995, on Coast Salish; Baker, 1995, on Mohawk). If it is the case that D-quantification is not universal, the question would arise what are the possible noun phrase-types in natural languages.

The idea that verbal morphology has quantificational force is also explored by Dalrymple, Mchombo and Peters (1994) and Mchombo and Ngunga (1994) in Bantu languages, Chichewa and Ciyao. Dalrymple, Mchombo and Peters (1994) propose that the reciprocal verbal affix *-an-* in Chichewa functions as a quantifier. The cross-linguistic investigation of reciprocals leads them to the conclusion that the semantic properties associated with reciprocals cannot be motivated by the idiosyncratic properties of a reciprocal construction in any particular language. In this connection, they reject a compositional analysis of reciprocals of Heim, Lasnik and May (1991) that is based on the syntax and semantics of the English reciprocal construction.

5.4 Proposal

5.4.1 Independence of (In)definiteness and Quantization

Problematic for Krifka are examples in which inherently cumulative Incremental Theme arguments do not have the quantized and definite interpretation in the scope of perfective aspect, on the one hand, and the cumulative and indefinite interpretation in the scope of imperfective aspect, on the other hand.

First, if verbal affixes that serve to derive perfective verbs carry weak/indefinite quantificational force, they preempt the definite interpretation of cumulative Incremental Theme noun phrases in the scope of a perfective operator. This is illustrated in (8a) with the accumulative prefix *na-* above, and a similar example is given in (20):

(20) **NA**-tkala^P jsem   plátno.
      ACM-weave.PAST   AUX   cloth.SG.ACC
      'I weaved a lot of cloth.'

(20) contains a perfective verb and a cumulative Incremental Theme noun phrase 'cloth', and yet (19) does not mean 'I weaved all the cloth' [the totality of cloth in some contextually specified domain], but rather 'I weaved a lot of cloth'. Similarly, (8a) does not mean 'The bakers

baked all the rolls [the totality of the rolls], but rather 'The bakers baked a lot of/many/a (large) quantity of rolls'.

Second, Incremental Theme noun phrases with inherently cumulative (mass and plural) noun heads may have a quantized interpretation in the scope of an imperfective operator. This is shown in (21) and (22):

(21)   Včera psal[I] **dopisy¡**   a dnes **je ¡/*¡** nesl[I] na poštu.
         'Yesterday he wrote **letters¡** and today he carried **them¡/*¡** to the post office.'

(22)   ??Včera večer pil[I] **víno¡** a dnes **ho ¡/*¡** zase pije[I].
         ??'Last night he drank some **wine¡** and today he is drinking
           it¡/*¡ again.'

'Letters' in (21) and 'wine' in (22) have a quantized interpretation, although they appear in imperfective sentences. The evidence for their quantized status comes from anaphora: the referential identity is required between quantized noun phrases and anaphoric pronouns, but not between cumulative noun phrases and anaphoric pronouns (see Carlson, 1977). Yet, the quantized reading of 'letters' and 'wine' cannot be obtained on Krifka's account, because imperfective predicates tend to enforce a cumulative interpretation of the Incremental Theme argument (see Krifka, 1992:50).

Although an Incremental Theme noun phrase is typically interpreted as meaning approximately *part of* x, *some* x in the scope of the imperfective operator (provided there no other quantificational elements present in a sentence), we need to take into account the well-known observation that imperfective sentences like (21) and (22) can be used in contexts and with meanings that are typically associated with perfective sentences, and attributed to the semantics of perfective operators: namely, they can be used to express complete, and hence quantized, events. This also means that we need to account for the quantized interpretation of undetermined Incremental Theme noun phrases with cumulative noun heads in such imperfective sentences: if an imperfective predicate is assigned a (contextually determined) quantized interpretation, then it also enforces a quantized interpretation of the Incremental Theme noun phrase.

Third, we also find contexts in which undetermined Incremental Theme noun phrases with inherently cumulative noun heads are assigned a *cumulative and definite* interpretation in the scope of imperfective aspect. Such readings cannot be generated on Krifka's

account, because undetermined mass and plural noun phrases in Czech are taken to be ambiguous between the 'cumulative-indefinite' and 'quantized-definite' meanings.   Consider the following examples with Incremental Theme subject noun phrases:

(23)   a. Vlaky   projížděly[I]   hranicí.
           train.PL.NOM   PREF.pass.IPF.PAST   border.SG.INSTR
           'The trains were crossing the border.'
           ('There were (some) trains crossing the border.')

       b. Vlaky   projely[P]   hranicí.
           train.PL.NOM   PREF.pass.PAST   border.SG.INSTR
           '(All) the trains crossed the border.'

(23a) with the imperfective verb *projíždět* 'to pass through', 'to cross'; 'to be passing through', 'to be crossing' has a reading in which it is entailed that there was an unbounded stream of trains crossing the border. In this 'on-going' or 'progressive' interpretation, 'trains' has a partitive and cumulative interpretation: some trains were across the border and some were not. (23b) with the perfective verb *projet* entails that all the trains passed through the border. That is, 'trains' has a totality, and hence quantized, interpretation. However, regardless of the partitivity-totality reading, 'trains' is most likely to have a definite interpretation in both the imperfective (23a) and perfective sentence (23b). This has to do with the topic-focus informational structure of Czech sentences. Subjects often function as topics. Topicalized constituents that occur in a sentence-initial position are often highly individuated and definite. Notice that this situation is similar to analogous examples in English (taken from Jackendoff, 1990:101-2), where definite Incremental Theme noun phrases in the subject position can be either cumulative or quantized depending on the aspect of a sentence:

(24)   a. The water was rushing out of the faucet.
       b. The people were streaming into the room.

(25)   a. The water rushed out of the faucet.
       b. The people streamed into the room.

According to Jackendoff (1990:101), the sense of unboundedness is in (24a,b) heightened by the use of progressive aspect, "which in a sense takes a snapshot of an event in progress" (p.101).   The definite article

"performs only a deictic function; in these cases it designates a previously known medium instead of a previously known object" (p.101). If the progressive is replaced by simple past, the event is viewed as temporally bounded and consequently, "the amount of water and the number of people is also bounded" (p.101).

Speakers of Czech can resort to various permutations of word order to convey differences in definiteness. If the subject-noun phrase 'trains' occurs in the sentence final position, it is likely to express new information, in which case the indefinite interpretation '(some) trains' will become available. The imperfective sentence *Hranicí projížděly[I] vlaky* will then mean 'There were (some) trains crossing the border'. The corresponding perfective sentence *Hranicí projely[P] vlaky* can be translated as 'Some trains crossed the border'. In order to assign the definite or indefinite interpretation to noun phrases in Czech, we need to take into account the word order and the information structure of sentences, among other factors.

To summarize, undetermined noun phrases with cumulative head nouns are not ambiguous between the 'indefinite-cumulative' and 'definite-quantized' interpretations. The 'definite-indefinite' distinction is orthogonal to the 'quantized-cumulative' distinction. In general, undetermined noun phrases in Czech (and other languages without the function category 'article') are not ambiguous between a definite and an indefinite interpretation. Rather, undetermined noun phrases are here unspecified with respect to (in)definiteness. In Slavic languages the categories 'definite' and 'indefinite' are reflected in linguistic structure "via lexical and grammatical properties that tend to cluster together" (Chvany, 1983:75). They are reflected "not only in the determiners and cases of nouns, but also in other categories (aspect, tense, mood) where D/I meanings appear as contextual, non-primary functions" (Chvany, 1983:86). Not only is it inadequate to associate the definite and indefinite interpretation directly with the senses of undetermined noun phrases in languages that have no overt article system, but also it is empirically and theoretically inadequate to limit the definite and indefinite interpretation of noun phrases to its formal expression by means of articles within noun phrases[2].

As far as the correlation between perfectivity and definite interpretation of noun phrases is concerned, we must pay attention to at least five factors in Slavic languages: (i) Is a given noun phrase assigned to the Incremental Theme role by the main perfective verb? (ii) What are the inherent quantization properties of its head noun? (iii) Does the noun phrase contain any determiner quantifiers or a measure expression? (iv) Does the perfective verb contain any quantificational

affix(es)? (v) What is the topic-focus structure of a sentence? The necessary correlation of the perfective aspect with definite noun phrases is restricted to a narrow class of noun phrases: undetermined mass and plural noun phrases linked to the Incremental Theme role, and which are not in the scope of other quantificational elements. The definite interpretation is here assigned in conjunction with the general requirement that Incremental Theme arguments in the scope of the perfective operator be assigned a totality interpretation: 'the maximal quantity of P' or 'the maximal group of Q', where P is a mass predicate and Q a plural predicate. Incremental Theme arguments that are syntactically realized as singular count noun phrases *need not* be assigned a definite interpretation in the scope of the perfective operator, and those realized as quantified noun phrases with weak quantifiers and measure expressions *must not.* Nevertheless, for all Incremental Theme noun phrases in the scope of the perfective operator it holds that they are assigned the totality intepretation.

In general, noun phrases that contain determiner quantifiers or measure expressions have a different discourse function than referring noun phrases. While a proposition with a referring noun phrase identifies a specific object in the domain of discourse, a proposition that contains a quantified or a measure noun phrase does not. Quantified noun phrases are non-referential and measure noun phrases are low in referential specificity. When we use measure noun phrases like 'a yard of fabric', 'a cup of coffee' or 'a bottle of beer', 'one [portion of] beer', we do not usually assert something about a specific yard, a pint of beer, a cup of coffee (cp.: 'the yard', 'the pint of beer', 'the cup of coffee'). We are interested in counting such entities, but we do not take an interest in them individually as discrete particular participants in an event. This motivates the observation that Incremental Themes realized as measure noun phrases have an indefinite interpretation in perfective sentences, as (26), for example, shows:

(26)   Vypil^P šálek kávy / láhev piva / jedno pivo.
        'He drank (up)/had a (whole) cup of coffee / a (whole) bottle of
         beer / one beer.'

5.4.2   Independence of Imperfectivity and Quantization

Quantized Incremental Theme arguments retain their quantized reading in the scope of an imperfective operator. Take, for example, the singular count noun phrase *jablko* 'an/the apple' in (27) :

(27)   K snídani   jedl^I jablko.
       for breakfast   eat.PAST   apple.SG.ACC
       'He had an apple for breakfast.'

Krifka's prediction is that a count noun phrase like 'apple' in imperfective sentences like (27) should undergo a count-to-mass shift so that (27) would mean something like 'He had some apple-stuff for breakfast'. However, (27) has no such meaning. According to Krifka (1986, 1989), imperfective verb forms are cumulative and complex imperfective predicates enforce a cumulative interpretation of Incremental Theme arguments, following the aspectual composition, given here in (1). (Krifka (1992) observes that imperfective predicates may not always have a cumulative interpretation, but he does not explain this point in detail.)

5.4.3   A Constraint-Based Approach

The English and Czech examples, such as those given in (28) and (29), illustrate two different types of interactions and mutual constraints between noun phrases and verbal predicates.

(28)   John at the apple / apples/ soup.

(29)   Ivan   snědl^P jablka   / polévku.
       Ivan   eat.PAST   apple.PL.ACC / soup.SG.ACC
       'Ivan ate (up) (all) the apples / the whole portion of soup.'

They share two fundamental characteristics. First, the interpretive rules make reference to the Incremental Theme argument, and the apparatus of lattice-theory within which the notion of 'Incremental Theme' is defined. The interpretive rules appear to be asymmetric. The reason is that the verb and the Incremental Theme argument differ with respect to how much information they contribute to the quantization (or telicity) property of a complex verbal predicate.

In English, the Incremental Theme argument is specified with respect to quantization, while its governing verb is unspecified in this respect: *the apple* yields a quantized verbal predicate, while *apples* and *soup* a cumulative verbal predicate. Since the Incremental Theme argument carries more information about quantization than its governing verb, this information appears to 'flow' from the Incremental

Theme argument onto the complex verbal predicate that combines the Incremental Theme argument and its governing verb.

In Czech, the apparent 'flow' of information appears reversed, it seems to be transferred from the verb onto the Incremental Theme noun phrase. In particular, if the Incremental Theme argument is realized as an undetermined mass or plural noun phrase functioning as an argument of a perfective verb, all the information about grammatical aspect (perfectivity), quantization (telicity) and quantificational properties of a sentence is encoded on the verb (provided the sentence does not contain any other quantificational elements). The meaning restriction of the Incremental Theme noun phrase by the perfective operator can be viewed as projecting a structure that is inherently present in the domain of verbal denotata onto the domain of nominal denotata that has no or little inherent structure.

In sum, the direct comparison of examples like (28) and (29) suggests that the information about quantization and cumulativity 'flows' from the noun phrase to the verb phrase in English and, in the opposite direction, from the verb to the noun phrase in Czech. In Krifka's (1986, 1989) work this is reflected in such formulations as 'the transfer of reference mode' (Krifka 1986; 1989) from the Incremental Theme argument onto the complex verbal predicate, and vice versa. This suggests that his approach to such interactions is implicitly procedural. The target of such an information 'transfer' undergoes a meaning shift (or at least what appears in many cases to be a meaning shift). What is the most suitable framework for capturing such differences in the directionality of 'flow' of information transfer between noun phrases and verbal predicates, and resulting meaning shifts?

The variability of noun and verb meanings has been accounted for via ambiguity, which is often captured by general lexical rules or type-shifting operations. The main disadvantage of such approaches is massive and unmotivated multiplication of interpretive rules, or multiplication of lexical entries or senses of items in questions. Take the Czech case, for example. We cannot account in any systematic and adequate way for all the meanings that undetermined common noun phrases can assume in a variety of contexts by simply extending Krifka's account, because this would lead to a rampant multiplication of interpretive rules for noun phrases. That is, to one syntactic rule 'NP → N' (where N is a common noun) would correspond not just two semantic interpretations, but as many as four: definite description, existential quantifier, name of a kind, and predicate. Neither can we account for this variety of noun phrase meanings by positing just one lexeme for each common noun in Czech and imposing constraints on

the interpretation of particular argument positions of a verb, as for example, Carlson (1977) proposes for existentially quantified mass and plural nouns in English.   This would lead to an unmotivated proliferation of lexical entries for verbs or proliferation of senses for verbs.

We can avoid such problems and provide a unified analysis for both the English and Czech cases if we assume a constraint-based (or unification-based) view of these interactions. (For an outline of a constraint-based approach to language description see chapter 3.9.)   In constraint-based terms, a verb and an Incremental Theme noun phrase each specify partial information about a single linguistic object, a complex verbal predicate or a sentence. Constraints imposed by the language require that information coming from these two sources be compatible. Languages may differ with respect to the encoding of the relevant information, quantization and cumulativity, in the surface syntax and morphology. In Czech, it is the verb that specifies more information than the Incremental Theme noun phrase (due to the lack of the closed-class function category 'article' as well as the rich verbal morphology and semantics of Czech verbs). In English, on the other hand, it is the Incremental Theme noun phrase that carries the most of the informational load.   The apparent 'flow' of quantization and cumulativity information in one direction is due to the imbalance in which this information is encoded in the surface structure. In each case, it is due to the fact that certain linguistic forms specify more information than others or specify information that takes precedence over the information specified by other linguistic forms.

In English, a verb and an Incremental Theme noun phrase each introduce instances of the feature attribute 'QUANT'. As was described in chapter 3, section 3.9.3, in the lexical entry for the English verb *eat*, it is required that the verb, the Incremental Theme argument, and the noun phrase co-indexed with the Incremental Theme argument all have the same value in the 'QUANT' feature structure. The sharing of the feature structure 'QUANT' between the verb and the Incremental Theme noun phrase here indicates that the quantization (telicity) value of the combination 'verb + Inchremental Theme NP' is determined by the quantization status of the noun phrase that satisfies the Incremental Theme requirement of the verb. The syntactic unification operation has as its semantic correlate the aspectual composition principle, given in (1) above. The aspectual composition can be thought of as one of the integration functions that combine the meaning of sentence's constituents into an interpretation of a sentence by integrating partial information provided by each constituent. A general HPSG-style rule

for the unification of the 'QUANT' values of the verb and the Incremental Theme noun phrase is given in (30):

(30)

$$
\begin{bmatrix} phrase \\ \text{HEAD}\,[1] \end{bmatrix} \rightarrow \begin{bmatrix} phrase \\ \text{HEAD}\,[1]\begin{bmatrix} verb \\ \text{QUANT}\,[2] \end{bmatrix} \end{bmatrix} \begin{bmatrix} phrase \\ \text{HEAD}\begin{bmatrix} noun \\ \text{QUANT}\,[2] \end{bmatrix} \end{bmatrix}
$$

This rule allows us to calculate the quantization properties of complex verbal predicates in those cases in which the noun phrase that determines the quantization of a verbal predicate is not a subcategorized Incremental Theme argument of its head verb: e.g., *She combed her hair* on its telic reading, for example. (See also chapter 3, section 3.5.)

In Czech, there are three separate distinctions whose members interact in systematic ways in the interpretation of Incremental Theme arguments that depends on verbal aspect:

(31)   quantized - cumulative distinction
        part - whole distinction
        definite - indefinite distinction

The first two are cross-categorial distinctions that are applicable to the domains of nominal and verbal predicates. In the domain of verbal predicates, the quantized-cumulative distinction corresponds to the telic-atelic distinction. The mereological part-whole distinction characterizes the core semantic properties of the perfective and imperfective aspect. (See also chapter 4.)

Aspect is marked directly in the lexical entries of verbs with the cross-categorial feature specifications '[TOT +]' and '[PART +]'. In a given Czech sentence, the feature specifications '[TOT +]' and '[PART +]' percolate upwards from the lexical head verb to the phrasal level and ultimately determine the aspect of a sentence.

In Chapter 4, I propose that in Slavic languages [PERFECTIVE ϕ] denotes events represented as integrated wholes (i.e, in their totality, as single indivisible wholes). The semantic contribution of the perfective operator can be represented as a function that maps from any kind of eventuality to a 'total event': PERF: $\mathscr{E} \rightarrow$ TOTAL.EVENT, whereby $\mathscr{E}$ = {process, state, event}. The aspectual operator takes scope over event predicates and their arguments. At the same time, the perfective operator quantifies simultaneously over all the temporal parts of an event and over all the parts of an individual denoted by the Incremental Theme argument. Roughly, this can be represented as in (32a). This

then amounts to the interpretation of the Incremental Theme argument as approximately *all the* x, *the whole of* x. In the case of undetermined mass and plural Incremental Theme noun phrases, we get interpretations of 'the maximal quantity of P' (32b) or 'the maximal group of Q', where P is a mass predicate and Q a plural predicate.

(32) a. TOT[**eat soup**] = TOT[**eat**] + TOT[**soup**]
     b. $[\![$ polévka $]\!]$ $= \iota x[$**soup'**$(x)]$ (the maximal quantity of soup,
                        the maximal individual that falls under SOUP)

That this totality interpretation is clearly an entailment associated with the Incremental Theme argument can be shown by the observation that it cannot be negated without contradiction:

(33)   *Snědl^P polévku$_i$,   ale nesnědl^P [ji všechnu]$_i$.
         *eat.PAST   soup.SG.ACC$_i$ but neg.eat.PAST   [it all.SG.ACC]$_i$
         *'He ate up [(all) the soup]$_i$, but he did not eat [it all]$_i$'.

The discourse anaphora test indicates that the Incremental Theme argument in the scope of the perfective operator does not behave like a strongly quantified noun phrase. Only noun phrases with existential or weak monotone increasing determiners can serve as antecedents of unbound anaphora which escape c-command domains (see Heim, 1982; Reuland and ter Meulen (eds.), 1987; Partee et al., 1990:389): cp. *Max built a house$_i$ - It$_i$ stood on a hill; Every dentist in this town built a house$_i$ - #It$_i$ was spacious / #They$_i$ were spacious.* In (34) we see that the Incremental Theme noun phrase is bound by a strong quantifier *každou* (fem.sg.acc.) 'each', 'every', and it cannot function as an antecedent of the understood *pro*-subject.

(34)   a. Otevřel^P [každou   zásuvku]$_i$.
             open.PAST   [each.SG.ACC drawer.SG.ACC]$_i$
             'He opened each drawer$_i$.'
         b. #Byla   prázdná. - #Byly   prázdné.
             #[pro]$_i$ was   empty   #[pro]$_i$ were   empty
             '#It$_i$ was empty.'   '#They$_i$ were empty.'

(35)   a. Otevřel^P [(všechny) zásuvky]$_i$. - Byly   prázdné.
             open.PAST [(each)   drawer]$_i$ [pro]$_i$ were   empty
             'He opened [(all) the drawers]$_i$.'   'They$_i$ were empty.'
         b. Snědl^P polévku$_i$.   - Byla   přesolená.
             *eat.PAST soup$_i$ [pro]$_i$ was over.salted
             *'He ate up [(all) the soup]$_i$.' 'It$_i$ was oversalted.'

By contrast, quantified noun phrases with *všechen* 'all' are acceptable antecedents of the understood *pro*-subject, as in (35). This indicates that quantified noun phrases with *všechen* 'all' are weakly quantified[3]. Since also the undetermined Incremental Theme noun phrases in (35) license discourse anaphora, we may conclude that the quantificational force of the perfective operator is that of a weak quantifier, and not of a strong one.

That the aspectual operator binds the variable introduced by the Incremental Theme argument, and not by some other argument, can be shown by examples in (36):

(36) a. Napsal[P]   dopisy   (inkoustem).
          COMPL.write.PAST   letter.PL.ACC   (ink.SG.INSTR)
          'He wrote the letters (in ink).'

      b. Napsal[P]   VSECHNY dopisy   (inkoustem).
          COMPL.write.PAST   ALL   letter.PL.ACC(ink.SG.INSTR)
          'He wrote all the letters (in ink).'

      c. Napsal[P]   dopisy   (??VSÍM   inkoustem).
          COMPL.write.PAST   letter.PL.ACC (??ALL   ink.SG.INSTR)
          'He wrote the/some letters (??with all the ink).'

      d. Vypsal[P]   (na dopisech)   VSECHEN inkoust.
          COMPL.write.PAST   (on   letter.PL.LOC)   ALL
ink.SG.ACC
          'He used up all the ink (to write the letters).'

(36a) entails (36b). However, (36a) does not entail that the Agent used all the ink to write the letters. In fact, the optional instrumental complement cannot be modified with the determiner quantifier 'all', as (36c) shows. In order to express that all the ink was used to write the letters, we would have to use a different prefixed verb, namely *vypsat* with the meaning 'to use x completely up by writing with it' that takes as its direct object (Incremental Theme) the optional instrumental complement of the simplex verb *psát* 'to write', 'to be writing', as (36d) shows.

It has been observed that the effect of the perfective operator on the meaning of Incremental Theme noun phrases is comparable to the effect of a universal quantifier *all.* However, (29) cannot mean that all quantities of soup and all quantities of apples (that there are) were eaten, but rather that some contextually specified totality of soup and some

specific totality of apples was eaten.   Such affinities between the perfective semantics and notions like totalities of portions of stuff and totalities of plural individuals make Link's (1983, 1987) lattice-theoretic logic of plurals and mass terms particularly suitable for the description of the data like those in Czech. The totality of soup and the totality of apples referred to in (29) is the maximal or largest individual that falls under the denotation of 'soup' and 'apples'. The maximal individual is unique in the domain and it constitutes the denotation of definite noun phrases.   This effect can be captured with the iota operator. This operator applies uniformly to predicates with non-atomic ('soup') and atomic ('apples') structures. It may be then proposed that undetermined mass and plural nouns, such as 'soup' and 'apples', in the scope of the perfective operator (see example (29)), shift their interpretation from mass and plural to the totality interpretation: namely, the maximal quantity of some specific portion of soup and the maximal group of some specific apples.   The iota operator can be thought of as a type shifting operator that allows us to get undetermined noun phrases with common noun heads up to the right referential type *e.* In Slavic languages, undetermined noun phrases with common noun heads are of the predicative type $<e,t>$ (see Partee, Bach, Kratzer, 1987:18-19).   Since this type is excluded in referential positions, we need a type-shifting operator that combines with a common noun whose basic meaning is of the predicative type $<e,t>$ and yields an individual term of the type e or the generalized quantifier type $<<e,t>,t>$.   Partee (1987) proposes four type-shifting operations: A, THE, *nom* and iota. In our examples, such as (3a), (4a) and (29), undetermined noun phrases with mass and plural noun heads receive the 'definite description' interpretation.

The application of the operator ι, is here supported by general pragmatic principles of interpretation.   In order to make an assertion about the totality of an individual, the individual must be well-demarcated. However, mass and plural nouns have unbounded entities in their denotation; hence, one way to make sense of the requirement (imposed by the perfective aspect) that they be interpreted as completely subjected to the event, is to interpret them as referring to a specific portion of stuff or a group individual in the discourse. For example, the speaker of (29) presupposes that the hearer can identify the entity that is spoken of: a unique portion of soup, or at least some clearly identifiable portion of soup in the discourse, for example.
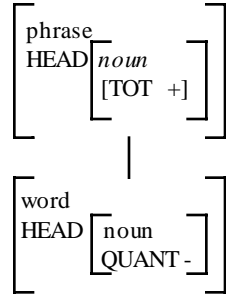
Constraints on the compatibility between aspect semantics and the Incremental Theme argument come from the lexicon. (37) is a partial lexical entry for the Czech perfective verb *sníst* 'to eat up'.

(37) Lexical sign for *sníst* 'to eat up'

$$
\begin{bmatrix}
\text{PHON} \quad \textit{sníst} \\[4pt]
\text{SYN} \begin{bmatrix} \text{HEAD} \begin{bmatrix} \textit{verb} \\ \text{TOT [3]} \end{bmatrix} \\[8pt] \text{SUBCAT} \ \langle [1]\text{NP}, \ [2][\text{NP}[\text{TOT [3]}]]\rangle \end{bmatrix} \\[12pt]
\text{SEM} \begin{bmatrix} \theta\text{-ROLE} \ \langle e, [1]\text{AGT}_i, [2][\text{INC-TH}[\text{TOT [3]}]]_j \rangle \\[8pt] \text{CONTENT} \begin{bmatrix} psoa \begin{bmatrix} e\text{-type} & incremental \\ aspect & [\text{TOT [3]+}] \end{bmatrix} \\[10pt] \text{PRED} \begin{bmatrix} \text{REL} & eat \\ \text{EATER} & i \\ \text{EATEE} & j \end{bmatrix} \end{bmatrix} \end{bmatrix} \\[12pt]
\text{CONTX} \ [\ ... \ ]
\end{bmatrix}
$$

(37) differs from the lexical entry for the English verb *eat* in that it has a specification for its inherent aspectual type as one of the values of the 'psoa' feature. The feature specification '[TOT +]' here encodes the perfective aspect of the verb. For the perfective verb *sníst* 'to eat up' it is required that the verb and its Incremental Theme argument both have the same value '+' for the TOT feature, indicated by the tag '[3]'. Mass and plural nouns are inherently cumulative and marked with the feature specification '[QUANT -]' in their lexical entries. Moreover, individual nouns are specified only with respect to quantization, but not with respect to the attribute 'TOT' (standing for the semantics of perfective verbs), hence they do not match the '[TOT +]' requirement imposed on the Incremental Theme argument by a perfective verb. They acquire this feature specification from a perfective verb when they are integrated into a perfective construction that combines a perfective verb with a noun phrase that satisfies its Incremental Theme argument requirement. The result of this integration is a 'two-story construction' (38), proposed independently by Fillmore and Kay (1992). It 'derives' a count noun phrase, marked as '[TOT +]', from a mass or plural noun: it takes a mass or a plural noun as its argument and yields a noun phrase marked in its external structure with the feature specification '[TOT +]'. In this case, the input mass and plural nouns retain their feature specification '[QUANT -]' marked in the internal structure of the noun phrase construction.

(38)

$$
\begin{bmatrix}
\text{phrase} \\
\text{HEAD}\begin{bmatrix} \textit{noun} \\ [\text{TOT} \ +] \end{bmatrix}
\end{bmatrix}
$$

$$
\mid
$$

$$
\begin{bmatrix}
\text{word} \\
\text{HEAD}\begin{bmatrix} \text{noun} \\ \text{QUANT} \ - \end{bmatrix}
\end{bmatrix}
$$

From this it follows that we need to distinguish between 'inherent (lexical) feature specifications' and 'structural feature specifications'. 'Inherent (lexical) feature specifications' are feature specifications that lexical items are assigned in their lexical entries. 'Structural feature specifications' are feature specifications that constituents inherit from constructions whose argument slots they fill.

Such a 'two-story' construction, in which we distinguish between internal (input) constraints and external constraints can be thought of as the constraint-based correlate of the type-shifting operation on the level of semantics: a shift from mass and plural interpretations of nouns to the interpretation of 'a maximal individual (portion or group) that falls under the denotation of a noun'. This shift is restricted to Incremental Theme arguments and the variable they introduce is bound by the type-shifting iota operator. This operation forms semantically singular predicates out of semantically mass and plural predicates. Hence, they are quantized. On the level of constraint-based representation, this can be captured by a feature co-occurrence restriction, according to which a given language expression that is specified as '[TOT +]' must also be specified as [QUANT +]: [TOT +] $\rightarrow$ [QUANT +]. (Recall that a predicate denoting an entity in its entirety, as a totality of some stuff or group individual, must be quantized.)

None of the feature structures given here contains information about the definite-indefinite distinction. On the constraint-based approach to the noun-verb interactions in Czech, there is just one lexeme for each (non-ambiguous) mass and plural noun, completely unspecified for definiteness. The definite-indefinite distinction is independent of the quantized-cumulative distinction, unlike in Krifka's system, and all relevant information about (in)definiteness is supplied by verbal forms, sentential and discourse context.

If the Incremental Theme noun phrase is inherently quantized, the whole noun phrase and its head have the feature specification '[QUANT +]'. In addition, the Incremental Theme noun phrase inherits the feature specification '[TOT +]' when it is integrated into a sentence as an argument of a perfective verb. However, it is not necessarily interpreted as a definite noun phrase:

(39) Ivan snědl^P jablko.
      Ivan eat.PAST   apple.SG.ACC
      'Ivan ate (up) (all) the apple / a whole apple.'

The iota operator together with the constraint that semantic type-shifting operations must be type range-preserving (see Partee, 1987) excludes proper names, pronouns, demonstratives and various indexicals, which are of the individual type *e*, from undergoing the type-shifting operation from mass and plural interpretations to the interpretation of 'a maximal individual (portion or group) that falls under the denotation of a noun'. But it is not clear how we can prevent the iota operator from applying to singular count noun phrases.

The feature specification that encodes the semantic contribution of imperfective verbs in Slavic languages, is given as '[PART +]'. '[PART +]' captures the assumption that [IMPERFECTIVE ϕ] denotes partial eventualities, where the notion of 'part' is understood in the sense of a weak ordering relation '$\leq$'. The imperfective operator functions as a partitive quantifier over the denotations of the Incremental Theme argument (that is, in the most typical cases). In the lexical entry for the imperfective verb *jíst* 'to eat'/ 'to be eating', given in (40), it is required that the verb and the noun phrase that is co-indexed with the Incremental Theme argument and the Incremental Theme argument itself have the same value for the PART feature.

A verbal predicate marked as '[PART +]' can be telic or atelic: '[QUANT +]' or '[QUANT -]'. The assignment of the determinate value to the feature attribute 'QUANT' of a complex verbal predicate depends on the value of the feature attribute 'QUANT' assigned to the noun phrase that functions as the Incremental Theme argument ('[QUANT [4]α]'), and follows the same general interpretation principle of aspectual composition described for English (1). If the Incremental Theme noun phrase is '[QUANT +]', the complex imperfective verbal predicate is also assigned the feature specificaton '[QUANT +]', it is telic.

(40) Lexical sign for *jíst* 'to eat'/'to be eating'

```
┌                                                              ┐
│ PHON  jíst                                                   │
│                                                              │
│ SYN ┌ HEAD ┌ verb                        ┐                   │
│     │      │ [PART[3] , QUANT[4]]        │                   │
│     │      └                             ┘                   │
│     │                                                        │
│     │ SUBCAT  <[1]NP, [2][NP[PART[3],  QUANT[4]] α]>          │
│     └                                                        │
│                                                              │
│ SEM ┌ θ-ROLE  < e, [1]AGT_i, [2][INC-TH[PART [3], QUANT[4]]]_j >  │
│     │                                                        │
│     │ CONTENT ┌ psoa ┌ e-type  incremental ┐   ┐             │
│     │         │      │ aspect  [PART [3]+]  │   │             │
│     │         │      └                      ┘   │             │
│     │         │      PRED ┌ REL     eat ┐       │             │
│     │         │           │ EATER   i   │       │             │
│     │         │           │ EATEE   j   │       │             │
│     │         └           └             ┘       ┘             │
│                                                              │
│ CONTX [ … ]                                                  │
└                                                              ┘
```

5.4.4   Supporting Evidence: Interactions between Aspect and Determiners

In perfective and imperfective sentences there are systematic restrictions on the occurrence of determiner quantifiers, numerals and various quantifying and measure expressions in Incremental Theme noun phrases. Such restrictions lend support to the Incremental Theme Hypothesis (see (2)) that aspectual operators have a quantifier-like functions and bind the variable introduced by the Incremental Theme noun phrase.

The hypothesis also sheds light on the seemingly complicated ways in which noun phrases with determiner quantifiers, numerals and other expressions of quantity interact with aspect and that have puzzled linguists working on Slavic languages (see Wierzbicka, 1967; Rassudova, 1977; Merrill, 1985; among others).

In imperfective sentences that denote single events, the Incremental Theme argument cannot be quantified with the universal quantifier *všechen* 'all', and it is odd with weak quantifiers like *hodně* 'a lot of' and *málo* /*trochu* 'a little'. This is shown in (41)-(43). Unless (41)-(43) are understood habitually, they are odd. In order to denote a single event, the use of the corresponding perfective verbs is here clearly preferred.

(41)   Pil[I]   (??)všechnu   kávu.
       drink.PAST   (??)all.SG.ACC   coffee.SG.ACC
       'He was drinking (?)all the coffee.'/'He drank (?)all the coffee.'

(42)   Pil[I]   (?)hodně   kávy.
       drink.PAST   (?)a.lot   coffee.SG.GEN
       'He was drinking (?)a lot of coffee.'/'He drank (?)a lot of coffee.'

(43)   Pil[I]   (?)málo   kávy.
       drink.PAST   (?)a.little   coffee.SG.GEN
       'He was drinking a small portion of coffee.'
       'He had a little coffee.'

The universally-quantified sentence (41a) is not acceptable under a single event interpretation, regardless whether it has a 'general factual' use (see chapter 4) or an 'on-going' situation ('progressive') use. The universal quantifier is also odd when (41) has a completive use, that is, if (41) is used in the following context: 'Last night, he drank all the coffee.' In such a context the corresponding perfective verb is preferred: *Včera večer vypil[P] všechnu kávu.*

One way to motivate this behavior would be to assume that the quantifiers *všechen* 'all', *hodně* 'a lot of' and *málo /trochu* 'a little' bind the variable introduced by the Incremental Theme argument. This variable cannot be, at the same time, bound by the imperfective operator which functions as a partitive quantifier over the denotations of the Incremental Theme argument. If we assume that there is a general prohibition against vacuous quantification in natural language (see Milsark, 1974, 1977; Chomsky, 1982; Kratzer, 1989, for example), the oddity of the above sentence would be accounted for.

(44)   **Prohibition against vacuous quantification.** For every quantifier Q, there must be a variable x such that Q binds an occurrence of x in both its restrictive clause and its nuclear scope (Kratzer, 1989:9).

The conflict between the imperfective operator and a determiner quantifier, which both lay claim on the variable introduced by the Incremental Theme argument does not arise in imperfective sentences with a habitual interpretation. In such a case the imperfective operator and the determiner quantifier bind different variables. (41) is felicitous in the following context, for example: *Když měl hodně práce, pil[P] všechnu kávu, kterou si přinesl do nemocnice v termosce* - 'When he

was busy, he drank all the coffee that he brought to the hospital in a thermos bottle.' Here, the imperfective verb *pil* 'he drank' introduce a situation variable that is bound by the habitual (or generic) operator. The imperfective operator does not function as a partitive quantifier over the variable introduced by the Incremental Theme argument.   This variable is bound by the universal quantifier.   The domain of the universal quantification is specified by the denotation of the Incremental Theme: portions of coffee.

If the Incremental Theme noun phrase is headed by a plural noun, then there are other options for resolving the conflict between the imperfective operator and a determiner quantifier (both strong or weak) in imperfective sentences. Consider the following sentence:

(45)   Barvila[I]   (*)všechna   trička.
        dye.PAST   (*)all.PL.ACC T-shirt.PL.ACC
        'She was dying (?)all the T-shirts.'/'She died (?)all the T-shirts.'

(45) is acceptable in a situation in which 'she' is dying all the T-shirts at the same time (simultaneous interpretation) or in which 'she' systematically works her way through the T-shirts, one by one (consecutive interpretation).   Under the simultaneous interpretation, there may be a point at which one-half of each T-shirt is died and the other is not, let us say, by simultaneously dipping all of them only halfway into a container with dye: *all* T-shirts are *partly* subjected to the denoted event. The problem of vacuous quantification does not here arise, because 'all' and the aspectual operator (in its function as a partitive quantifier over the denotation of the Incremental Theme) have different domains of quantification, and 'all' takes wide scope relative to the aspectual operator 'PART'.

Under the consecutive interpretation, the aspectual operator 'PART' takes wide scope relative to the universal quantifier 'all'. (45) would be felicitous in a situation in which 'she' dies each T-shirt completely, one after another, until all of them are died.   However, the consecutive interpretation seems to be much less frequent than the simultaneous one.

When the imperfective operator functions as a partitive quantifier that simultaneously binds the Incremental Theme and event variable, its quantificational force is roughly comparable to the English unstressed *some* ('sm'). If we assume Ioup's (1975) hierarchy of the relative scope of different quantifier types in multiply-quantified sentences, we can predict that the partitive quantifier incorporated in imperfective verb

stems should take narrow scope relative to the universal determiner quantifier *všechen* 'all':

(46)   Ioup's Hierarchy:
        each > every > all > most > many > several > some > a few

As Diesing (1992:64) points out, the quantifiers in the left-hand half of Ioup's Hierarchy tend to have wider scope and belong to the class of strong determiners in the sense of Milsark (1974, 1977). Those in the right-hand half that tend to have narrower scope belong to the class of weak determiners. This means that partitive quantifiers have a narrower scope than nonpartitive quantifiers[4]. Diesing (1992:63) illustrates this point with English examples (the unstressed readings of the determiners are here indicated by deleting the vowels):

(47)   a. Sm cellists played every suite today.
        b. Mny cellists played SOME suite today.
        c. Tw cellists played SOME suite today.

In (47) the strongly quantified object noun phrases *every suite* and *SOME suite* (presuppositional reading) take scope over the weakly quantified subject noun phrases (on their cardinal reading).

   In the consecutive interpretation of (45), the imperfective aspectual 'PART' quantifier takes wide scope relative to the universal quantifier. This, however, contradicts Ioup's (1975) hierarchy and it may be viewed as motivating the observation that the associated consecutive reading is clearly not the preferred one.

   Whether a given imperfective sentence has a simultaneous or consecutive interpretation depends on the nature of the denoted event, on what we know about how events typically take place. The most likely interpretation of (48a) is a consecutive one in which the Agent participant drinks one portion of coffee and then the other, while in (48b) the consecutive reading is the only plausible reading, given what we know about the nature of singing.

(48)   a. Pil[1]   (?)dvě   kávy.
            drink.PAST   (?)two   coffee.PL.GEN
            'He was drinking (?)two portions of coffee.'
            'He drank (?)two portions of coffee.'

(48)   b. Zpíval[I]   tři árie   z Prodané Nevěsty.
            sing.PAST   three arias   from Bartered Bride
            'He was singing three arias from Bartered Bride.'
            'He sang three arias from Bartered Bride.'

Imperfective sentences with a quantified or numerically-specified Incremental Theme argument raise a number of difficult questions. One of them concerns the conditions under which a consecutive or simultaneous interpretation can be assigned to them. Related to this question is another that concerns the scope of the aspectual operator and the quantified or numerically-specified Incremental Theme argument. The above preliminary observations just scratch the surface of this phenomenon and they clearly need to be refined.

In perfective sentences quantified or numerically-specified Incremental Theme noun phrases are unconditionally acceptable. This is shown in (49) and (50):

(49)   a. Vypil[P]   všechnu   kávu.
            COMPL.drink.PAST   all.SG.ACC   coffee.SG.ACC
            'He drank up (all) the coffee.'

       b. Upletla[P]   všechny   svetry.
            COMPL.knit.PAST   all.PL.ACC   sweater.PL.ACC
            'She knitted all the sweaters.'

(50)   Vypil[P]   hodně / málo / dvěkávy.
       COMPL.drink.PAST   a.lot / a.little / two   coffee.SG.GEN
       'He drank (up) a large /small portion / two portions of coffee.'

(50) with *dvě kávy* 'two coffees' is not felicitous in a situation in which there were two separate occasions on each of which he had one portion of coffee. That is, in (50) *dvě kávy* 'two coffees' denotes a group individual, and the whole sentence has a single event interpretation. The effect of the perfective operator on the numerically-specified Incremental Theme argument 'two coffees' in (50) amounts to inducing a shift from plural (two portions of coffee) to group interpretations (two portions of coffee as a group). This yields two interpretations for noun phrases like 'two coffees' (see Landman, 1989a, 1996:441):

(51)   *dvě kávy* 'two coffees':
    (i) the set of properties that a sum of two coffees has,
    (ii) the set of properties that a group of two coffees has.

Such data can be viewed as supporting the claim that an Incremental Theme noun phrase in the scope of the perfective operator is understood as referring to the maximal group individual that falls under its denotation. This is captured here by proposing that the variable introduced by the Incremental Theme argument is bound by the iota operator.

Unlike in imperfective sentences in (41), in (49) and (50) the problem with the vacuous quantification does not seem to arise. The oddity of (41) is motivated by assuming that the partitive quantifier 'PART' and the determiner quantifier 'all' cannot simultaneously bind the same variable introduced by the Incremental Theme noun phrase. Following the same line of argumentation, we would have to assume that also in (49) the variable introduced by the Incremental Theme noun phrase is bound by the universal quantifier and also by the perfective quantifier 'TOT', contrary to (44). Hence, we are here faced with the problem how to account in a uniform way for the behavior of the universally quantified Incremental Theme noun phrases in the scope of the perfective and imperfective operator.

Not only does the perfective operator sanction any determiner quantifier within the Incremental Theme noun phrase, but there is a preference for the Incremental Theme noun phrase denoting a plurality of individuals to be quantified. Perfective sentences with undetermined plural noun phrases linked to the Incremental Theme argument sound odd (unless they are used in some special contexts, such as enumeration of events, for example). This is illustrated by examples in (50) ("#" indicates 'acceptable, but not preferred or frequent'). Corresponding examples in Polish are described in Wierzbicka (1967).

(52)   a.   Postavil[P] #domy / dva domy.
        'He built houses / two houses.'

     b.   Napsal[P] #knížky / několik knížek pro děti.
        'He wrote books / several books for children.'

     c.   Napsal[P] #žádosti / hodně žádostí.
        'He wrote applications / a lot of applications.'

Slavic undetermined plural nouns do not shift as easily from the cumulative to quantized interpretation as undetermined mass nouns do. In the scope of perfective operator the meaning shift from plural to a maximal (group) individual needs to be formally supported by some overt determiner quantifier. In this respect undetermined plural noun phrases clearly differ from undetermined mass noun phrases. This difference in the syntactic and semantic behavior between mass and plural nouns can be motivated by the difference in their respective denotational domains. It has been observed in chapter 2 (section 2.5.2) that the difference between mass and plural nouns, according to Link (1983, 1987), is in the type of the semi-lattice that structures their denotations: in the case of plural nouns it is atomic, while in the case of mass nouns it is non-atomic. Partee (1996) suggests that the mass lattice structure is more general than the count noun structure. The domains of mass noun interpretations are join semi-lattices, unspecified for atomicity, hence they represent the unmarked case. Atomic join semi-lattices are characterized as the same structures but with an added requirement, hence they represent the marked case. It may be suggested that linguistic expressions with denotational domains that represent an unmarked case shift more easily between interpretations than linguistic expressions with denotational domains that represent the marked case.

If a perfective or an imperfective verb is combined with quantified noun phrases that are not linked to the Incremental Theme role, we do not observe the interactions described above. This may be viewed as a piece of negative evidence for the hypothesis that the imperfective and perfective operators have a quantifier-like function with respect to the variable introduced by the Incremental Theme argument, but not with respect to variables introduced by other nominal arguments. In perfective sentences, we observe no preference for overt quantification with noun phrases that are not linked to the Incremental Theme argument, as for example, (13) shows. In imperfective sentences, such as (53a) and (53b), we see that the quantifiers *všechen* 'all', *několik* 'several' and the numeral *tři* 'three' freely occur within direct object noun phrases linked to the Patient (or Theme) (53a) and to the Stimulus role (53b):

(53) a. Václav nesl[I]   všechny   balíky   na poštu.
          Vaclav carry.PAST all.PL.ACC package.PL.ACC to post-office
          'Vaclav was carrying all the packages to the post office.'
          'Vaclav carried all the packages to the post office.'

(53) b. Slyšel^Iněkolik lidí   / tři hlasy   na chodbě.
          hear.PAST several people / three voices on corridor
          'He heard several people / three voices in the corridor.'

A similar interaction between aspectual operators and quantified Incremental Theme noun phrases can be observed in English. A quantified Incremental Theme noun phrase with *some* is unacceptable in the scope of the imperfective operator (54), but not in a sentence with the corresponding simple verb form (55) (examples are taken from Jackendoff, 1990:101):

(54) a. ??Some water was rushing out of the faucet.
      b. ??Some people were streaming into the room.

(55) a. Some water rushed out of the faucet.
      b. Some people / Fifty people streamed into the room.

Notice also that we do not find such an interaction with quantified noun phrases that are not linked to the Incremental Theme role:

(56) a. Some water was glistening / glistened in the distance.
      b. Some people were waiting / waited in line.

5.4.5 Verbal Affixes as Expressions of Quantity and Measure

In the case of quantification over variables introduced by Incremental Theme noun phrases that are triggered by verbal aspect the scope-bearing element is incorporated in a whole verb form, perfective and imperfective. With verbal predicates that take Incremental Theme arguments, aspectual operators quantify simultaneously over parts of an individual (Incremental Theme) and parts of an event. Verbal affixes as quantifiers can bind (i) an event variable, or (ii) a variable introduced by the Incremental Theme noun phrase, or (iii) simultaneously both the event and Incremental Theme variable. For example, it has been observed (see section 5.2.2) that the Czech accumulative prefix *na-* expresses quantification over event-related parts of plural (or group) events, meaning approximately 'many times', 'frequently' and 'often' (as in (6)), or it quantifies only over the variable introduced by the Incremental Theme noun phrase, meaning approximately 'a lot', 'many/much', 'a large quantity of' (as in (8a)). What is most significant is that the prefix *na-* cannot simultaneously quantify over

both the individual-related and event-related parts, a situation that we find with various distributivity operators, for example, such as the distributive prefix *po-* in Slavic (see Filip and Carlson, 1997). (There are independent proposals to treat a distributivity operator as an operator that quantifies simultaneously over the members of a group and parts of an event, see Lasersohn (1997:5), for example). The Incremental Theme Hypothesis given in (2) can be elaborated along the following lines. Quantifiers that are incorporated in verbal morphology can be divided into three types according to their domain of quantification:

(i) simultaneous quantification over parts of an individual (denoted by the Incremental Theme argument) and parts of an event (e.g., distributivity operators, aspectual (perfective and imperfective) operators);

(ii) quantification over event-related part structure of a given eventuality (e.g., the accumulative prefix *na-*, as in example (6))[5];

(iii) quantification over individual-related part structure, i.e., that is, what we "count" are the individual-related parts (e.g., the accumulative prefix *na-*, as in example (8a)).

To conclude this section, I will comment on the properties of two Czech prefixes that have a quantificational force: the accumulative prefix *na-* and the distributive prefix *po-*. The accumulative prefix *na-*, which is directly attached to the verb, has an effect comparable to a vague cardinality quantifier, approximately 'a lot of', 'many/much', or 'a relatively large quantity/group of' with respect to the variable introduced by the Incremental Theme noun phrase. A supporting piece of evidence for this observation can be seen in the fact that the Incremental Theme noun phrase cannot be singular count, but mass or plural, as is shown in (58)[6]:

(58) a. NA-trhat^P *jablko.
          ACM-pick   *apple.SG.ACC
          'to pick a lot of apple'

      b. NA-trhat^P šeřík   / jablka.
          ACM-pick   lilac.SG.ACC / apple.PL.ACC
          'to pick a lot of lilac / apples

Another piece of evidence for the quantificational force of the prefix *na-* comes from its interaction with overt determiner quantifiers within the Incremental Theme noun phrase. The prefix *na-* is incompatible with quantifiers that indicate a relatively small number or measure, such as the cardinal numerals *jeden* 'one', *pět* 'five', the adverbial quantifier *málo* 'a few', 'little', or indefinite cardinal quantifiers, such as *několik* 'several', 'a few':

(59) a. Nakoupil^P *jedno jablko   / ??pět jablek.
     ACM.buy.PAST *one apple.SG.ACC / ??five apple.PL.GEN
     'He bought one apple / five apples.'

    b. Nadělal^P *několik dluhů.
      ACM.make.PAST *several   debt.PL.GEN
      ?'He made several debts.'

The weak quantificational meaning of the prefix *na-* is also incompatible with strong determiner quantifiers like 'every', 'each', 'all' (see Milsark, 1974, 1977):

(60) a. Nadělal^P *všechny   dluhy.
     ACM.make.PAST *all.PL.ACC   debt.PL.ACC

    b. *Všechno   nám   navyprávěl^P.
     *all.SG.ACC us.PL.DAT   ACM.tell.PAST

    c. Natrhala^P *každou   jahodu.
     ACM.pick.PAST *each.SG.ACC   strawberry.SG.ACC

The prefix *na-* is compatible with Incremental Theme noun phrases that contain weak determiner quantifiers, such as 'many', 'a lot (of)', 'many/much' and nonstandard measure expressions, such as 'a basket':

(61) Nakoupil^P hodně   / koš   jablek.
    ACM.buy.PAST   a.lot.of   / basket.SG.ACC apple.PL.GEN
    'He bought a lot of / a basket of apples.'

As has been observed in chapter 4, prefixes typically exhibit polysemy and homonymy, and one prefix can be applied to different verbs, or

classes of verbs, with different semantic effects. For example, the prefix *na-* does not have a weak quantificational force in a perfective verb like *napsat* 'to write up' that takes an Incremental Theme argument, and neither in predicates like *nahmatat^P tepnu* 'to find a vein by touching', *načechrat^P polštář* 'to plump up the/a pillow', *nakázat^P někomu něco* 'to order somebody to do something', *nalomit něco* 'to break something partly', *nahnout něco* 'to slant something' that do not take an Incremental Theme argument. Such perfective *na*-verbs can freely occur with singular count direct object noun phrases, and with noun phrases quantified with definite cardinal quantifiers, such as *one* and *three*, indefinite cardinal quantifiers, such as *several, a few*, or strong determiner quantifiers, such as *every, each, all* (see Milsark, 1974, 1977):

(62) a. Napsal^P jeden dopis   / tři dopisy.
          COMPL.write.PAST   one letter.SG.ACC / three letter.PL.GEN
          'He wrote one letter/five letters.'

      b. Napsal^P několik   dopisů.
          COMPL.write.PAST   several   letter.PL.GEN
          'He wrote several letters.'

      c. Napsal^P každý dopis   / všechny dopisy.
          COMPL.write.PAST   each   letter.SG.ACC / all letter.PL.ACC
          'He wrote each letter/ all the letters.'

The distributive prefix *po-* functions as a quantifier that simultaneously quantifies over parts of an individual (denoted by the Incremental Theme argument) and parts of an event. It is the defining characteristics of the Incremental Theme argument that its denotation has a part-whole structure. The application of a distributive operator presupposes that we have a predication over pluralities or anything with a part-whole structure (see Partee, 1995). For example, (63) is odd, because the property of distributively locking something up cannot be predicated of a single drawer, a single drawer is not *typically* thought of as an object with a part-structure that is correlated with a part structure of a locking event:

(63) Po-zamykal^P ??zásuvku.
      DISTR-lock.PAST   ??drawer.SG.ACC
      'He locked a/the drawer.' [gradually, successively]

(64) with a singular count Incremental Theme noun phrase is acceptable, because every successive subevent corresponds to a different subpart of the shoe-lace that was chewed up by the dog named *Dášenka*:

(64) Dášenka mi po-rozžvý kala[P] tkaničku od boty.
     Dášenka me DISTR-chew.PAST lace from shoe
     'Dášenka gradually chewed up my whole shoe-lace.'

The distributive *po*-verb requires that each subevent of the sum eventuality corresponds to a part of the Incremental Theme argument (or to a partial change of the referent of the Incremental Theme argument), and (64) entails that the whole shoe-lace was chewed up.

The distributive prefix *po*- differs in its quantificational force from the distributive determiner quantifier *každý* 'each', 'every': the prefix behaves like a weak quantifier while the determiner quantifier is strong. As has been observed with respect to (34), noun phrases quantified with strong quantifiers cannot serve as antecedents of unbound anaphora which escape c-command domains. By contrast, Incremental Theme noun phrases that introduce variables bound by the distributive prefix *po*- can:

(65) Po-otvíral[P] zásuvky$_i$. - Byly prázdné.
     DISTR-open.PAST drawer.PL.ACC$_i$ [pro]$_i$ were empty
     'He opened [all the drawers]$_i$. 'They$_i$ were empty.'
     [one after the other, successively].

The distributive prefix also seems to take narrow scope with respect to the distributive determiner quantifier. (66) means that each individual drawer was opened in a distributive fashion, which is odd for the same reason that (63) is odd. (66) cannot have a meaning in which the distributive po- takes scope over the distributive determiner quantifier:

(66) Po-zamykal[P] ??každou zásuvku.
     DISTR-lock.PAST ??each/every drawer.SG.ACC
     'He locked each/every drawer.' [gradually, successively]

The distribution of quantificational meanings into verbal roots and stems that is manifested in the Slavic verb seems to coincide with the distribution of quantificational meanings into roots and stems in Haisla that is observed by Bach (1995:19). From the point of view a cross-linguistic research, patterns of distribution of quantificational meanings in words could provide an important typological parameter.

Thisparameter seems to be directly related to the extent to which the semantics of a language is verbally oriented or centered around the verb. It is also related to morphological and syntactic verb-prominence, or heavy loading of information in the verb, which could be another possible candidate for a typological parameter (see David Gil cited in Partee, 1995:559). Furthermore, the above observations indicate that different types of lexical verb operators in their role as quantifiers are sensitive to different aspects of the part-structure of individuals and/or eventualities. That is, in stating generalizations about domains of quantification of various types of quantifiers, we need to make reference not only to the distinction between the domains of individuals and eventualities but also to their internal ordering in terms of part structures.

Notes

1. That a quantifier is linked to a verb argument means that it binds a variable filling the corresponding argument position and that the descriptive content of the linked NP provides a restrictive clause for the quantifier" (see Partee, Bach and Kratzer, 1987:21-2).

2. The article is only one of several morphosyntactic contexts from which the cluster of meanings grouped together as D/I may be derivable in whole or in part. It is therefore essential to separate the manifestations of D/I from the semiotic value of the article" (Chvany, 1983:72).

3. For arguments that in English *every* is a strong quantifier, but *all* is not, see Vendler (1967) and Reinhart (1983, 1987).

4. Independently of the issues in this section, Carlson (1981) proposes that English has a general ordering principle concerning the order of interpretation of nonpartitive and partitive quantifiers: "a nonpartitive (singular count) quantifier takes right of way over a partitive (noncount or plural) quantifier" (Carlson, 1981:59).

5. In this function, lexical quantifiers incorporated in verbal morphology behave like adverbs of quantification, such as *frequently* and adverbials with *times* in English (see Moltmann, 1997:183).

6. The Incremental Theme argument of an 'accumulative' *na*-verb can be realized in the accusative case, as in the above examples, or in the genitive case. Apart from some conventionalized cases, the accusative is preferred, especially by younger speakers, while the genitive is often considered to be archaic. The genitive case is claimed to indicate a (subjectively, relatively) larger quantity of entities denoted by the noun to which it is attached than the accusative case.