

Allomorphy, morphological operations and the order of Slavic verb-prefixes

STEFANO QUAGLIA, MARKO SIMONOVIĆ, SVITLANA ANTONYUK YUDINA, & BOBAN ARSENIJEVIĆ
University of Graz

ABSTRACT

Slavic verbal prefixes are traditionally divided into lexical and superlexical types. Lexical prefixes are base-generated below the verb, while superlexical prefixes are generated within the verb's functional projection. However, this analysis incorrectly predicts their linearization. We propose that all verbal prefixes correspond to argument-structural effects, generated as heads of a voice projection. Our PF analysis follows Embick & Noyer (2001), with heads linearizing bottom-up, accompanied by local dislocation. Default dislocation is string-vacuous; inversion occurs only when the head participates in allomorphic realization. Strict implementation of this algorithm precisely yields the observed surface order.

KEYWORDS Allomorphy · Local dislocation · Linearization · Prefixes · Secondary imperfectivizers

1 INTRODUCTION

The goal of the present paper is to derive the order and form of the morphemes of the Slavic verb, as exemplified by the template in (1) and by one of its instantiations, the Bosnian/Croatian/Montenegrin/Serbian (BCMS) verbal participle *naugrađivala* (pronounced as [naugradzjivala]) in (2).¹

- (1) prefix* - root -TV -suffix -TV -T - Φ PersNumGen
 (2) na- u- grad -i -iv -a -l -a
 on in build TV IPFV TV PST 3SG.F
 'had her fill of building in'

In the analysis we propose here, both the templatic ordering of constituents and allomorphy involving thematic vowels are accounted for by a constrained interplay of operations at Core Syntax and at PF, in the spirit of the research program of Distributed Morphology (Halle & Marantz 1993). We argue that prefixes (crucially both "lexical" and "super-lexical") share properties at both Syntax (they are voice heads affecting argument structure) and PF (they are inert, preserving the base-generated Merge order). Importantly, these properties set prefixes aside from both secondary imperfectivization suffixes and thematic vowels, which are represented as light roots (Lowenstamm 2014, Simonović forthcoming, Simonović & Mišmaš 2020) and as (re-)verbalizers (Fábregas

¹While a number of approaches assume or imply exactly this template (e.g. for Russian Matushansky 2021 and elsewhere), depending on the analysis and the language, the template may receive a slightly different shape (e.g., Simonović et al. under review). One anonymous reviewer challenges the analysis of the segment [dz] in [naugradzjivala] as a fusion of the final [d] of the root and the theme vowel [i], suggesting instead that [dz] may be an allophone of [d] in front of the front vowel [i] of the affix *iv* (in which case the theme vowel *i* could also be absent from the structure). This alternative analysis is falsified by examples such as [grad-iv-o] 'material' and [grad-i-l-a] 'she built', where the same root occurs in the same (phonological) environment without any alternation.

2017), respectively, and which are subject to (non-vacuous) Local Dislocation (Embick & Noyer 2001) at PF due to the (possibly allomorphic) Vocabulary Insertion requirements of theme vowels. The advantages of the overall analysis are the involvement of only three basic building blocks in Syntax, i.e. roots, *v*, and voice, and the dismissal of Head Movement as an operation relevant to the linear order in morphology (see, e.g., Dékány 2018 on the benefits of this elimination). Importantly, the present account rests upon an analysis of Slavic prefixes as heads universally affecting the overall V(P) argument structure, in line with both findings from previous research (Arsenijević 2006, Žaucer 2009) and novel empirical evidence.

The paper is organized as follows. In §2 we show that prefixes universally affect argument structure. In light of this generalization, in §3 we show that all prefixes can be analyzed as being of category P, whereas suffixes can be seen as light/transitive roots which condition their own theme vowels. In §4 the hierarchical structure in Core Syntax is discussed. §5 takes this structure as a starting point for deriving the surface order. As we show, a crucial role is played by the Vocabulary Insertion requirements of theme vowels, which can only be inserted under adjacency with a root. §6 concludes the paper.

2 PREFIXES UNIVERSALLY AFFECT ARGUMENT STRUCTURE

Arsenijević (2006), Pazel'skaya & Tatevosov (2008), Tatevosov (2011, 2015), Žaucer (2009) have argued that, despite the widely held belief that the ability to affect argument structure is a characteristic property of internal prefixes only, external prefixes, too, can add arguments to the verb and affect argument structure in systematic ways, suggesting there is no clear-cut, categorical distinction between the two types of prefixes. While effects such as augmented argument structure may be easiest to attest, addition of an argument is not the only way that the argument structure of a verb may be affected. Thus, such effects as causativization or antipassivization also fall under the scope of argument-structure effects and can be shown to be due to external prefixation.

Indeed, such effects hold quite generally across Slavic. Consider the following data from Russian, presented in Tatevosov (2010), the relevant construction being what he terms 'Russian Intensive Resultatives', which carry an implication of a positive result of the activity:

- (3) Turisty gulja -l -i.
tourist.NOM.PL walk PST PL
'The tourists walked.'
- (4) Turisty na-gulja -l -i -s'.
tourist.NOM.PL NA-walk PST PL REFL
'By walking, the tourists achieved a state of being satisfied.'

In his discussion of the construction and its semantic properties, Tatevosov does not directly label the prefix *na-* as either internal or external or discuss its role in deriving this resultative construction, relying instead on traditional grammatical descriptions of Russian, such as Shvedova et al. (1980). As pointed out by Tatevosov, in such traditional literature the morphological elements *na-* -*sja* in (4) are treated as a "circumfix", as a complex exponent of the intensive resultative Aktionsart. This intuition then is taken to reflect the inappropriateness of (5) and (6), where either the prefix *na-* or the reflexive morpheme *-sja* are left out:

- (5) *Turisty na- gulja -l -i.
tourist.NOM.PL NA- walk PST PL
- (6) *Turisty gulja -l -i -s'.
tourist.NOM.PL walk PST PL REFL

Antonyuk (2020) discusses a related resultative construction, which she dubs “Russian Unaccusative Resultatives”, which, in contrast to Tatevosov’s Intensive Resultatives, yields an implication of negative result.

- (7) Lev za-gruž -a -l kirpič-i.
 Lev ZA-load IPFV PST.SG.M brick-ACC.PL
 ‘Lev loaded/was loading the bricks’
- (8) Lev do-za-gruž -a -l -sja kirpič-ej (do polu-smert’ -i).
 Lev DO-ZA-load IPFV PST.SG.M REFL brick-GEN.PL (to half-death GEN.F)
 ‘Lev loaded bricks until he was half-dead.’

As with Tatevosov’s Intensive Resultatives, it is clear that in (8) the prefix involved, *do-*, is external, since it attaches outside the lexical prefix *za-* and contributes a predictable (completive) aspect of meaning. Thus, we have two cases where external prefixation affects verbal argument structure by contributing the obligatory result component. Even more strikingly, external prefixes can be shown to license the realization of a Ground argument from the result subevent in the direct object position, yielding an argument alternation well-known in the literature on English as the *Spray-Load* alternation (see Beavers 2006, for an overview and discussion). Consider the following pair of sentences:²

- (9) Lev za-bros -i -l odeždu na stul.
 Lev.NOM ZA-throw -TV -PST.SG.M clothes.ACC on chair.ACC
 ‘Lev threw the clothes onto the chair’
- (10) Lev za-bros -a -l stul odeždoj.
 Lev.NOM ZA-throw TV PST.SG.M chair.ACC clothes.INSTR
 ‘Lev covered the chair with clothes’

While the prefix in (9) and (10) may at first glance appear to be the same one, in fact, two different, though homophonous prefixes are involved. In (9) *za-* (which corresponds to a preposition meaning *behind*), contributes an idiosyncratic, lexical component of meaning that is characteristic of lexical prefixes. In (10), on the other hand, the meaning of *za-* is entirely transparent and compositional, being that of an action done to excess. And while this external/superlexical prefix does not augment argument structure, it clearly has a non-trivial effect on argument realization, with the former Ground argument (PP *na stul*) now obligatorily realized as the direct object (NP *stul*).

As one might expect, this situation obtains in other Slavic languages as well. The following pair of examples is from Ukrainian. What we observe in (11) and (12) is that the *Spray-Load* alternation is morphologically realized with the help of aspectual prefixes (see Antonyuk & Mykhaylyk 2022 on the syntactic and semantic properties of Ukrainian *Spray-Load* alternations). Specifically, the locative frame involves a lexical/internal prefix *vy-* and the ‘with’ variant is realized with the help of superlexical prefix *za-*, just as in the Russian pair in (9) and (10). In fact, considering these Russian and Ukrainian examples, as well as other examples from these languages, the preliminary generalization appears to be that the two frames of the *Spray-Load* alternations, at least in the East Slavic languages in question, systematically contrast in that one alternant involves an internal and the other an external prefix.

- (11) Marijka vy-ljapa -l -a farbu na stinu.
 Mary VY-splatter PST SG.F paint.ACC on wall.ACC
 ‘Mary splattered paint on the wall’

²The difference in theme vowels is associated with aspect and is independent of the prefixes, as evidenced by the fact that the same two themes also occur with the given root without any prefixes.

- (12) Marijka za-ljapa -l -a stinu farboju.
 Mary ZA-splatter PST SG.F wall.ACC paint.INSTR
 ‘Mary splattered the wall with paint’

Summing up this section, based on the representative data discussed here as well as additional examples not included for reasons of space, we claim that for every verbal prefix in Slavic languages (irrespective of its classification as belonging to inner or outer aspect), at least one of the following two statements holds:

- the prefix selects an argument (result, source, route, measure) and/or
- the prefix introduces an augmented argument structure (causative, anticausative, antipassive).

3 PREFIXES ARE PS, SUFFIXES ARE VERBALIZED ROOTS

In this section we discuss parallels between verbal prefixes and prepositions, on the one hand, and verbal suffixes and verbalized roots, on the other.

Commonalities between verbal prefixes and prepositions have been widely observed in the literature. The most obvious parallelism is in their segmental content. For instance, Biskup (2019) shows that in modern Czech and Russian the overwhelming majority of verbal prefixes have a segmentally corresponding preposition. In Biskup’s words these languages “have approximately twenty verbal prefixes and only three of them do not have a prepositional counterpart” (Biskup 2019: 28). Indeed, in the examples mentioned above, BCMS *na* and *u* are both prefixes and prepositions, as are *na*, *do* and *za* in Russian and *za* in Ukrainian. The few prefixes which do not segmentally correspond to any preposition (such as the East Slavic *vy*) may be analyzable as allomorphs of specific prepositions (in this case most plausibly *iz* in Russian and *z* in Ukrainian), which appear in certain well-defined contexts. Allomorphic realisation in prepositions is not unheard of outside the verbal domain. In the Slovenian examples below, the preposition which normally gets realized as [u] (in some varieties also [və]) surfaces as stressed [‘va] in combination with a subset of case forms of a subset of personal pronouns, which includes the accusative case of the third-person-singular pronoun (14), but not the first-person-plural (15). This type of allomorphy is not amenable to a straightforward phonological explanation and thus both allomorphs need to be listed.

- (13) Peter gleda { v / *va } njorko.
 peter looks in great auk.ACC
 ‘Peter looks at the great auk.’
- (14) Peter gleda { vanjo / v njo }.
 Peter looks in-her.ACC in her.ACC
 ‘Peter looks at her/it.’
- (15) Peter gleda { v nas / *vanas }.
 Peter looks in us.ACC
 ‘Peter looks at us.’

A further parallelism between prepositions and prefixes is in their prosodic behavior: both verbal prefixes and prepositions are typically unaccented (in the sense that they don’t carry underlying stress/tone). A famous exception is the East Slavic prefix *vy-*, discussed above for being exceptional in not corresponding to a preposition. It seems that while in some Slavic languages (BCMS) we can maintain that all verbal prefixes and prepositions are underlyingly unaccented, in other languages (i.e., East Slavic) the same generalization holds of the Elsewhere allomorphs of this category (i.e. the version that

shows up in most PPs in a language).³

A final parallelism is related to the syntactic effects of both prepositions and prefixes. As discussed in §2, prefixes, like prepositions (see Tungseth 2008 and the references therein), affect argument structure. We argue in §5 that P elements surfacing in voice^o are best understood as instances of agreement. This voice head carries an uninterpretable feature [uResult], which probes into its c-command domain and agrees with the ResultP. This triggers the copying of the P-element occurring in the Result head expressing the predicate of result. The copying is thus triggered by an Agree operation, established between the ResultP and a corresponding voice head.

While the parallelism between prepositions and prefixes has been widely acknowledged in the literature, the other parallelism that our account will capitalize on has received virtually no attention so far. The key observation is that secondary imperfectivizers, at least in Slovenian and BCMS, contain a theme vowel and behave as ‘mini verbs’. All imperfectivizers in these languages end in a vowel which also appears as a theme vowel. Some of them display allomorphic patterns, either on the theme vowel or on the formant preceding it, parallel to those in simplex verbs. The imperfectivizer *-iv-a* illustrated in (1) in §1 is a case in point. The citation form is *na-u-grad-i-iv-a-ti* [naugradzjivati] ‘to have one’s fill of building in’. In the present tense the imperfectivizer surfaces as *-u-je*, e.g. *na-u-grad-i-u-je-mo* ([naugradzujemo] ‘we have our fill of building in’). The theme-vowel combination *a/je* is widely attested in simplex verbs, both with consistent exponence of the root (16) and with root allomorphy (17). As will be argued below, secondary imperfectivizers can be analyzed as ‘bound’ roots (following Lowenstamm 2014, who analyses all derivational affixes as transitive roots). In this case the only difference between the root \sqrt{sl} and the root \sqrt{iv} (18) would be the fact that \sqrt{iv} belongs to a class of roots which always require a complement in order to project to the phrasal level (Lowenstamm 2014: 243).

- (16) pis-a-ti – pis-je-mo [pijemo]
 write-TV-INF write-TV-1.PL
 ‘to write’ ‘we write’
- (17) sl-a-ti – šal-je-mo [ʃalɛmo]
 send-TV-INF send-TV-1.PL
 ‘to send’ ‘we send’
- (18) -iv-a-ti – -u-je-mo
 iv-TV-INF iv-TV-T.PL

An argument for the analysis of derivational affixes as roots is their ability to appear in different categories. The affix *-iv-* indeed appears in both nouns (19) and adjectives (20).

- (19) gor-iv-o (cf. gor-(j)e-ti) – maz-iv-o (cf. maz-a-ti)
 ‘fuel’ ‘to burn’ ‘grease’ ‘to daub’
- (20) jez-iv (jez-a) – milost-iv (milost)
 ‘erie’ ‘shudder’ ‘gracious’ ‘grace’

A further important feature of systems like BCMS and Slovenian is that the theme-vowel class of the verb cannot be predicted based on the phonological properties of the root.

³An anonymous reviewer ponders the above statements in the context of Ukrainian data, since Ukrainian (along with Polish) has been shown to represent a typologically rare case, exhibiting bidirectional rhythmic stress (see esp. Lukaszewicz & Molczanow 2018 on this score). This means that in words with lexical stress at or close to the right edge of the word there will be obligatory iterative secondary stress starting at the left edge. This, in turn, entails the presence of secondary stress on prefixed verbal forms, such as, e.g., *pere-pro-čyt-a-ty* (to read through again), with the following stress assignment: ($\sigma \sigma$) ($\sigma \sigma$) ($\sigma \sigma$). Thus, in an example like this one, a superlexical as well as a lexical aspectual prefix will indeed receive secondary stress. It is therefore necessary to underscore that we are making a principled distinction here between the underlying lexical stress and a surface-level phenomenon of secondary (and ternary) stress, predicating our statements on the behavior of prefixes with respect to the former.

This leads some researchers (e.g., Marvin 2002 for Slovenian) to postulate that theme vowels are part of the root. In our analysis the insertion of theme-vowel morphemes is regulated by Vocabulary items which make reference to adjacent roots. This extends to derivational affixes. To stay with BCMS imperfectivizers, the second most common imperfectivizer is *-av-a-* (e.g. *pre-žvak-av-a-ti* ‘to ruminate’, from *žvak-a-ti* ‘to chew’). In this case the root $\sqrt{\text{AV}}$ conditions the theme vowel class a/a, as attested by the present-tense form (e.g. *pre-žvak-av-a-mo* ‘we ruminate’).

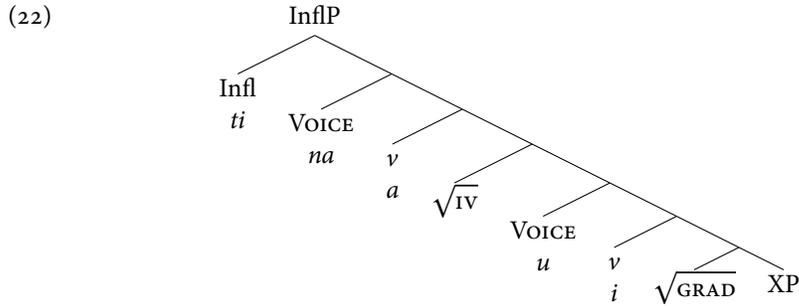
Finally, it is a feature of systems like BCMS and Slovenian that no clear default theme vowel class can be identified, so that, e.g., Marvin (2002) proposes that in Slovenian i/i and a/a are both defaults, i.e., neither of them figures as the Elsewhere allomorph. This means that both bear some specification which allows different contexts to choose one of the two. This view is corroborated by the quantitative findings in Milosavljević & Arsenijević (2022), showing that in BCMS the two themes are found in similar numbers of different verbs, and combine with similar numbers of different roots (due to rich verbal affixation in Slavic languages, these two quantities can display very different ratios). In our model this means that there is no Elsewhere allomorph for the theme vowel morpheme and theme vowel morphemes can only be inserted in the context of a root.

4 THE HIERARCHICAL STRUCTURE

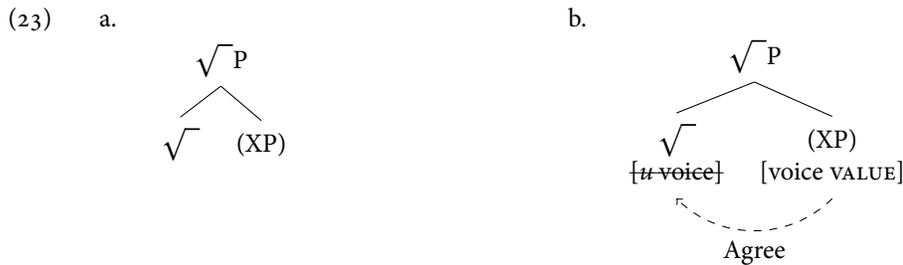
In this section, we discuss the structure underlying the verbal template introduced in (1). The goal is to establish the structural positions of all the relevant morphemes and thus lay the groundwork for the discussion of their surface order. We argue that the Slavic verb instantiates the (core) syntactic structure in (21):

$$(21) \quad [\text{Infl} \quad [\text{voice} \quad [\text{v} \quad [\sqrt{\quad} \quad [\text{voice} \quad [\text{v} \quad [\sqrt{\quad} (\text{XP})]]]]]]]] \\ \text{inflection} \quad \text{prefix} \quad \text{TV} \quad \text{IPFV} \quad \text{suffix} \quad \text{prefix} \quad \text{TV} \quad \text{root}$$

Focusing on the domain below inflection (labeled Infl, corresponding to either a single node bundling different features or to two distinct nodes T and ϕ), the structure consists of a (possibly repeated) sequence of root ($\sqrt{\quad}(\text{P})$), verbalizer ($\text{v}(\text{P})$) and a special voice head ($\text{voice}(\text{P})$), responsible for the promotion into the direct object position of one of the arguments of the ResultP, the figure or the ground (corresponding, respectively, to the active and passive values of the standardly postulated higher voice head). While the most deeply embedded root head ($\sqrt{\quad}^0$) corresponds to the verb root, specifying not only PF and encyclopedic information, but also an underspecified argument structure (Travis 2012), higher $\sqrt{\quad}^0$ -s correspond to (secondary) imperfectivizing suffixes, and are instances of “bound roots”, in need of an XP bearing a specific feature in order to project a $\sqrt{\quad} \text{P}$ (Lowenstamm 2014). Every time a $\sqrt{\quad}$ projects, a verbalizing head v^0 merges with the $\sqrt{\quad} \text{P}$, categorizing the resulting constituent as verbal. The Spell-Out of v-heads are the theme vowels, well-known from the Indo-Europeanist linguistic tradition and here understood as signatures of Extended Projection in Grimshaw’s sense (cf. Grimshaw 2005: 1–71; Oltra-Massuet 2000: 28–31). Based on the evidence in §2, prefixes are uniformly analyzed as voice heads. We argue that a voice^0 syntactically licenses an augmented or an altered argument structure in its c-command domain. As an example of the structure in (21), consider the tree in (22), corresponding to the (still non-linearized) BCMS verbal form *naugrađivati* ‘to have one’s fill of building something in’.



In what follows, we consider in more detail the syntactic contribution of the heads $\sqrt{^0}$, v^0 and voice^0 (the linearization of structures like (22) will be dealt with in §5). As previewed in §3, we adopt the approach to roots advanced in Lowenstamm (2014): differently from what is assumed in more canonical DM frameworks (Embick 2010, Halle & Marantz 1993, Marantz 2013), two types of well-formed roots are assumed: free \sqrt{s} and bound \sqrt{s} . Free \sqrt{s} can autonomously project, whereas bound \sqrt{s} can only project if they merge with an XP deleting their uninterpretable feature (cf. Lowenstamm 2014, Simonović forthcoming). Applied to our empirical domain, we analyze verb roots as free \sqrt{s} , and secondary imperfectivizing suffixes as bound \sqrt{s} specified as $[u\text{voice}]$. Accordingly, verb roots are able to project a \sqrt{P} even without a complement (23-a), whereas secondary imperfectivizing suffixes need to merge and agree with a voiceP to project a \sqrt{P} (23-b).⁴



Importantly, our approach allows free \sqrt{s} to have a complement XP: this obtains whenever a free \sqrt{s} takes arguments. In line with Travis (2012), we argue that verb roots do have an argument structure, albeit an underspecified one (possibly manipulated by higher heads, like voice^0 in our case study, as we will argue below).

Turning back to the hierarchical structure in (21), the head merging with the \sqrt{P} is v^0 : the contribution of this head in Core Syntax is to (re-)verbalize the structure every time a (free or bound) \sqrt{s} has projected. In the structures below, this obtains twice: after the verb root projects (24) and after the secondary imperfectivizing suffix (a bound \sqrt{s}) projects (25).

(24) $[vP v [\sqrt{P} \sqrt{=} \text{Verb Root } [\dots]]]$

(25) $[vP v [\sqrt{P} \sqrt{=} \text{IPFV Suffix } [\text{voiceP voice } [vP [\sqrt{P} \sqrt{=} [\dots]]]]]]$

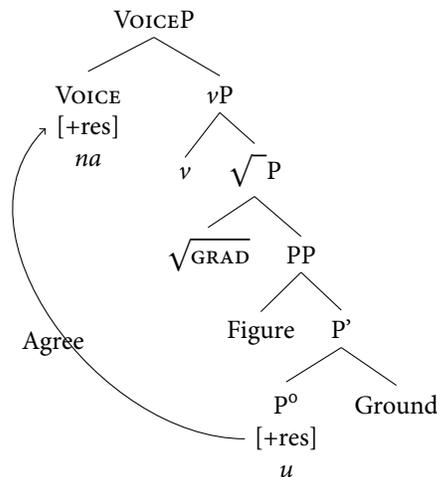
At PF, these v -heads are spelled out as theme vowels (cf. Biskup 2019, Fábregas 2017, Kayne 2016), most of which in Slavic involve allomorphy, as discussed in §3 (cf. BCMS *gled-a-ti* ‘watch.INF’ vs. *gled-a-m* ‘watch.PRES.1SG’, but *pis-a-ti* ‘write.INF’ vs. *pis-je-m* ‘write.PRES.1SG’) and require specific linear configurations in order to be inserted (cf.

⁴This correctly predicts that a secondary imperfectivizing suffix can only be added to a verb in the presence of a prefix, which under our analysis corresponds to the head of voiceP. If this projection is absent, \sqrt{P} will not be able to project, thus blocking the further structure building of the verb.

§5). A contribution that has been ascribed to theme vowels is that of marking a given constituent as pertaining to, or extending, a given categorial domain (verb or noun). A prominent proposal is formulated by Oltra-Massuet (1999, 2000, 2020), who argues that theme vowels in Indo-European languages are “dissociated morphemes”, adjoined to functional heads at PF to comply with morphological well-formedness requirements. The intuition behind this analysis is that theme vowels mark a given (functional) projection as verbal/nominal (Oltra-Massuet 2000: 28–31), thus explicitly signaling the extension of a given categorial spine. For example, in the verbal domain Asp° , Mood° , T° are functional heads with their own featural contribution, yet they belong to the Extended Domain of the category $\text{V}(\text{erb})$ (cf. Grimshaw 2005: 1–17). Verbal theme vowels mark each of these functional heads as belonging to the (V)P Extended Domain. In the present approach, this intuition is made more explicit, in that (Slavic) theme vowels are simply verbalizers that turn a given (category-free) $\sqrt{\text{P}}$ into a verbal projection, an operation which can form a loop with bound roots (the theme vowel verbalizes a $\sqrt{\text{P}}$, which projects a voiceP ; the voice P is selected by a bound root, which can be verbalized, too).

In the verb structure in (21), the head that merges with vP is voice° . As anticipated above, both lexical and super-lexical prefixes are analyzed as instantiating this head. Each voice head syntactically licenses an augmentation or an alteration of the argument structure of the projecting vP . In particular, a voice° can introduce a new argument in its Specifier or enter an Agree relation with a lower head, checking a respective feature (by default the feature [+res(ultative)]). We exemplify the range of syntactic contributions of voice° below, by illustrating the relevant derivation steps for BCMS *ugradi* ‘builds (sth.) in’, featuring the lexical prefix *u* (26), and for *naugrađuje (se)* ‘has her/his fill of building smth. in’, featuring in addition the super-lexical prefix *na* (27).

- (26) kad Ive u-grad-i- \emptyset prozore (u zid)
 when Ive in-build-TV-PRES.3SG windows.ACC in wall.ACC
 ‘when Ive builds the windows in (the wall)’
- (27) kad se Ive na-u-grad-i-u-je- \emptyset (prozora) (u zid)
 when REFL Ive na-u-build-TV-IPFV-TV-PRES.3SG windows.GEN in wall.ACC
 ‘when Ive has his fill of building windows in (the wall).’
- (28)

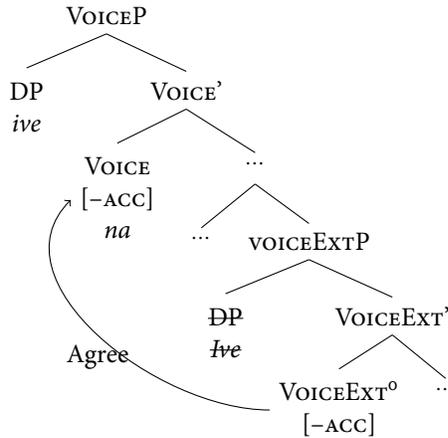


In (26), the verb root *grad* (a free $\sqrt{\text{P}}$) has an underspecified argument structure: it selects a PP instantiating a spatial relation R holding between a Figure and a Ground (Talmy 1985). Importantly, this relation is underspecified with respect to its event-theoretic status: it can be either a state (*in the wall*) or a transition to an end-state (*into the wall*). The specification is effected by the closest c-commanding VOICE° via the syntactic operation

Agree. In the case at stake, the VOICE head *u* is specified as [+res(ultative)]: it licenses a resultative structure, i.e. an event structure involving a transition to an end-state. Through the operation Agree between VOICE⁰ and the head P⁰ of the PP complement to the free $\sqrt{\text{grad}}$, P⁰ gets the feature specification [+res] (as well as additional feature specifications of the P-item *u*). At LF, the structure is interpreted as a transition to a spatial end-state, where the Figure (*prozore*) is in the *u*-region of the Ground (*zid*; cf. Hale & Keyser 2002, Wunderlich 1991, a.o.). The resulting VOICEP is represented in (28).

The verb form in (27) involves the super-lexical prefix *na* on top of the imperfectivized version of the lexically prefixed verb in (26). At the point of derivation corresponding to (28), an additional VOICE head, VOICEEXT⁰, is merged. VOICEEXT⁰ introduces the Agent of the event, which is merged as a Specifier. Subsequently, the bound root $\sqrt{\text{IV}}$ merges with VOICEEXTP, its uninterpretable [VOICE]-feature is deleted, and it can project a $\sqrt{\text{P}}$. The head *v*⁰ re-verbalizes the structure, yielding a *v*P. The super-lexical prefix *na* is merged at this point, as VOICE⁰. The type of argument structure alteration associated with super-lexical *na* is reminiscent of antipassivization in important respects: it demotes the clausal object to an adjunct (as signaled by the change in case-marking from accusative to genitive) while retaining the clausal subject, and it involves reflexive morphology (here the reflexive clitic *se*; cf. Polinsky (2017)). These changes are effected by the following operations: (i) the VOICE head corresponding to *na* agrees with VOICEEXT⁰, the lower VOICE head introducing the external argument *Ive*; (ii) structural Accusative is absorbed by the reflexive in VOICEEXT⁰, the Figure cannot be assigned accusative any more, and it receives the default case for the internal arguments in environments that do not assign accusative in Slavic, i.e., the genitive (with event nouns and adjectives, the internal argument is also typically realized in the genitive case); (iii) the external argument *Ive* is moved to the specifier position of VOICE⁰. The clitic *se* is hence a PF reflex of Case absorption, amenable to being modeled as a dissociated morpheme. The underlying features mark that the subject is both the agent and the argument that measures out the eventuality: it is *Ive*(’s fill) in (27) that measures out the event of building in windows in the wall. The three operations are graphically represented in (29).

(29)

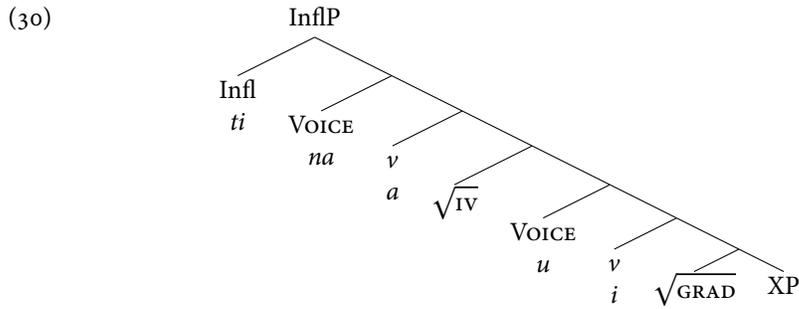


Having discussed the hierarchical structure of the verb, we now turn to its linearization.

5 DERIVING THE ORDERING WITHOUT POSITIONAL DIACRITICS

On the analysis above, the overt material at the PF interface for a verb like *naugrađivati* ‘have one’s fill of building smth in (to smth)’ is structured as in (22), repeated for convenience in (30). Neither its direct lexicalization, as in (31), nor its linearization after all heads evacuate to the highest head position via head movement, as in (32), fit the

attested form in (33).



(31) Direct linearization:
 ti-na-a-iv-u-i-grad
 Infl-voice- $\sqrt{\text{IV}}$ -voice- $\sqrt{\text{IV}}$

(32) Linearization after strict head-movement:
 grad-i-u-iv-a-na-ti
 $\sqrt{\text{IV}}$ - $\sqrt{\text{IV}}$ -voice- $\sqrt{\text{IV}}$ - $\sqrt{\text{IV}}$ -voice-Infl

(33) Attested form:
 na-u-grad-i-iv-a-ti
 voice-voice- $\sqrt{\text{IV}}$ - $\sqrt{\text{IV}}$ - $\sqrt{\text{IV}}$ -Infl

In traditional literature, the linearization is accounted for by stipulating that two of the heads are prefixes, and therefore must precede all other items. In a formal account, this translates into positional diacritics on the relevant heads, which signal that they attach to the left edge of the word. Alternatively, the prefixes may bear a different syntactic status than the rest of the morphemes involved. For instance, they may be derived as phrasal expressions, surfacing as adjuncts to some verbal projections, as in Svenonius (2004). This view is supported by the availability of overt PP counterparts of internal prefixes. Apart from it being unclear what the relation between the prefix and the PP is, problems for this approach come from the fact that external prefixes do not have corresponding PPs. A lot remains unclear also regarding the trigger of movement of these adjuncts to the left edge and their mutual ordering. In Nanosyntax, Caha & Ziková (2022) propose that prefixes are built in separate workspaces and then merged in as phrases as a last resort after none of the more economical linearization strategies can be made to work.

In this section, we develop an account that derives the observed ordering without resorting to diacritics or assigning the prefixes any other special status in addition to the differences stemming from the different feature specification and the corresponding syntactic positions between the items involved. We assume, with Embick & Noyer (2001), that at the PF interface, the spelled-out material is first linearized, and then vocabulary insertion proceeds. Hence, if vocabulary insertion went smoothly (i.e. if there were no allomorphy, as we discuss below) this would yield the output in (34), reflecting the bottom-up derived structure.

(34) [Infl*[voice₂*[v₂*[√₂*[voice₁*[v₁*[√₁]]]]]]]]

At insertion, however, each node can either preserve the base-generated order (string-vacuous local dislocation), as in (35), or invert with the neighbor, as in (36), or with the neighbor's closest member as in (37). The latter two options are what Embick & Noyer 2001 refer to as non-string-vacuous local dislocation (henceforth simply local dislocation).

- (35) $[X^*[Z^*Y]] \rightarrow [X^*[Z+Y]] \rightarrow [X+Z+Y]$ (string-vacuous Local Dislocation)
 (36) $[X^*[Z^*Y]] \rightarrow [[Z+X]^*Y] \rightarrow [Z+X+Y]$ (non-string-vacuous Local Dislocation 1)
 (37) $[X^*[Z^*Y]] \rightarrow [X^*[Z+Y]] \rightarrow [Z+Y+X]$ (non-string-vacuous Local Dislocation 2)

Local dislocation, on our analysis, needs a trigger, and the trigger is the dependence between the currently inserted vocabulary item and its neighbor. In other words, if the morpheme to be inserted allomorphically depends on the neighbor, the vocabulary item and the neighbor will undergo local dislocation. Otherwise, linearization proceeds under string-vacuous local dislocation.

The vocabulary insertion thus unfolds bottom up in a stepwise fashion as presented in (38-a), where $\text{dep}_{\text{VI}}(x, y)$ abbreviates that the insertion of x depends on y , i.e. y is a member of a list that occurs in the specification of at least one context of insertion of x . It is assumed, following the tradition in Distributed Morphology, that allomorphic insertion is specified by the local context which includes lists of items conditioning the insertion of the allomorph.

- (38) a. Step 1:
 $[\sqrt{v_1}], \sqrt{v_1} \leftrightarrow /grad/$
 Result of Vocabulary Insertion: [grad]
 b. Step 2:
 $[v_1^*[grad]]$
 $\text{dep}_{\text{VI}}(v_1, grad) \rightarrow \text{LD}$
 Result of Local Dislocation: [grad+v₁]
 c. Step 3:
 $[\text{voice}_1^*[grad+v_1]]$
 $\text{voice}_1 \leftrightarrow /u/$
 Result of Vocabulary Insertion: [u+grad+v₁]
 d. Step 4:
 $[\sqrt{v_2}^*[u+grad+v_1]]$
 $\text{dep}_{\text{VI}}(v_1, \sqrt{v_2}), \text{dep}_{\text{VI}}(\sqrt{v_2}, grad+v_1), \rightarrow \text{LD},$
 Result of LD: [u+grad+v₁+ $\sqrt{v_2}$]
 $v_1 \leftrightarrow /i/ / \text{List}_a\text{-List}_j, grad \in \text{List}_a, \{\sqrt{v_2}\} \subset \text{List}_j$
 $\sqrt{v_2} \leftrightarrow /iv/ / \text{List}_m, grad+i \in \text{List}_m$
 Result of Lexical Insertion: [u+grad+i+iv],
 e. Step 5:
 $[v_2^*[u+grad+i+iv]]$
 $\text{dep}_{\text{VI}}(v_2, iv), \rightarrow \text{LD}$
 Result of LD: [u+grad+i+iv+v₂]
 f. Step 6:
 $[\text{voice}_2^*[u+grad+i+iv+v_2]]$
 $\text{voice}_2 \leftrightarrow /na/$
 Result of Lexical Insertion: [na+u+grad+i+iv+v₂]
 g. Step 7:
 $[\text{Infl}^*[na+u+grad+i+iv+v_2]]$
 $\text{Infl} \leftrightarrow /ti/$
 $\text{dep}_{\text{VI}}(v_2, ti), \rightarrow \text{LD},$
 $v_2 \leftrightarrow /a/ / \text{List}_x\text{-List}_p, iv \in \text{List}_x, ti \subset \text{List}_p$
 Result of Vocabulary Insertion and Left Dislocation: [na+u+grad+i+iv+a+ti]

The vocabulary insertion begins with the insertion of *grad*, the exponent of the most deeply embedded root, as in Step 1 in (38-a). Next is the lower theme vowel, which is allomorphic and depends on both linear neighbors, hence also the root – and this triggers local dislocation at Step 2. The application of the VI of v_1 , corresponding to the

lower theme vowel, only obtains after non-string-vacuous LD and upon the application of the VI of $\sqrt{2}$ (Step 4). Before that, at Step 3, the next in line is the lower voice. It is not a member of any of the lists of items the lower theme is sensitive to, nor is it itself allomorphic, hence local dislocation is string-vacuous. At Step 4 comes the root of the re-verbalizer. It is now the case both that it represents a possible restriction for the insertion of the (lower) theme, and that the lower theme represents a possible restriction on its insertion. Local dislocation takes place, and both the theme and the root can be inserted, as *i* and *iv*, respectively. The same procedure is then repeated, *mutatis mutandis*, in the last three steps to derive the surface form of the verb.

This gives a special perspective on local dislocation in BCMS (and potentially Slavic more generally). Its effect is that all the items that enter allomorphic dependencies either as restrictors or as allomorphic vocabulary items end up linearized next to each other and to the right of the most deeply embedded root, whereas all those that do not enter allomorphic dependencies remain on the left of the most deeply embedded root. This accounts for the directionality in the BCMS verb without resorting to diacritics, separate workspaces, or stipulating phrasal status of particular items. The key feature of the system is that the theme vowel morpheme does not have an Elsewhere allomorph, so that it cannot be spelled out without the adjacent root (see Kastner & Zu (2017) for cases where the lack of an Elsewhere allomorph leads to ineffability).⁵

The proposed analysis of reordering does not depend on the particular syntactic analysis presented in section 4. Since it is only sensitive to the morphological properties of vocabulary items, it would work equally well with an analysis that derives some or all prefixes in an aspectual projection (AspP, #P, QP, depending on the approach). An interesting speculative observation is that the same procedure can derive the linearization of Slavic clitics, with the reservation that the second position placement requires an additional operation (but see Jung & Migdalski 2014 for arguments that indeed the cluster originates verb-oriented, as in Macedonian and Bulgarian). Assuming that clitics originate in higher voice (for pronominal clitics) and person heads (for auxiliaries), and given that they are fully neutral regarding the allomorphy of items realized within the verb, our mechanism is bound to linearize them to the left of the verb. Their positioning outside the lexical phrase may then be responsible for their weaker phonological unity with the verb. Finally, the allomorphic dependency of the third person singular clitic auxiliary *je* on the pronominal clitics *je* 'she.ACC' and *se* 'REFL' accounts for its placement at the end of the cluster, as opposed to the initial placement of other auxiliary forms. The parallel is supported by the fact that pronominal clitics and person, too, belong to a category other than the verb. Together, this prompts us to hypothesize that both the affected vocabulary items and the restrictions in allomorphic vocabulary insertion cannot be categorially heterogeneous: the participants must belong to the same category or not be categorized at all (i.e. be categorially neutral). In the inverse perspective, allomorphic interactions then serve as a powerful cue in the acquisition of categories and their projections.

6 CONCLUSIONS

We have provided arguments that verbal prefixes in Slavic always exert argument-structural effects and that they realize features of prepositional predicates occurring in the voice head of the verb. Being categorially distinct, they also do not partake in rules governing the allomorphic realization of genuinely verbal features from the extended verbal projection. A simple algorithm in the style of Embick & Noyer (2001), where straightforward linearization is followed by string-vacuous local dislocation if the realized material is orthogonal to any applicable rules of allomorphic realization (and non-vacuous otherwise), yields exactly the empirically observed surface ordering. This algorithm ensures that

⁵In a similar spirit, Gouskova & Bobaljik (2022) take linear adjacency to condition the visibility of class diacritics on nouns.

Vocabulary Insertion can apply without crashing on morphemes which lack Elsewhere allomorphs, such as theme vowels in the languages discussed here.

ABBREVIATIONS

ACC	accusative	N	neuter
BCMS	Bosnian/ Croatian/ Montenegrin/ Serbian	NOM	nominative
F	feminine	PL	plural
GEN	genitive	PRES	present
INF	infinitive	PST	past
INSTR	instrumental	REFL	reflexive
IPFV	imperfective	SG	singular
M	masculine	TV	thematic vowel

ACKNOWLEDGMENTS

The grant info: Austrian Science Fund FWF grant M-3361-G and Austrian Science Fund FWF grant I-4215-G30.

CONTACT

Stefano Quaglia — stefano.quaglia@uni-graz.at
 Marko Simonović — marko.simonovic@uni-graz.at
 Svitlana Antonyuk-Yudina — syudina@gmail.com
 Boban Arsenijević — boban.arsenijevic@uni-graz.at

REFERENCES

- Antonyuk, Svitlana. 2020. The puzzle of Russian ditransitives. In Anna Pineda & Jaume Mateu (eds.), *Dative constructions in Romance and beyond*, 43–74. Berlin: Language Science Press.
- Antonyuk, Svitlana & Roksolana Mykhaylyk. 2022. Scope freezing and object shift in Ukrainian: Does Superiority matter? *Syntax* 25(1). 122–146.
- Arsenijević, Boban. 2006. *Inner aspect and telicity: The decompositional and the quantificational nature of eventualities at the syntax-semantics interface*. Utrecht: LOT.
- Beavers, John. 2006. Semantic underspecificity in English argument/oblique alternations. In Michal Temkin Martínez, Asier Alcázar & Roberto Mayoral Hernández (eds.), *Proceedings of Western Conference on Linguistics 2004*, 26–37. Los Angeles, CA: University of Southern California.
- Biskup, Petr. 2019. *Prepositions, case and verbal prefixes: The case of Slavic*. Amsterdam: John Benjamins.
- Caha, Pavel & Marketa Ziková. 2022. Prefixes in Czech zero-derived nominalizations and verbs. In Petr Karlík & Lucie Taraldsen Medová (eds.), *Nominalizations and Participles in Czech and beyond*, 3–61. München: Lincom.
- Dékány, Éva. 2018. Approaches to head movement: A critical assessment. *Glossa* 3(1).
- Embick, David. 2010. *Localism versus globalism in morphology and phonology*. Cambridge, MA: MIT Press.

- Embick, David & Rolf Noyer. 2001. Movement operations after syntax. *Linguistic inquiry* 32(4). 555–595. .
- Fábregas, Antonio. 2017. Theme vowels are verbs. *Rivista di Grammatica Generativa* 39(5). 1–11.
- Gouskova, Maria & Jonathan David Bobaljik. 2022. The lexical core of a complex functional affix: Russian baby diminutive -onok. *Natural Language & Linguistic Theory* 40. 1075–1115.
- Grimshaw, Jane. 2005. *Words and structure*. Chicago: Center for the Study of Language and Information.
- Hale, Kenneth & Samuel Jay Keyser. 2002. *Prolegomenon to a theory of argument structure*. Cambridge, MA: MIT Press.
- Halle, Morris & Alec Marantz. 1993. Distributed Morphology and the pieces of inflection. In Kenneth Hale & Samuel Jay Keyser (eds.), *The View from Building 20: Essays in linguistics in honor of Sylvain Bromberger*, 111–176. Cambridge, MA: MIT Press.
- Jung, Hakyung & Krzysztof Migdalski. 2014. On the degrammaticalization of pronominal clitics in Slavic. In Małgorzata Szajbel-Keck, Roslyn Burns & Darya Kavitskaya (eds.), *Formal Approaches to Slavic Linguistics 23: The First Berkeley Meeting*, 143–162. Ann Arbor: Michigan Slavic Publications.
- Kastner, Itamar & Vera Zu. 2017. Blocking and paradigm gaps. *Morphology* 27(4). 643–684.
- Kayne, Richard. 2016. What is suppletive allomorphy? Manuscript, NYU. <https://ling.auf.net/lingbuzz/003241>.
- Lowenstamm, Jean. 2014. Derivational affixes as roots: Phasal spell-out meets English stress shift. In Artemis Alexiadou, Hagit Borer & Florian Schafer (eds.), *The syntax of roots and the roots of syntax*, 230–259. Oxford: Oxford University Press.
- Lukaszewicz, Beata & Janina Molczanow. 2018. Rhythmic stress in Ukrainian: Acoustic evidence of a bidirectional system. *Journal of linguistics* 54(2). 367–388.
- Marantz, Alec. 2013. Locality domains for contextual allomorphy across the interfaces. In *Distributed Morphology today*, 95–113. Cambridge: The MIT Press.
- Marvin, Tatjana. 2002. *Topics in the stress and syntax of words*. Cambridge, MA: MIT dissertation.
- Matushansky, Ora. 2021. ThEmAtIc nOn-Uniformity of Russian vocalic verbal suffixes. Presented at Theme vowels in V(P) structure and beyond, University of Graz, April 22–23, 2021. <https://ThVplatform.at/sessions/invited-talk/>.
- Milosavljević, Stefan & Boban Arsenijević. 2022. What differentiates Serbo-Croatian verbal theme vowels: Content or markedness? *Glossa: a journal of general linguistics* 7(1).
- Oltra-Massuet, Isabel. 1999. On the constituent structure of Catalan verbs. *MIT Working Papers in Linguistics* 33. 279–322.
- Oltra-Massuet, Isabel. 2000. On the notion of theme vowel: A new approach to Catalan verbal morphology. In *MIT Occasional Papers in Linguistics* 19, Cambridge, MA: MIT.
- Oltra-Massuet, Isabel. 2020. Conjugation class. In *Oxford Research Encyclopedia of Linguistics*, Oxford: Oxford University Press.

- Pazel'skaya, Anna & Sergei Tatevosov. 2008. Otglagol'noe imja i struktura russkogo glagola [Deverbal nouns and the structure of the Russian verb]. In Vladimir Plungjan & Sergei Tatevosov (eds.), *Issledovanija po glagol'noj derivacii [Studies in verbal derivation]*, 284–312. Moscow: Jazyki Slavjanskix Kul'tur.
- Polinsky, Maria. 2017. Antipassive. In Jessica Coon, Diane Massam & Lisa deMena Travis (eds.), *Oxford handbook of ergativity*, Oxford: Oxford University Press.
- Shvedova, Natalia Yulievna et al. 1980. *Russkaya grammatika [Russian grammar]*. Moscow: Institute of the Russian Language, Russian Academy of Sciences.
- Simonović, Marko. forthcoming. Derivational affixes as roots across categories. *Journal of Slavic linguistics* 30(2).
- Simonović, Marko & Petra Mišmaš. 2020. √ov is in the air. *Linguistica* 60(1). 83–102.
- Svenonius, Peter. 2004. Slavic prefixes inside and outside VP. *Nordlyd* 32(2). 205–253. .
- Talmy, Leonard. 1985. Lexicalization patterns: Semantic structure in lexical forms. In Timothy Shopen (ed.), *Language typology and syntactic description*, vol. 3, 57–149. Cambridge: Cambridge University Press.
- Tatevosov, Sergei. 2010. Building intensive resultatives. In Wayles Browne, Adam Cooper, Alison Fisher, Esra Kesici, Nikola Predolac & Draga Zec (eds.), *Formal Approaches to Slavic Linguistics 18: The Cornell meeting 2009*, 289–302. Ann Arbor: Michigan Slavic Publications.
- Tatevosov, Sergei. 2011. Severing perfectivity from the verb. *Scando-Slavica* 57(2). 216–244.
- Tatevosov, Sergei. 2015. Severing imperfectivity from the verb. In Gerhild Zybatow, Petr Biskup, Marcel Guhl, Claudia Hurtig, Olav Mueller-Reichau & Maria Yastrebova (eds.), *Slavic grammar from a formal perspective: The 10th anniversary FDSL conference*, 465–494. Frankfurt am Main: Peter Lang.
- Travis, Lisa deMena. 2012. Arguments From The Root Vs. Arguments From The Syntax. In Maria Cristina Cuervo & Yves Roberge (eds.), *The end of argument structure?*, 261–291. Leiden: Brill.
- Tungseth, Mai Ellin. 2008. *Verbal prepositions and argument structure: Path, place and possession in Norwegian*. Amsterdam: John Benjamins Publishing Company.
- Wunderlich, Dieter. 1991. How do prepositional phrases fit into compositional syntax and semantics? *Linguistics* 29(4). 591–622.
- Žaucer, Rok. 2009. *A VP-internal resultative analysis of 4 “VP-external” uses of Slavic verbal prefixes*. Ottawa: University of Ottawa dissertation.