

# Arguments, Grammatical Relations, and Diathetic Paradigm

Tania Avgustinova  
Universität des Saarlandes

## Introduction

Formalized as a systematic interaction between a tier of co-arguments and a tier of co-dependents, the concept of diathesis offers a considerable theoretical advantage in stating linguistic generalizations.<sup>1</sup> Various phenomena, which used to be described in terms of surface configurations or argument structure configurations, are more appropriately interpreted in terms of a diathetic paradigm.

In this contribution, I argue for a theoretically motivated maintaining of the three syntactic representational levels that are de facto distinguished in recent HPSG research. The multistratal model of valence, most prominent in Relational Grammar ([Perlmutter and Postal 1983]), has been adapted to HPSG by [Manning 1996; Manning and Sag 1999], who distinguish a syntactic argument structure and valence. A significant development in the HPSG linguistic theory ([Bouma *et al.* 1998; Bouma *et al. to appear*]) is related to the introduction of a representational level of syntactic dependency structure that mediates between the two.

For a given predicator, the ARG-ST list represents the inherent argument structure (its syntactic arguments), the DEPS list contains the actual dependents (its grammatical relations), and the VALENCE lists encode the local combinatorial potential in terms of overt grammatical functions like subject (SUBJ), specifier (SPR) and complements (COMPS). While there are separate generalizations that must be stated at each of these levels, the explicit distinction of ARG-ST and DEPS is crucial in developing an HPSG theory of diathesis.

With the notion of diathetic paradigm in the spotlight, I show on Slavic linguistic material how a number of linguistic problems can be approached in a novel and theoretically rewarding way. As the sensitivity to subject prominence is of special interest, I sketch a diathesis-based analysis of binding, alternative to [Manning and Sag 1998] (in which also the analysis of morphological causatives by [Manning *et al.* 2000] can naturally be accommodated), so that a compatibility with the lexical approach to extraction proposed by [Bouma *et al.* 1998; Bouma *et al. to appear*] is achieved.

## Two-tiered representation of diathesis

Beginning with [Manning 1996], a division among the *arguments* of a verb is assumed into *term* and *oblique*. Voice and voice-like alternations exclusively involve the term arguments *a-subject* ("arguments-structure subject") and *a-object* ("arguments-structure object"), therefore, this distinction is crucial for modeling diathetic relations. The ordering in the ARG-ST list encodes arguments obliqueness which is governed by two principles: (i) terms precede obliques, and (ii) within each of these groupings the arguments are ordered according to thematic obliqueness (Figure 1).

---

<sup>1</sup> I am grateful to Ivan Sag, Hans Uszkoreit, and the audience of the conferences "Formal Description of Slavic Languages" (FDSL-3, Leipzig 1999) and "Berkeley Formal Grammar" (LFG HPSG, Berkeley 2000) for comments and stimulating discussions of various ideas related to the present study.

Figure 1: Term vs. oblique arguments

$$\left[ \text{ARG-ST} \langle 'terms' \mid 'obliques' \rangle \right]$$

The ordering in the DEPS list (the level of grammatical relations) encodes a separate prominence ranking which depends on the predicate's (morphological) form. I assume that the arguments give rise to *diathetic grammatical relations* in the DEPS list. They precede all *adverbial grammatical relations* which correspond to what [Bouma *et al. to appear*] consider "syntactically selected adjuncts" (Figure 2). While the adverbial grammatical relations are added as a suffix to the DEPS list by a special constraint (called Argument Structure Extension in [Bouma *et al. to appear*]), the diathetic grammatical relations are systematically related to the argument structure by constrained mappings.

Figure 2: Diathetic vs. adverbial grammatical relations

$$\left[ \text{DEPS} \langle 'diathetic grammatical relations' \mid 'adverbial grammatical relations' \rangle \right]$$

I propose that the notion of *diathesis* conceptualizes the way in which actual syntactic dependencies relate to the predicate's argument structure. It encompasses arguments and diathetic grammatical relations (Figure 3). A *diathetic paradigm* consists of the various ways in which the arguments can be mapped into grammatical relations. Traditional voices and voice-like alternations are trivially included in it, while derivational processes that alter the predicate's lexical meaning in unpredictable ways are not involved in its formation. Constructing a diathetic paradigm presupposes modeling the syntactic aspect of a predicate's diathesis. The semantic motivation of the diathesis by the head is subject to HPSG linking theory ([Davis 1996]), and concerns the constraints that mediate the association of thematic roles with syntactic arguments, hence, with diathetic grammatical relations. In contrast, no linking to thematic roles is observed with adverbial grammatical relations.<sup>2</sup>

Figure 3: Two tiered representation of diathesis

$$\left[ \begin{array}{l} \text{ARG-ST} \langle 'arguments' \rangle \\ \text{DEPS} \quad \langle 'diathetic grammatical relations' \mid \dots \rangle \end{array} \right]$$

The fact that the most prominent grammatical relation can but need not correspond to the most prominent argument provides two notions of subjecthood for subject-sensitive phenomena. The one is defined with respect to the co-arguments (the a-subject) and the other with respect to the co-dependents (the d-subject) of the same predicator (Figure 4). The d-subject is similar to the notion of "final 1" in Relational Grammar, i.e. as the privileged term in a system of surface grammatical relations.

---

<sup>2</sup> I will have nothing more to say about the treatment of adjuncts or the problems of the argument-adjunct opposition, as the common assumptions in recent HPSG research are, in principle, compatible with the approach presented here.

Figure 4: Two diathesis-based notions of subjecthood

$$\left[ \begin{array}{l} \text{ARG-ST} \langle a\text{-subject} \mid \dots \rangle \\ \text{DEPS} \quad \langle d\text{-subject} \mid \dots \rangle \end{array} \right]$$

The notion of a-subject, defined by Manning as "the class of all arguments that are first on some level of argument structure", can thus be maintained. What I argue must be changed is the criterion for introducing compound (i.e. nested) argument structures as a result of derivational operations. Most notably, the phenomenon of passivisation does not affect argument structure in terms of complexity but rather its mapping to grammatical relations in terms of syntactic dependencies. Therefore, the nested ARG-ST analysis of passive in [Manning and Sag 1998] loses its motivation in the general context of a diathetic paradigm.

### Diathetic paradigm

Three aspects of diathesis realization are significant in constructing a diathetic paradigm. All basic diathesis realization patterns involve ARG-ST – DEPS mappings with reference to the SUBJ valence feature. The linking of syntactic arguments to semantic (thematic) roles is trivially realized at the CONTENT – ARG-ST interface. The first aspect concerns obliqueness and whether it is rearranged in the mapping between the ARG-ST and DEPS. A diathesis can be organized so as to preserve or to change obliqueness. The *obliqueness preservation* aims, specifically, at mapping the a-subject to the d-subject. The *obliqueness change*, in turn, aims at establishing a d-subject that is different from the a-subject by promoting another argument (typically, the a-object). The second aspect takes into consideration whether all arguments are paired with grammatical relations or a diathesis reduction takes place. When all arguments, and especially the a-subject, have correspondents in the DEPS list, this is the case of *unreduced diathesis*. There is always a d-subject in this type of diathesis realization. It is encoded as the initial item of the DEPS list. If the unreduced diathesis is obliqueness-preserving, the d-subject corresponds to the a-subject. If it is obliqueness-changing, an a-subject demotion to a less prominent grammatical relation takes place and the a-object is promoted to d-subject. When the a-subject has no realization in the DEPS list, this is the case of *reduced diathesis*. If it is obliqueness-preserving, there is no d-subject, because the a-subject is blocked and all the other arguments preserve their obliqueness at the level of grammatical relations. If, however, the reduced diathesis is obliqueness-changing, the a-object is promoted to d-subject. Finally, the third aspect concerns the value of the valence feature SUBJ – whether it is an empty list or contains one element corresponding to the d-subject (in accord with the Argument/Dependent Realization constraint of [Bouma *et al.* 1998; Bouma *et al. to appear*]). The *subject valence* is required with all obliqueness-changing diathesis types, as well as in a subtype of obliqueness-preserving unreduced diathesis. In contrast, there is *no subject valence* with the obliqueness-preserving reduced diathesis, as well as in yet another subtype of obliqueness-preserving unreduced diathesis. All these regularities are summarized in (Figure 5), and will be illustrated by representative members of the Slavic diathetic paradigm in the next section.

Figure 5: Diathetic constraints

	<i>obliqueness preserved (OP)</i>	<i>obliqueness changed (OC)</i>
		$\left[ \begin{array}{l} \text{ARG\_ST} \langle \boxed{1} a\text{-subj} \mid \dots \rangle \\ \text{DEPS} \langle \boxed{0} d\text{-subj} \mid \dots \rangle \\ \text{VAL} \mid \text{SUBJ} \langle \boxed{0} \rangle \end{array} \right]$
<i>unreduced diathesis (UD)</i> $\left[ \text{DEPS} \langle d\text{-subj} \mid \dots \rangle \right]$	$\begin{array}{c} \text{UDOP} \\ \left[ \begin{array}{l} \text{ARG-ST} \langle \boxed{1} a\text{-subj} \mid \dots \rangle \\ \text{DEPS} \langle \boxed{1} d\text{-subj} \mid \dots \rangle \end{array} \right] \\ \hline \begin{array}{cc} \text{UDOP-1} & \text{UDOP-2} \\ \left[ \text{VAL} \mid \text{SUBJ} \langle \boxed{1} \rangle \right] & \left[ \text{VAL} \mid \text{SUBJ} \langle \rangle \right] \end{array} \end{array}$	$\begin{array}{c} \text{UDOC} \\ \left[ \begin{array}{l} \text{ARG-ST} \langle \boxed{1} a\text{-subj}, \boxed{2} a\text{-obj} \mid \dots \rangle \\ \text{DEPS} \langle \boxed{2} d\text{-subj}, \boxed{1} \mid \dots \rangle \\ \text{VAL} \mid \text{SUBJ} \langle \boxed{2} \rangle \end{array} \right]$
<i>reduced diathesis (RD)</i> $\left[ \begin{array}{l} \text{ARG-ST} \langle \boxed{1} a\text{-subj} \mid \boxed{2} \rangle \\ \text{DEPS} \langle \boxed{2} \oplus \text{list}('adv') \rangle \end{array} \right]$	$\begin{array}{c} \text{RDOP} \\ \left[ \begin{array}{l} \text{ARG-ST} \langle \boxed{1} a\text{-subj} \mid \boxed{2} \rangle \\ \text{DEPS} \langle \boxed{2} \oplus \text{list}('adv') \rangle \\ \text{VAL} \mid \text{SUBJ} \langle \rangle \end{array} \right]$	$\begin{array}{c} \text{RDOC-1} \\ \left[ \begin{array}{l} \text{ARG-ST} \langle \boxed{1} a\text{-subj}, \boxed{2} a\text{-obj} \mid \boxed{3} \rangle \\ \text{DEPS} \langle \boxed{2} d\text{-subj} \mid \boxed{3} \rangle \oplus \text{list}('adv') \\ \text{VAL} \mid \text{SUBJ} \langle \boxed{2} \rangle \end{array} \right] \\ \hline \text{RDOC-2} \\ \left[ \begin{array}{l} \text{ARG-ST} \langle \boxed{1} a\text{-subj}, \boxed{2} a\text{-obj}, \boxed{3} \mid \boxed{4} \rangle \\ \text{DEPS} \langle \boxed{3} d\text{-subj}, \boxed{2} \mid \boxed{4} \rangle \oplus \text{list}('adv') \\ \text{VAL} \mid \text{SUBJ} \langle \boxed{3} \rangle \end{array} \right]$

The table encodes a cross-classification distinguishing the following diathetic types. With *OP* nothing is promoted, while *OC* is intrinsically promotional. *UD* requires a d-subject. *UDOP* identifies the d-subject with the a-subject. *UDOP-1* requires subject valence, and is the most straightforward and trivial diathesis realization. *UDOP-2* suppresses the subject valence, but the d-subject and the a-subject are still both available. *UDOC* presupposes an a-subject demotion. *RD* is characterized by an a-subject blocking. *RDOP* has no d-subject, as the a-subject is blocked and nothing else is promoted. *RDOC* requires a d-subject even though the a-subject is blocked. *RDOC-1* resolves this by promoting the a-object and *RDOC-2* by promoting another (non-term) argument.

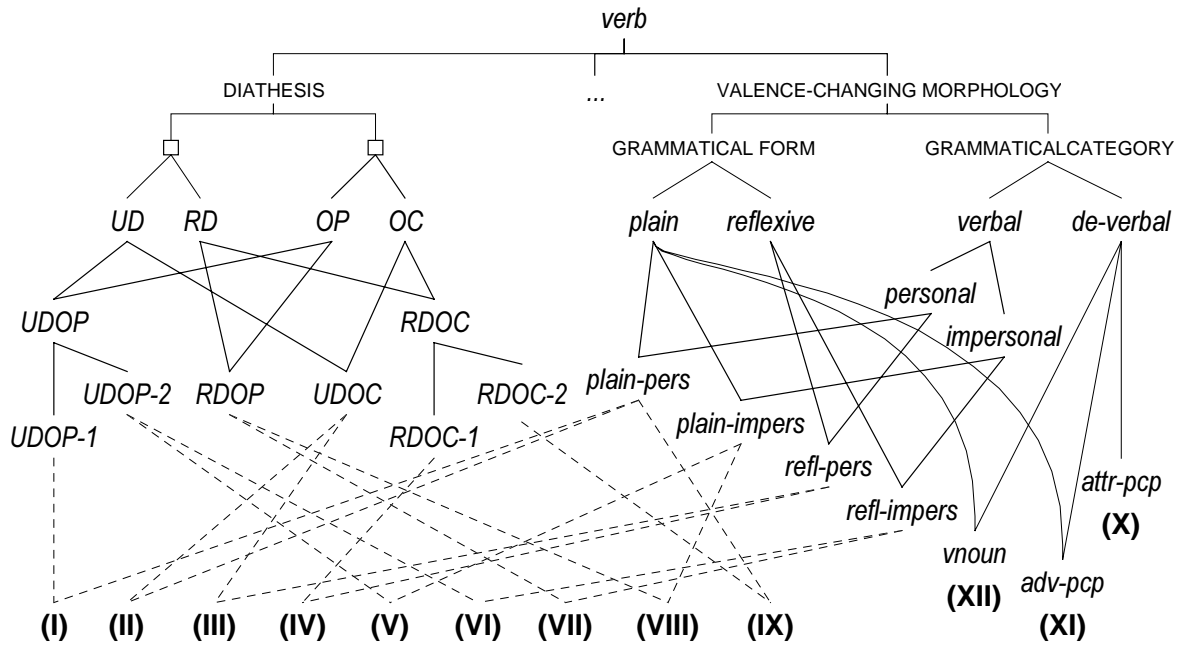
### Case study: Slavic diathetic paradigm

The typology of diathesis provides an insightful way of discussing similarities and systematic differences among Slavic languages. As an illustration, let us consider some examples of how the diathesis is organized with respect to the verb morphology. For expository purposes, only the interaction of argument structure, syntactic dependents and valence will be shown.

Cross-linguistically, valence changing morphology offers a number of options (Figure 6). With respect to grammatical form it can be plain or reflexive, and with respect to grammatical category it can be verbal (*personal* or *impersonal*) or de-verbal, in particular, de-verbal nominal (*vnoun*), de-verbal adverbial (*pcp-adv*) or de-verbal adjectival (*attr-pcp*). So, the basic verbal morphology can be *plain personal*, *plain impersonal*, *reflexive personal* and *reflexive impersonal*. In Slavic languages, the personal verb morphology often supplies enough information about the grammatical features of the surface subject. So, the latter can be dropped if

it is pronominal and no factors of information structure require its overt realization. Such "pro-drop" effects can be modeled by allowing well-formed sentences with an optionally unsaturated subject valence (i.e. non-empty SUBJ value).

Figure 6: Diathesis and verb morphology



**(I) Active voice**

ARG-ST	⟨ <span style="border: 1px solid black; padding: 2px;">1</span> a-subj   ...⟩	] & plain personal
DEPS	⟨ <span style="border: 1px solid black; padding: 2px;">1</span> d-subj   ...⟩	
VAL   SUBJ	⟨ <span style="border: 1px solid black; padding: 2px;">1</span> ⟩	

A canonical active verb form is an instance of obliqueness-preserving unreduced diathesis which is characterized by a plain personal morphology. The a-subject is identified with the d-subject which surfaces as a subject valence.

**(II) Agentive participial passive**

ARG-ST	⟨ <span style="border: 1px solid black; padding: 2px;">1</span> a-subj, <span style="border: 1px solid black; padding: 2px;">2</span> a-obj   ...⟩	] & plain personal
DEPS	⟨ <span style="border: 1px solid black; padding: 2px;">2</span> d-subj, <span style="border: 1px solid black; padding: 2px;">1</span>   ...⟩	
VAL   SUBJ	⟨ <span style="border: 1px solid black; padding: 2px;">2</span> ⟩	

The agentive participial passive is an instance of obliqueness-changing unreduced diathesis. Its morphological form of is plain personal. With the a-subject being demoted, the d-subject is identified with the a-object, and surfaces as a subject valence.

In Polish, the verbal aspect is crucial for the auxiliary selection (ex. 1a): with perfective verbs the auxiliary *zostać* ('to get') is used, and with imperfective verbs the auxiliary *być* ('to be') is used. The respective active-voice counterparts are given in (ex. 1b). Another restriction is observed in Russian where only perfective verbs form a participial passive (ex. 1c). In contrast, Bulgarian has no such restrictions (ex. 1d).<sup>3</sup>

ex. 1

- P(a) Zadanie było sprawdzane / zostało sprawdzone przez rodziców.  
 homework.NOM was checked.IMPRF / was checked.PRF by parents  
 The homework was checked by the parents.
- P(b) Rodzice sprawdzali / sprawdzili zadanie.  
 parents.NOM checked.IMPRF / checked.PRF homework.ACC  
 The parents checked the homework.
- R(c) Pis'ma \*pisany / napisany rebenkom.  
 letters \*written.IMPRF / written.PRF child.INST  
 The letters were written by a child.
- B(d) Pismata bjaxa pisani / napisni ot dete.  
 letters were written.IMPRF / written.PRF from child  
 The letters were written by a child.

**(III) Agentive reflexive passive (Russian, Bulgarian); "inactive experiential" (Russian); "feel-like" of transitive verbs (Bulgarian)**

ARG-ST	⟨ <u>1</u> a-subj, <u>2</u> a-obj   ...⟩	] & reflexive personal
DEPS	⟨ <u>2</u> d-subj, <u>1</u>   ...⟩	
VAL   SUBJ	⟨ <u>2</u> ⟩	

This pattern is an instance of obliqueness-changing unreduced diathesis and reflexive personal morphology. In Bulgarian and Russian, the agentive reflexive passive is similar to the agentive participial passive in realizing the a-subject as a more oblique grammatical relation. In Russian, the verbal aspect must be imperfective (ex. 2a), while in Bulgarian there is no restriction in this respect (ex. 2b).

ex. 2

- R(a) Pis'ma pialis' / \*napialis' rebenkom.  
 letters.NOM wrote.IMPRF.RFL / \*wrote.PRF.RFL child.INST  
 The letters were written by a child.
- B(b) Pismata se pisaxa / napisaxa ot dete.  
 letters.DEF REFL wrote.IMPRF / wrote.PRF from child  
 The letters were written by a child.

<sup>3</sup> The Slavic languages used for illustration of the discussed phenomena are abbreviated in the examples as follows: B(ulgarian), C(zech), P(olish) and R(ussian).

As in the agentive passive, Russian "inactive experiential" forms demote the a-subject and promote the a-object. The demoted a-subject, corresponding to the experiencer, is realized in the dative case – cf. (ex. 3a) whose active voice counterpart is given in (ex. 3b).

ex. 3

R(a)	Nam	vspomnilas'	staraja	pesnja.
	we.DAT	remembered.SG.F.RFL	old.NOM	song.F.NOM.
	We remembered a song.			
R(b)	My	vspomnili	staruju	pesnju.
	we.NOM	remembered.PL	old.ACC	song.ACC
	We remembered a song.			

The "feel-like" forms of Bulgarian verbs are productively built from verbs of the imperfective aspect. The main trait of this lexical process is the demotion of the a-subject, which becomes the experiencer and, as such, is cross-referenced by a dative verbal clitic. With transitive verbs, the a-object is promoted to d-subject and surfaces as a subject valence – cf. (ex. 4a) whose active voice counterpart is given in (ex. 4b).

ex. 4

B(a)	Na	mene	mi	se	četat	anglijski	romani.
	to	me	DAT.CL.1SG	REFL	read.3PL	English	novels
	I feel like reading English novels.						
B(b)	Az	četa	anglijski	romani.			
	I	read.1SG	English	novels			
	I read English novels.						

**(IV) Middle; non-agentive passive (Czech)**

[	ARG–ST	⟨ <u>1</u> a-subj, <u>2</u> a-obj   <u>3</u> ⟩
	DEPS	⟨ <u>2</u> d-subj   <u>3</u> ⟩ ⊕ list('adv')
	VAL   SUBJ	⟨ <u>2</u> ⟩
		]
<i>&amp; reflexive personal</i>		

This pattern is an instance of obliqueness-changing reduced diathesis and reflexive personal morphology. In the middle forms, the d-subject corresponds to the a-object and surfaces as a subject valence. The a-subject is blocked.

ex. 5

B	Vratata	se	otvarja.
	door.DEF	REFL	opens
	The door opens.		

The diathesis organization of the non-agentive passive in Czech is similar, inasmuch as no agentive by-phrase is allowed (ex. 6a). This obviously contrasts with Czech participial-passive (ex. 6b).

ex. 6

C(a) Školka se postavila za dva roky. (\*zedníky)  
 school.NOM REFL erected for two years (\*builders.INST)  
 The school was erected in two years.

C(b) Školka byla postavena zedníky za dva roky.  
 school.NOM was erected builders.INST for two years  
 The school was erected by the builders in two years.

**(V) "Uncontrollable/adversity" impersonal (Russian)**

$$\left[ \begin{array}{l} \text{ARG-ST} \quad \langle \boxed{1} \text{ a-subj} \mid \dots \rangle \\ \text{DEPS} \quad \langle \boxed{1} \text{ d-subj} \mid \dots \rangle \\ \text{VAL} \mid \text{SUBJ} \langle \rangle \end{array} \right] \& \textit{ plain impersonal}$$

This pattern is an instance of obliqueness-preserving unreduced diathesis and plain impersonal morphology. The subject valence is suppressed in Russian "uncontrollable/adversity" forms, the d-subject corresponds to the a-subject and is realized in the instrumental case (ex. 7a,c). Note that the a-object is trivially realized as an accusative direct object. The respective active voice counterparts are given in (ex. 7b,d).

ex. 7

R(a) Doždjami smylo nadpis'.  
 rainfalls.PL.INST washed.IMPERS.SG.N writing.F.ACC  
 The rainfalls washed away the writing.

R(b) Doždi smyli nadpis'.  
 rainfalls.NOM washed.PL writing.F.ACC  
 The rainfalls washed away the writing.

R(c) Tečením unosit lodku.  
 current.INST carries-away.IMPERS.3SG boat.ACC  
 The current carries away the boat.

R(d) Tečenie unosit lodku.  
 current.NOM carries-away.3SG boat.ACC  
 The current carries away the boat.

**(VI) "Modal experiential" (Russian); "feel-like" of intransitive verbs (Bulgarian)**

$$\left[ \begin{array}{l} \text{ARG-ST} \quad \langle \boxed{1} \text{ a-subj} \mid \dots \rangle \\ \text{DEPS} \quad \langle \boxed{1} \text{ d-subj} \mid \dots \rangle \\ \text{VAL} \mid \text{SUBJ} \langle \rangle \end{array} \right] \& \textit{ reflexive impersonal}$$

This pattern is an instance of obliqueness-preserving unreduced diathesis and reflexive impersonal morphology. What can be called "modal experiential" in Russian preserves the correspondence between the a-subject and the d-subject, with the latter acquiring an experiencer interpretation and occurring in the dative case (ex. 8a,c). Again, the corresponding active-voice counterparts are given to outline the contrast (ex. 8b,d).



ex. 8

R(a) Nam veselo živetsja.  
we.DAT happily live.RFL.IMPERS

We live happily.

R(b) My veselo živem.  
we.NOM happily live.1PL

We live happily.

R(c) Mne ne spitsja.  
I.DAT NEG sleep.RFL.IMPERS

I can't sleep / don't feel like sleeping.

R(d) Ja ne splju.  
I.NOM NEG sleep.1SG

'I don't sleep.'

The "feel-like" forms of Bulgarian intransitive verbs belong to this diathesis pattern, since there is no a-object to be promoted. The active-voice counterpart of (ex. 9a) is given in (ex. 9b).

ex. 9

B(a) Na decata im se spi.  
to children.DEF DAT.CL.3PL REFL sleep.IMPERS

The children feel like sleeping.

B(b) Decata spjat.  
children.DEF sleep.3PL

The children sleep.

### (VII) "De-agentive" reflexive (Polish)

$$\left[ \begin{array}{l} \text{ARG-ST} \quad \langle \boxed{1} \text{ a-subj} \mid \boxed{2} \rangle \\ \text{DEPS} \quad \boxed{2} \oplus \text{list}('adv') \\ \text{VAL} \mid \text{SUBJ} \langle \rangle \end{array} \right] \& \textit{ reflexive impersonal}$$

This pattern is an instance of obliqueness-preserving reduced diathesis and reflexive impersonal morphology. In the context of the Slavic language family, these forms are a specialty of Polish. There is no d-subject because the a-subject is blocked, and nothing else is promoted. The subject valence is suppressed. So, if there is an a-object, as in (ex. 10), it is realized as the direct object.

ex. 10

P Buduje / Budowało się fabrykę.  
build.IMPERS.3SG / built.IMPERS.3SG.N REFL factory.ACC  
A factory is / was being built.

**(VIII) -no/-to (Polish); uncontrolled-force" impersonal (Russian); 3rd-plural impersonal**

$$\left[ \begin{array}{l} \text{ARG-ST} \quad \langle [1] a\text{-subj} \mid [2] \rangle \\ \text{DEPS} \quad [2] \oplus \text{list}('adv') \\ \text{VAL} \mid \text{SUBJ} \langle \rangle \end{array} \right] \& \textit{plain impersonal}$$

This pattern is an instance of obliqueness-preserving reduced diathesis and plain impersonal morphology. The a-subject is blocked, there is no d-subject and no subject valence. Note that Polish -no/-to forms (ex. 11) have a dedicated morphology.

ex. 11

P(a) Spacerowano dwie godziny.  
walk.IMPERS two hours  
It has been a two-hours walk.

P(b) Potem pito herbatę.  
afterwards drink.IMPERS tea.ACC  
Afterwards one drank tea.

Russian "uncontrolled-force" forms share the same pattern (ex. 12a). The corresponding active-voice form is illustrated in (ex. 12b).

ex. 12

R(a) Jamu napolnilo vodoj.  
pit.ACC filled.IMPERS.SG,N water.INST  
The pit filled with water.

R(b) Deti napolnili jamu vodoj.  
children.NOM filled.PL pit.ACC water.INST  
The children filled the pit with water.

The third-person-plural impersonal form is another instance of the same pattern, which is basically available in all Slavic languages. The examples below are from Russian and Czech.

ex. 13

R(a) Za stenoi igraju na gitare.  
behind wall play.IMPERS.3PL on guitar  
They play guitar behind the wall.

C(b) V Itálii už zase stávkují.  
in Italy already again strike.IMPERS.3PL  
They are striking again in Italy.

**(IX) "Demi-active" of lexically causative verbs**

$$\left[ \begin{array}{l} \text{ARG-ST} \quad \langle [1] a\text{-subj}, [2] a\text{-obj}, [3] \mid [4] \rangle \\ \text{DEPS} \quad \langle [3] d\text{-subj}, [2] \mid [4] \rangle \oplus \text{list}('adv') \\ \text{VAL} \mid \text{SUBJ} \langle [3] \rangle \end{array} \right] \& \textit{plain personal}$$

This pattern is an instance of obliqueness-changing reduced diathesis and plain personal morphology. I give Russian examples below, but there are clear parallels in the other Slavic languages too. What happens here is that the a-subject is blocked, the a-object is trivially mapped to the direct-object grammatical relation, but there is a d-subject which surfaces as a subject valence. So, a non-term argument (with a general meaning of material or substance) is promoted. The active-voice counterpart of (ex. 14a) would be (ex. 12b).

ex. 14

R(a)	Voda	napolnila	jamu.
	water.NOM	filled	pit.ACC
	The water filled the pit.		
R(b)	Strela	ranila	vsadnika.
	arrow.NOM	wounded	rider.ACC
	An arrow wounded the rider.		
R(c)	Pesok	tušit	ogon'.
	sand.NOM	extinguishes	fire.ACC
	Sand extinguishes fire.		
R(d)	Voda	rastvotjaet	sol'.
	water.NOM	dissolves	salt.ACC
	Water dissolves salt.		

Slavic languages do not have a productive morphological causative that would be a distinct member of the diathetic paradigm. In languages like Japanese, which have dedicated causative affixation, causative is a member of the diathetic paradigm. The nested argument structure analysis of Japanese causatives by [Manning *et al.* 2000] is compatible with the theory of diathesis developed here. The technical operations mediating complex argument structures and valence features will now be localized in the mapping between ARG-ST and DEPS.<sup>4</sup>

Let us turn now to category-changing lexical processes. I assume that the modeling of *de-verbal* forms (cf. Figure 6) involves derivational types. A derivational type ([Manning and Sag 1998; Manning *et al.* 2000]) specifies a declarative relationship between a SOURCE stem and a RESULT stem (which is morphologically derived from it). Both participial adverbials and verbal nouns presuppose plain (i.e. non-reflexive) morphology, while attributive participles may be plain or reflexive in form (ex. 15).

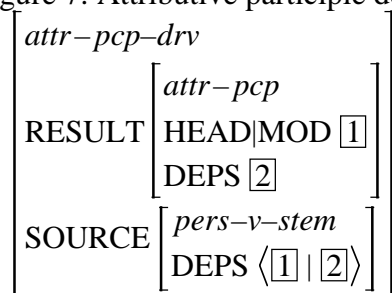
### (X) Attributive participles

Their derivation is characterized by what can be called *subject-to-head advancement*. By means of a derivational type (Figure 7), the d-subject of the source personal verbal stem is identified with the modified nominal head. I illustrate this for Russian. When applied to active verbal stems, the *attr-pcp-drv* gives rise to active attributive participles (ex. 15a), while passive attributive participles (ex. 15b,c) are derived from passive verbal stems. Note that in the former case the modified nominal corresponds to the a-subject, and in the latter to the a-object.

---

<sup>4</sup> It is also possible to accommodate the passivisation of causatives, provided this phenomenon is linguistically attested, e.g., [Manning 1996] discusses some relevant data.

Figure 7: Attributive participle derivation



ex. 15

- R(a) poseščajušcie biblioteku deti  
 visiting.ATTR-PCP.ACT library.ACC children  
 children visiting the library
- R(b) pobityj xuliganami rebenok  
 beaten.ATTR-PCP.PASS hooligans.INST child  
 a child beaten by hooligans
- R(c) strojaščajasja innostranoj firmoj fabrika  
 being-built.ATTR-PCP.RFL foreign.INST company.INST factory  
 a factory that is being built by a foreign company

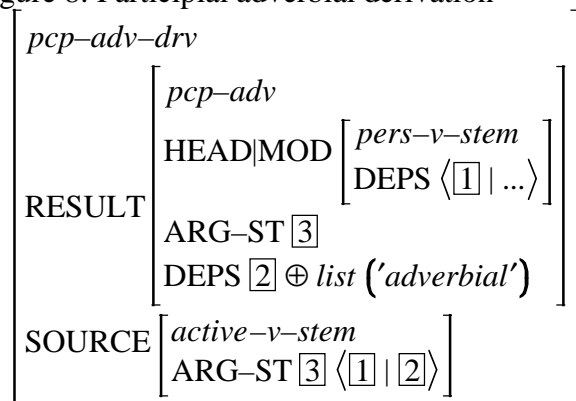
### (XI) Participial adverbials

A participial adverbial can only be derived from active verbal stems. It is controlled by the surface subject of the predicate it modifies (ex. 16). So, a derivational type (Figure 8) identifies the a-subject of the participial adverbial with the d-subject of the modified personal verbal stem.

ex. 16

- R(a) Čitaja ego piš'mo, ona ulybalas'.  
 reading.PCP-ADV.PRES his letter.ACC she.NOM smiled  
 Reading his letter, she smiled.
- R(b) Kupiv biletu na poezd, my uspokoilis'.  
 having-bought.PCP-ADV.PAST tickets.ACC on train we.NOM calmed  
 Having bought tickets for the train, we calmed down.

Figure 8: Participial adverbial derivation



## (XII) Verbal nouns

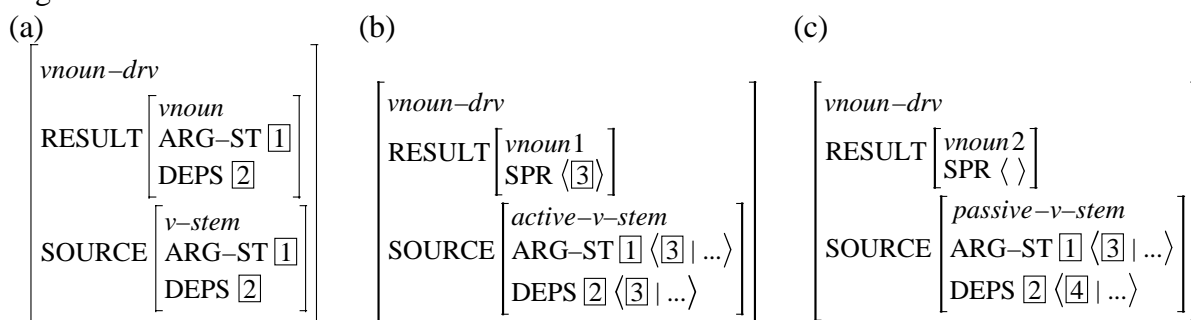
In Slavic, these are derived from active (ex. 17a,b) as well as from passive (ex. 17c) verbal stems. I will refer to the former as *vnoun1* and to the latter as *vnoun2*

ex. 17

R(a)	Ivana	/ Ivanovo	čtenie	apokrifov
	Ivan.GEN	/ Ivan.POSS.ADJ	reading	apocrypha.GEN
	Ivan's reading of apocrypha			
R(b)	Ivana	/ Ivanovo	xoždenie	v lesu
	Ivan.GEN	/ Ivan.POSS.ADJ	walking	in wood
	Ivan's walking in the wood			
R(c)	čtenie	apokrifov	Ivanom	
	reading	apocrypha.GEN	Ivan.INST	
	reading by Ivan of apocrypha			
R(d)	*xoždenie	v lesu	Ivanom	
	walking	in wood	Ivan.INST	
	(intended: walking by Ivan in the wood)			

The derivational type which provides for the category shift from verbal to nominal does not alter the diathesis (Figure 9a). In the case of *vnoun1* (Figure 9b), the d-subject (corresponding to the a-subject) surfaces as a specifier valence, which is an immediate consequence of the Argument Realization constraint. But there is no specifier in the case of *vnoun2* (Figure 9c), which is achieved by explicitly suppressing the specifier valence, i.e. by requiring that the SPR list of the RESULT category be empty.

Figure 9: Verbal noun derivation



The ungrammaticality of (ex. 17d) is due to the fact that Russian intransitive verbs like *xodit'* ('to walk') have no passive forms, and the application of *vnoun-drv* will never result in *vnoun2*.

## Subject-oriented binding of reflexive anaphors

The traditional view of anaphoric binding as being subject-oriented in Slavic languages receives a sound formalization in a diathesis-based approach.

The reflexive pronouns appear to be sensitive to either the a-subject or else the d-subject status of their antecedent. In other words, a reflexive anaphor can be bound either by the most prominent argument or by the most prominent dependent. In active voice the two trivially coincide, but let us consider some cases where they don't.

**Agentive passives (II), (III).** Since in agentive passive constructions the most prominent argument differs from the most prominent dependent, both binding possibilities – by the a-subject and by the d-subject – are available. The Russian sentences in (ex. 18a-b) are ambiguous. Note that the anaphoric pronoun may be (inside) an adjunct as well as (inside) an argument of the respective predicate. The unambiguous preference in interpreting (ex. 18c) is due, in fact, to the animacy restriction.

ex. 18

- R(a) Gosti(1) byli priglášeny / priglášalis' Annoj(2) iz-za sebja(1/2).  
 guests.NOM were invited.PL / invited.PL.RFL Anna.INST because-of SELF  
 The guests were invited by Anna for their / her sake.
- R(b) Oni(1) byli predstavleny Borisom(2) svoemu(1/2) šefu.  
 they.NOM were introduced.PL Boris.INST SELF's boss.DAT  
 They were introduced by Boris to their / his boss.
- R(c) Knigi(1) byli kupleny / kupualis' Borisom(2) dlja sebja(2/\*1).  
 books.NOM were bought.PL / bought.PL.RFL Boris.INST for SELF  
 The books were bought by Boris for himself.

**Impersonals (VII), (VIII).** Polish impersonal constructions pose a challenge to the binding theory, as the actual binder of the reflexive anaphor in (ex. 19) corresponds to the blocked a-subject.

ex. 19

- P(a) Gazety kupuje / kupowało się dla siebie.  
 newspapers.ACC buy.IMPERS.PRES/PAST REFL for SELF
- P(b) Gazety kupowano dla siebie.  
 newspapers.ACC buy.IMPERS for SELF  
 Newspapers are / were bought for oneself.
- P(c) Nie mówiono o sobie.  
 NEG speak.IMPERS about SELF  
 It has not been spoken about oneself.

**Attributive participles (X).** The fact that the modified nominal (*studenty* 'students') binds the reflexive anaphors in (ex. 20) can be explained by its a-subject status.

ex. 20

- R verjaščie v sebja i v svoj uspex studenty  
 believing.PL in SELF and in SELF's success students  
 students believing in themselves and in their own success

I argue that with respect to the locus of binding, a diathesis-based approach is superior because the concepts of obliqueness hierarchy and element prominence gain the desired flexibility. Extending Manning's a-subject principle, I propose the following *subject-prominence principle*: some anaphors must be bound by an entity that is first either on an ARG-ST list (a-subject) or on a DEPS list (d-subject). The notions relevant for the binding theory are defined in (Figure 10), and an alternative formulation of the binding principles is sketched in (Figure 11).

Figure 10: Diathesis-based formulation of binding-related notions

<i>a-bound</i> — bound by a less oblique member of an ARG-ST list (vs. <i>a-free</i> )
<i>locally a-bound</i> — bound by a less oblique member of the same ARG-ST list (vs. <i>locally a-free</i> )
<i>a-subject-bound</i> — bound by an a-subject
<i>d-bound</i> — bound by a d-subject (vs. <i>d-free</i> )
<i>locally d-bound</i> — bound by the d-subject of the same DEPS list (vs. <i>locally d-free</i> )

Figure 11: Binding principles

Principle A:	A reflexive anaphor must be <i>a-subject-bound</i> <u>or</u> <i>locally d-bound</i> .
Principle B:	A personal pronoun must be <i>locally a-free</i> <u>and</u> <i>d-free</i> .
Principle C:	A non-pronoun must be <i>a-free</i> <u>and</u> <i>d-free</i> .

## Further corollary

Once the features ARG-ST and DEPS are both admitted into the sign's architecture, this step has far-reaching and theoretically rewarding consequences. I have shown how working out a systematic inventory of ARG-ST / DEPS mappings results in a diathetic paradigm. With this important linguistic generalization at hand, a number of novel linguistic analyses become possible. Let us briefly consider some of them.

### Grammatical case assignment.

The case taxonomy I assume for Slavic has the form of a multiple-inheritance hierarchy. It employs *functional cases* in the sense of [Avgustinova *et al.* 1999], as abstractions over language-specific morphological realizations. I assume that a natural locus for grammatical case assignment constraints is the two-tiered diathesis representation. To sketch the basic constraints, I use a notation in the form of an implication in which a variable occurring in the antecedent is explicitly instantiated in the consequent part of the implication.

If the feature CASE is appropriate for a term argument of a verbal predicate, then the value of this feature has to be of type *term-case* (Figure 12a-b). The case assignment to terms is then refined in three further implications. The case of nominal d-subjects is instantiated to *subjective* (Figure 12c), so, it can be further expanded to construction-specific and language-specific instances. Similarly, the case of a demoted a-subject is instantiated to *obl-subjective* (Figure 12d), while the case of a "conserved" a-object is instantiated to *objective* (Figure 12e).

Figure 12: Case assignment to terms

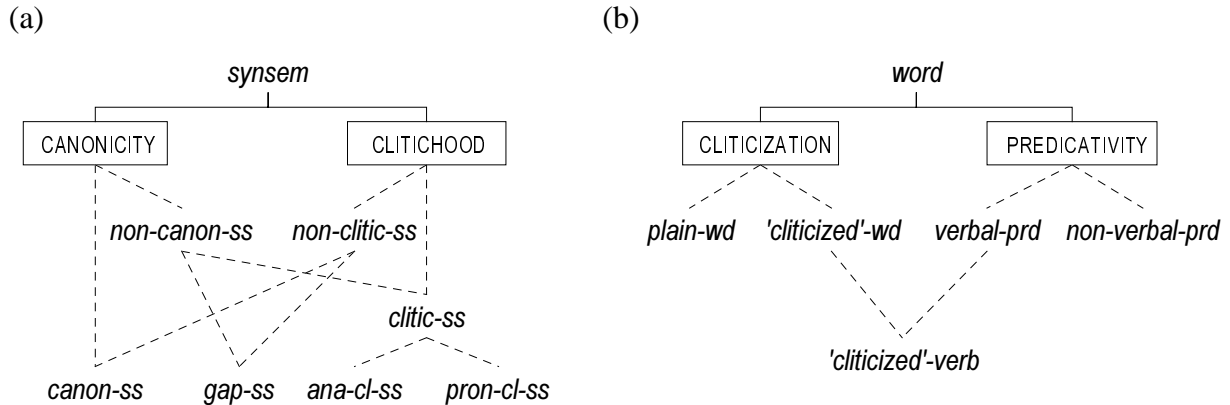
$$\begin{array}{l}
 \text{(a)} \quad \left[ \begin{array}{l} \textit{verb} \\ \text{ARG-ST} \langle \textit{a-subj} [\text{CASE } \boxed{1} \textit{case}] | \dots \rangle \end{array} \right] \Rightarrow \boxed{1} = \textit{term-case} \\
 \text{(b)} \quad \left[ \begin{array}{l} \textit{verb} \\ \text{ARG-ST} \langle \textit{a-subj}, \textit{a-obj} [\text{CASE } \boxed{1} \textit{case}] | \dots \rangle \end{array} \right] \Rightarrow \boxed{1} = \textit{term-case}
 \end{array}$$

- (c)  $\left[ \begin{array}{l} \text{verb} \\ \text{DEPS} \langle d\text{-subj} [\text{CASE } \boxed{1} \text{term-case}] | \dots \rangle \end{array} \right] \Rightarrow \boxed{1} = \text{subjective}$
- (d)  $\left[ \begin{array}{l} \text{verb} \\ \text{ARG-ST} \langle a\text{-subj } \boxed{1} | \dots \rangle \\ \text{DEPS} \langle \dots, \boxed{1} [\text{CASE } \boxed{2} \text{term-case}] | \dots \rangle \end{array} \right] \Rightarrow \boxed{2} = \text{obl-subjective}$
- (e)  $\left[ \begin{array}{l} \text{verb} \\ \text{ARG-ST} \langle a\text{-subj}, a\text{-obj } \boxed{1} | \dots \rangle \\ \text{DEPS} \langle \dots, \boxed{1} [\text{CASE } \boxed{2} \text{term-case}] | \dots \rangle \end{array} \right] \Rightarrow \boxed{2} = \text{objective}$

### Cliticisation and clitic replication.

To account for Slavic cliticisation, I assume the cross-classification of the type *synsem* in (Figure 13a); and as soon as the potential of certain predicative words to take clitic arguments is considered a lexical matter, this has to be reflected in the taxonomy of the type *word* (Figure 13b).

Figure 13: Assumed types (Slavic)



The type *'cliticized'-wd* is associated with an **argument cliticisation** constraint ensuring that the ARG-ST list contains at least one element of type *clitic-ss*, while the DEPS list contains only non-clitic syntactic dependents (*canon-ss* or *gap-ss*). In Czech, Slovak, Serbo-Croatian, Slovene, or Polish, the clitic realization of a predicate's argument is in a complementary distribution with its realization as a canonical syntactic dependent. So, the type *'cliticized'-verb* is associated with a further constraint stating that for an ARG-ST element of type *clitic-ss* there is no co-indexed canonical realization in DEPS list (Figure 14a).



Figure 14: Cliticized verb (cross-Slavic perspective)

(a)	(b)	(c)
$\left[ \begin{array}{l} \text{'cliticized'-verb (Cz, Sk, Sn, SC, Pl)} \\ \text{ARG-ST} \left\langle \dots, \left[ \begin{array}{l} \text{clitic-ss} \\ \text{INDEX } \boxed{1} \end{array} \right], \dots \right\rangle \\ \text{DEPS } \boxed{2} \ominus \left\langle \left[ \begin{array}{l} \text{canon-ss} \\ \text{INDEX } \boxed{1} \end{array} \right] \right\rangle \end{array} \right]$	$\left[ \begin{array}{l} \text{'cliticized'-verb (Bg, Mc)} \\ \text{ARG-ST} \left\langle \dots, \left[ \begin{array}{l} \text{ana-cl-ss} \\ \text{INDEX } \boxed{1} \end{array} \right], \dots \right\rangle \\ \text{DEPS } \boxed{2} \ominus \left\langle \left[ \begin{array}{l} \text{canon-ss} \\ \text{INDEX } \boxed{1} \end{array} \right] \right\rangle \end{array} \right]$	$\left[ \begin{array}{l} \text{'cliticized'-verb (Bg, Mc)} \\ \text{ARG-ST} \left\langle \dots, \left[ \begin{array}{l} \text{pron-cl-ss} \\ \text{INDEX } \boxed{1} \end{array} \right], \dots \right\rangle \\ \text{DEPS} \left\langle \dots, \left[ \begin{array}{l} \text{canon-ss} \\ \text{INDEX } \boxed{1} \end{array} \right], \dots \right\rangle \end{array} \right]$

A similar situation is observed with anaphoric clitics in Bulgarian and Macedonian, where the 'cliticized'-verb is constrained not to allow an ARG-ST element of type *ana-cl-ss* to be co-indexed with a canonical DEPS element (Figure 14b). The clitic replication, in turn, involves non-canonical arguments of type *pron-cl-ss* in the ARG-ST which are co-indexed with DEPS elements, i.e. with canonical nominal syntactic dependents of a matching syntactic function (Figure 14c). This is illustrated for Bulgarian by (ex. 21), where the direct object and the accusative verbal clitic replicating it are underlined.

ex. 21

B	Nie	šte	gi	pokanim	<u>muzikantite.</u>
	we	will	ACC.CL.3PL	invite	musicians
	We will invite the musicians.				

### Pronominal resumption.

I assume that characteristic of resumption is the involvement of an extraction mechanism, which means a *gap-ss* in the DEPS list. The key idea is to (optionally) allow for lexical entries in which a *gap-ss* is co-indexed with a resumptive canonical syntactic dependent (of type *canon-ss*) within the same DEPS list. Only particular types of canonical *synsem* objects can have a resumptive function, namely, personal and demonstrative pronominal elements, as well as phrases containing them (ex. 22a-c). On the other hand, a pronominal clitic can function as a resumptive element too (ex. 22d). The relevant material is underlined in the examples.

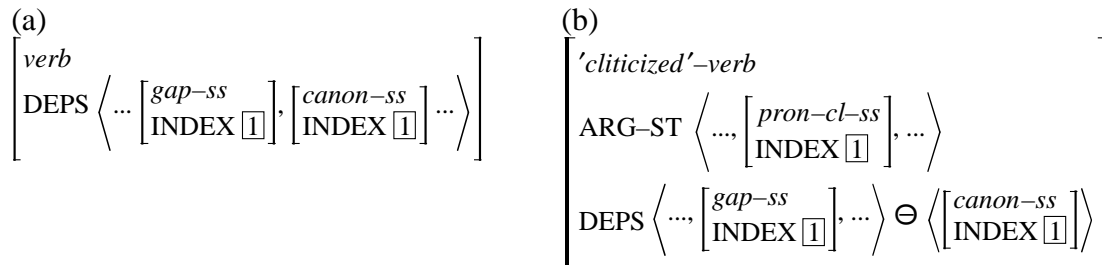
ex. 22

B(a)	Kolkoto	do	<u>Kostov,</u>	<u>nego</u>	ne	sme	kanili.
	as	to	Kostov	him	NEG	AUX.1PL	invited.PL
	'As to Kostov, we have not invited him.'						
B(b)	Kolkoto	do	<u>Kostov,</u>	vsyštност	<u>zaradi</u>	<u>nego</u>	dojdoxme.
	as	to	Kostov	actually	because-of	him	came.1PL
	'As to Kostov, we actually came because of him.'						
B(c)	Kolkoto	do	<u>Kostov,</u>	ne	sme	kanili	<u>tozi</u> <u>glupak.</u>
	as	to	Kostov	NEG	AUX.1PL	invited.PL	this fool
	'As to Kostov, we have not invited this fool.'						
B(d)	Kolkoto	do	<u>Kostov,</u>	ne	sme	<u>go</u>	kanili.
	as	to	Kostov	NEG	AUX.1PL	ACC.CL.3SG.M	invited.PL
	'As to Kostov, we have not invited him.'						

The **canonical resumption** constraint is appropriate for the type *verb* (Figure 15a), and the **clitic resumption** constraint is formulated as appropriate for the type 'cliticized'-verb (Figure 15b).

The crucial requirement in the latter case is to exclude from the DEPS list any *canon-ss* dependent that is co-indexed with a *pron-cl-ss* in the ARG-ST list and with a *gap-ss* in the DEPS list. The clitic resumption is thus modeled by *gap-ss*-mediated co-indexing of the extracted item with the pronominal clitic.

Figure 15: Resumption



### Bulgarian possessor raising.

For space reason, I cannot go into the details of this language specific phenomenon which, in fact, is optional and belongs to the colloquial style. Its main trait is the occurrence of a possessive clitic belonging to a predicate's nominal dependent in a higher morphosyntactic domain where it stands in a syntactic relationship to the predicate itself.

In (ex. 23), the possessive clitic *ti* ('your') occupies – with respect to the verbs *padnat* ('fall') / *xaresvam* ('like') / *vidjax* ('saw') – the position reserved for the predicative dative clitic, and obeys all restrictions imposed on the distribution of the latter, e.g., with respect to clitic cluster formation (ex. 23c). The possessive clitic can be 'raised' out of arguments (ex. 23a,c) as well as out of adjuncts (ex. 23e). The respective non-raised variants are given in (ex. 23b,d,f).

ex. 23

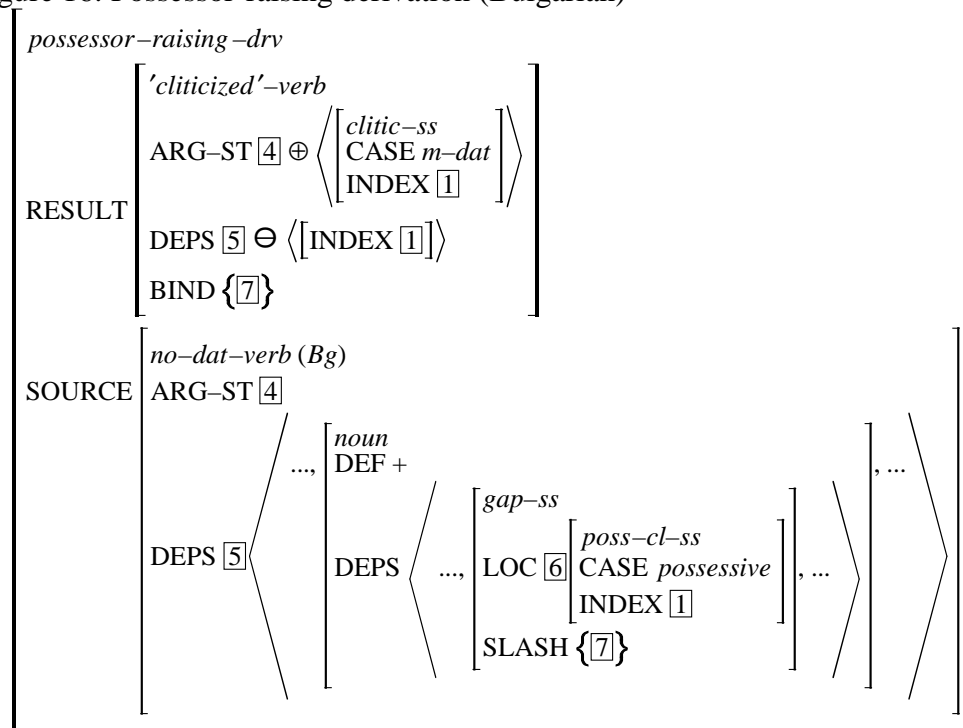
- B(a) Šte ti padnat očilata.  
 will POSS.CL.2SG fall.PL glasses.DEF  
 Your glasses will fall down.
- B(b) Šte padnat očilata ti.  
 will fall.PL glasses.DEF POSS.CL.2SG  
 Your glasses will fall down.
- B(c) Mnogo ti xaresvam novoto palto.  
 very POSS.CL.2SG like.1SG new.def coat  
 I like your new coat very much.
- B(d) Mnogo xaresvam novoto ti palto.  
 very like.1SG new.def POSS.CL.2SG coat  
 I like your new coat very much.
- B(e) Vidjax ti go pod legloto.  
 saw.1SG POSS.CL.2SG ACC.CL.3SG.M under bed.DEF  
 I saw him under your bed.
- B(f) Vidjax go pod legloto ti.  
 saw.1SG ACC.CL.3SG.M under bed.DEF POSS.CL.2SG  
 I saw him under your bed.

Let me mention just two more points that I need in order to sketch the basic idea of the analysis: (i) the source dependents in which the possessive clitic originates must be morphologically definite, and (ii) the verbs involved can be referred to by means of a common lexical type *no-dat-verb*, since they typically have no lexical formant (in the terminology of [Avgustinova 1997]) and no indirect object.

I assume that the possessive clitic is a canonical dependent of nominal categories, even though a prosodically deficient one. Therefore, the corresponding type *poss-cl-ss* is an instance of *canon-ss*. It belongs to DEPS and is, in principle, extractable.

The derivational type in (Figure 16) systematically relates, on the one hand, a *no-dat-verb* lexeme with a morphologically definite syntactic dependent from which a possessive clitic has been extracted (cf. the *gap-ss*) and, on the other hand, a *'cliticized'-verb* lexeme with a dative *clitic-ss* in its ARG-ST co-indexed with the extracted possessive clitic. At the same time, the resulting DEPS list must not contain items co-indexed with the newly introduced *clitic-ss*. The interaction of all these specifications terminates the extraction dependency, i.e. the type *possessor-raising-drv* induces a lexical SLASH-binding.

Figure 16: Possessor-raising derivation (Bulgarian)



The distribution of the raised possessive clitic is thus predicted to be the same as the distribution of the predicative dative clitic in Bulgarian (i.e. *'cliticized'-verb*). Since any co-indexed dependents are excluded, no possessive clitic will ever be involved in clitic replication or resumption in the clausal domain headed by the cliticized verb.

## Conclusion

Based on Slavic data, this paper argues for the general notion of dependents in HPSG, in addition to arguments and subcategorized elements (valence). It attempts to provide a systematic inventory of ARG-ST / DEPS mappings which results in a diathetic paradigm. The approach offers

an insightful cross-linguistic and cross-constructural perspective. It is important to realize that DEPS is not only an enriched level of argument structure, it is a part of diathesis of predicators.

Maintaining the lexicalist view, a uniform analysis of voice and voice-like alternations is achieved, resulting in a satisfactory account of valence changing morphology. With the most prominent co-argument and the most prominent grammatical relation qualifying as potential antecedents of reflexive anaphors, a superior account of subject-sensitive binding becomes possible. The formalized notion of diathesis leads to a clearer status of the derivational morphological component and, eventually, to a limited and better motivated use of compound (i.e. nested) argument structures.

## References

- Avgustinova, T. (1997). *Word order and clitics in Bulgarian*. Saarbrücken Dissertations in Computational Linguistics and Language Technology, Volume 5. Universität des Saarlandes / DFKI.
- Avgustinova, T., W. Skut and H. Uszkoreit (1999). Typological similarities in HPSG: a case study on Slavic verb diathesis. In: *Slavic in HPSG*. R. Borsley and A. Przepiórkowski (Eds.) Stanford, CSLI: 1-28.
- Bouma, G., R. Malouf and I. Sag (1998). *A unified theory of complement, adjunct, and subject extraction*. In Proceedings of the Joint Conference on Formal Grammar, Head-driven Phrase Structure Grammar and Categorical Grammar, Saarbrücken.
- Bouma, G., R. Malouf and I. Sag (*to appear*). Satisfying constraints on extraction and adjunction. *Natural Language and Linguistic Theory*.
- Davis, A. (1996). *Lexical semantics and linking in the hierarchical lexicon*. Doctoral dissertation, Stanford University.
- Manning, C. (1996). *Ergativity: argument structure and grammatical relations*. Stanford, CSLI.
- Manning, C. and I. Sag (1998). Argument structure, valence and binding. *Nordic Journal of Linguistics* **21**(2): 107-144.
- Manning, C. and I. Sag (1999). Dissociation between argument structure and grammatical relations. In: *Lexical and constructional aspects of linguistic explanation*. G. Webelhuth, J.-P. Koenig and A. Kathol (Eds.) Stanford, CSLI Publications: 63-78.
- Manning, C., I. Sag and M. Iida (2000). The lexical integrity of Japanese causatives. In: *Studies in Contemporary Phrase Structure Grammar*. R. Levine and G. M. Green (Eds.) Cambridge, Cambridge University Press: 39-79.
- Perlmutter, D. and P. Postal (1983). The inadequacy of some monostratal theories of passive. In: *Studies in Relational Grammar*. D. Perlmutter and C. Rosen (Eds.), The University of Chicago Press: 3-37.