CHAPTER 1

Nanosyntax

The Basics

LENA BAUNAZ AND ERIC LANDER

Nanosyntax (Caha 2009; Starke 2009, 2011a, 2011b) is a generative approach to the study of language that is in line with the major tenets of the Principles and Parameters framework of Chomsky (1981, 1986). More precisely, the nanosyntactic approach is a direct descendant of cartography, as it is anchored in basic cartographic assumptions about the fine-grained nature of the functional projection and the fundamental simplicity of syntactic structure. Although nanosyntax is currently in the process of growing and developing as a theoretical framework in its own right, it has already proven to offer a promising set of methods for doing detailed empirical research, coupled with an innovative yet restrictive theory of syntax and its place in the architecture of Universal Grammar (UG).

The first chapter of this volume aims to set the theory of nanosyntax in the broader context of generative grammar, especially with regard to two leading frameworks in current generative theory and research: cartography and Distributed Morphology (henceforth DM). The chapter is written for readers familiar with generative linguistics. Section 1.1 briefly sketches the history and basic theoretical underpinnings of cartography, with particular attention

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paid to those facets that have led to the emergence of nanosyntax. Section 1.2 consists of a short overview of the theory and terminology of DM, with the aim of explicitly pinpointing and exposing some of the core differences with nanosyntax that could otherwise lead to confusion or misunderstanding. Section 1.3 provides the reader with an overall picture of nanosyntactic theory and also introduces the major technical tools needed to navigate this volume (any additional technical information will be provided where relevant in later chapters). Section 1.4 is an overview of the nanosyntactic interpretation of the Principles and Parameters framework. Section 1.5 concludes.

1.1. CARTOGRAPHY: A MAP OF SYNTACTIC CONFIGURATIONS

In earlier Principles and Parameters work, very basic structures were advocated for clauses and noun phrases (CP-IP-VP and NP, as in Chomsky 1981, 1986), but the meticulous study of syntax from a crosslinguistic perspective has, over time, led researchers to postulate more finely articulated structures for clauses and noun phrases. In many ways this began with Pollock's (1989) splitting of the category I on the basis of a comparison between French and English, and Abney's (1987) arguments for positing the functional projection DP above the lexical NP in English, which built on earlier work by Szabolcsi (1981, 1984, 1987) on the Hungarian noun phrase. It was from this general line of reasoning that the cartographic approach to syntax (see Benincà 1988; Cinque 1990, 1999, 2002; Rizzi 1997, 2004b; Belletti 2004) can be said to have emerged. Foundational work in cartography was done in the 1990s, notably Rizzi (1997) arguing for a fine-grained left periphery (i.e. splitting CP into further projections) mostly on the basis of Italian data, and Cinque's (1999) crosslinguistic study leading to a finely articulated map of the adverb positions populating the functional domain of IP. Their main results are summarized in (1):

(1) a. [$_{\text{ForceP}}$ [$_{\text{TopP*}}$ [$_{\text{FocP}}$ [$_{\text{TopP*}}$ [$_{\text{FinP}}$ [$_{\text{IP}\ldots}$]]]]]] [Rizzi 1997, 15, his (41)]

b. [$_{\text{ModP speech-act}}$ frankly [$_{\text{MoodP evaluative}}$ fortunately [$_{\text{MoodP evidential}}$ allegedly [$_{\text{ModP epistemic}}$ probably [$_{\text{TP past}}$ once [$_{\text{TP future}}$ then [$_{\text{ModP irrealis}}$ perhaps [$_{\text{ModP necessity}}$ necessarily [$_{\text{ModP possibility}}$ possibly [$_{\text{AspP habitual}}$ usually [$_{\text{AspP repetitive}}$ again [$_{\text{AspP frequentative(I)}}$ often [$_{\text{ModP volitional}}$ intentionally [$_{\text{AspP celerative(I)}}$ quickly [$_{\text{TP anterior}}$ already [$_{\text{AspP terminative}}$ no longer [$_{\text{AspP continuative}}$ still [$_{\text{AspP perfect(?)}}$ always [$_{\text{AspP retrospective}}$ just [$_{\text{AspP proximative}}$ soon [$_{\text{AspP durative}}$ briefly [$_{\text{AspP generic/progressive}}$ characteristically [$_{\text{AspP prospective}}$ almost [$_{\text{AspP sg.completive(I)}}$ completely [$_{\text{AspP pl.completive}}$ *tutto* [$_{\text{VoiceP}}$ well [$_{\text{AspP celerative(II)}}$ fast/early [$_{\text{AspP repetitive(II)}}$ again [$_{\text{AspP frequentative(II)}}$ often [$_{\text{AspP sg.completive(II)}}$ completely]]]]]]]]]]]]]]]]]]]]]]]]]]]]]].
(Cinque 1999, 106)

The goal of the cartographic approach is clearly illustrated in (1), namely to draw "maps as precise and complete as possible of syntactic configurations" (Rizzi 2013, 1). An important result of cartographic research, then, is the view that the units of syntax are much smaller, and syntactic representations much more articulated, than previously thought. This general notion of decomposition as the (empirical and theoretical) way forward in mapping out UG is a prominent feature of nanosyntax as well.

It is commonly assumed in cartography that the map of UG should be very simple, structurally speaking. First, each syntactico-semantic feature is assumed to be an independent head that projects. This is known as the "one feature–one head" maxim (henceforth OFOH) (Cinque and Rizzi 2008, 50; see also Kayne 2005, ch.12). Second, most researchers have strict assumptions about how heads project. These assumptions are deeply influenced by the work of Kayne (1984, 1994): (i) structures are strictly binary-branching and right-branching, (ii) only one specifier per head is allowed, and (iii) only leftward movement is allowed. In short, the combination of the OFOH maxim with a strict Kaynean (antisymmetric) view on structure-building leads to the kinds of detailed syntactic representations emerging out of the cartographic research program.

Closely related to this goal of mapping out UG is the strong trend in cartography to "syntacticize" domains of grammar (see Section 1.1.1 for references). The degree to which meaning can and should be syntacticized continues to be a major point of contention within and between frameworks (see Geeraerts 2010 for an overview). In generative frameworks it is (at least implicitly) assumed that certain aspects of meaning, often termed *grammatical* semantics, belong to the grammar proper (i.e. syntax), whereas other aspects of meaning, termed *extralinguistic* or *conceptual* semantics, fall outside of grammar.[1] Typical examples of the first category are features encoding number, case, tense, aspect, and so on; aspects of meaning considered to arise from the social, cultural, or historical context, on the other hand, are seen to fit into the latter category. Drawing the boundary between the two is an empirical question, in that only concepts observed to have morphosyntactic encoding across languages can be considered grammatical(ized) (see Cinque 2010). A major goal of cartography (and nanosyntax), then, is to determine exactly which parts of meaning are grammatical and should thus be syntacticized. The great extent to which semantics is syntacticized in cartography can be described in terms of a strict mapping between syntax and semantics. This means that syntax is assumed to be the vehicle for expressing grammatical semantics, and it does so by means of abstract syntactico-semantic features that are arranged by syntax into a hierarchy.

1. Although definitions will vary, other terms for this kind of meaning may include *extragrammatical, pragmatic, encyclopedic*, etc.

1.1.1 The model of grammar and full syntacticization

The broad-strokes model of grammar currently adopted by most generativists, including cartographers, is shown in Figure 1.1 (Chomsky 1965, 1981, 1986, 1995; for a cartographic perspective see Rizzi 2013, among others).

The "box of linguistic computations" (as *syntax* is called by Rizzi 2013, 10) contains a presyntactic repository (or lexicon) storing both functional and lexical morphemes, made up of (one or more) abstract features like SG, PL, PAST, DEF, etc. The presyntactic lexicon then feeds these "bundles" of abstract features into the recursive syntax. Syntax then computes the grammatical representations to be interpreted at the interfaces of phonological form (PF) and logical form (LF). Typically, phonological interpretation is achieved at PF. This includes, among other things, the interpretation of special prosodic contours relating to topic and focus (see Bocci 2009 for Italian). Semantic interpretation is achieved at LF, which includes the interpretation of scope-discourse properties. Beyond these interfaces we find "other (language independent) systems on both sound and meaning sides, which use grammar-determined representations for communication, socialization, the expression of thought, play, art, and whatever use humans make of their linguistic abilities" (Rizzi 2013, 10). In the former systems the ways in which we articulate and perceive phonological representations are determined. In the latter systems the ways in which we understand language are determined. As is clear from Figure 1.1, these systems are external to syntax: That is, the articulatory–perceptual systems and conceptual–intentional systems receive input via the interfaces from syntax. From the point of view of cartography, with so much of the grammar having been syntacticized, we can state that there is "very little computation" required postsyntactically for the purposes of interpretation, because the information received from syntax comes packaged in such rich syntactic structures (Rizzi 2013, 11).

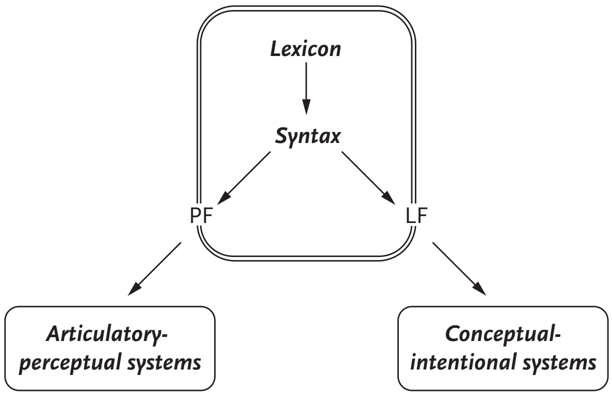


Figure 1.1 Architecture of grammar [based on Rizzi 2013, 10, his (22)]

1.1.2 The proliferation of functional heads and the fseq

Generative linguists generally assume the Uniformity Principle: "In the absence of compelling evidence to the contrary, assume languages to be uniform, with variety restricted to easily detectable properties of utterances" (Chomsky 2001, 2). This principle is at the core of cartography; as a research program, cartography aims to identify the complete set of atoms making up grammatical structures and the hierarchical organization of these structural atoms, both of which are taken to be universal (Rizzi 1997; Cinque 1999; Cinque and Rizzi 2008). The existence of crosslinguistic variation is due to the way languages (overtly or covertly) realize these structures, as well as the type of movements they allow: "the distinct hierarchies of functional projections dominating VP, NP, AP, PP, IP, etc., may be universal in the type of heads and specifiers that they involve, in their number, and in their relative order, even if languages differ in the type of movements that they admit or in the extent to which they overtly realize each head and specifier" (Cinque 1999, 2002; Cinque and Rizzi 2008, 46, citing Rizzi 1997). Under this hypothesis, "parameters are formal properties of features" (Shlonsky 2010, 12). This is known as the Borer–Chomsky Conjecture, which has been formulated as in (2):

(2) The Borer–Chomsky Conjecture

All parameters of variation are attributable to differences in the features of particular items (e.g. the functional heads) in the lexicon.

(Baker 2008, 353, and also Borer 1984)

So information-structural movement to the left periphery, for instance, is triggered by the presence of the relevant features and heads, and when the attracting head has the appropriate triggering properties (say, an EPP feature). As cartographers admit, this is a strong claim, because it "implies that if some language provides evidence for the existence of a particular functional head (and projection), then that head (and projection) must be present in every other language, whether the language offers overt evidence for it or not" (Cinque and Rizzi 2008, 45, citing Kayne 2005 and Cinque 2006).

Because not all languages provide overt evidence for all the functional projections that are postulated, a question that naturally arises under the cartographic approach is whether the full fseq is always syntactically represented and if so, how one handles the fact that not all languages provide overt evidence for its full instantiation. One way to approach the issue of crosslinguistic variation might be in terms of activation: Although functional categories in the fseq as such are universal, they may be deactivated or inactive in some languages but not others, perhaps because of whether certain heads carry interpretable or uninterpretable features (Shlonsky 2010, 426). The concept of truncation has also played a role in trying to answer this question. According to this view, a structure can be reduced by being "cut off" at a certain layer, preventing the higher functional categories from projecting (see Rizzi 1994; Haegeman 2003, 2006b,2006c). The stronger approach, that all functional categories are always active in every language, is argued for by Cinque (1999, 132–133, 2013). It has also been proposed that variation in the overt instantiation of functional categories can be explained by assuming that the fseq can to some extent display conflation of two or more syntactic heads (e.g. Rizzi 1997; Zubizaretta 1998), possibly the product of the movement of one head to a higher head.

Evidence that the fseq is universal comes, on the whole, from detailed empirical work, often from a comparative perspective. In particular, efforts have been made to achieve a more fine-grained, syntactic(ized) decomposition of scope-discourse properties in the CP domain (Rizzi 1997; Aboh 2004a; Belletti 2004; Haegeman 2006a, 2012). Additional efforts include elaborating the precise structural positions for adverbs (Laenzlinger 1998; Cinque 1999), adjectives (Cinque 2010), subjects (Cardinaletti 1997, 2004), negation (Haegeman and Zanuttini 1991; Zanuttini 1991; Haegeman 1995), quantifiers (Beghelli and Stowell 1997; Szabolcsi 1997; Puskás 2000), tense/aspect/mood/modality (Cinque 1999), inflection (Pollock 1989; Belletti 1990), the nominal domain (Abney 1987; Giusti 1997), and more. Over the course of cartographic investigations there has been a proliferation of fine-grained functional structures: CP has been split into Force, Top, Int, Foc, Mod, and Fin (Rizzi 1997, 2001, 2004a; Aboh 2004a), the *v*P-to-TP region into a range of modal, temporal, and aspectual projections (Cinque 1999, 2006), the event structure into various sorts of VPs (Larson 1988; Hale and Keyser 1993; Ramchand 2008), DP into D, Q, Num, A, and so forth (Szabolcsi 1981, 1984, 1987, 1994; Abney 1987; Ritter 1991; Giusti 1997; Alexiadou, Haegeman and Stavrou 2007). Work has also been done on refining the internal structure of PPs (Koopman 2000; den Dikken 2010; Noonan 2010) and APs (Scott 2002; Laenzlinger 2005; Svenonius 2008; Leu 2015).

The identification of fine-grained syntactic structures is perhaps the most salient characteristic of cartographic work, but it is important to recognize why exactly syntactic representations have developed in this direction. As emphasized by Cinque and Rizzi (2008), fine-grained structures are posited only insofar as there is morphosyntactic evidence for the functional heads involved, with the overall result after years of research of a very large inventory of functional categories. For example, Rizzi (1997) demonstrates that Italian distinguishes separate syntactic positions for topicalized and focused elements; Aboh (2004a), moreover, shows that Gungbe has particles that overtly realize the topic and focus heads. This is evidence for discrete features or projections encoding topic and focus in the syntax. In other words, a comparative approach is deployed to assess the universality of the fseq. Work on crosslinguistic variation often has macrocomparative (typological) scope, but the systematic study of grammatical phenomena in closely related languages or dialects has also given rise to a fruitful field of microcomparative work, notably for the dialects of North Italy (Benincà and Vanelli 1982; Poletto 2000; Manzini and Savoia 2003, 2007, 2011; Benincà and Poletto 2004), Dutch and its dialects (Haegeman 1992, 2014; Barbiers 2006; Barbiers and Bennis 2007), Scandinavian languages (Johannessen et al. 2009; Lindstad et al. 2009), and also for diachronic studies (see Benincà, Ledgeway, and Vincent 2014 for a recent reference).

1.1.3 Cinque 2005

An influential theoretical development in cartography has been Cinque's (2005) reinterpretation of Greenberg's Universal 20 (Greenberg 1963, 87) (see Abels and Neeleman 2009, 2012; for an alternative account based on semantics, see Dryer 2009). In his seminal work, Cinque observes that of the 24 mathematically possible orders of demonstrative (Dem), numeral (Nml), adjective (A), and noun (N), only 14 are attested, leaving 10 possible orders unattested. He proposes to derive this striking pattern from the following basic restrictions:

(i) The universal merge order is Dem > Nml > A > N (the extended projection of the noun; Grimshaw 1991).
(ii) Only leftward movement is allowed (Kayne 1994).
(iii) Only phrasal movement is allowed (i.e. only XPs move; head movement is disallowed) (see Koopman and Szabolcsi 2000, among others).
(iv) Only phrases containing N may be moved (i.e. remnant movement is disallowed).

Note that the fourth restriction means that pied-piping is allowed (as long as N is included in the moved constituent). On the basis of these restrictions, Cinque demonstrates that the 14 attested orders can be derived whereas the 10 unattested orders are, by the same token, underivable. Importantly, Cinque's theory can be applied at the level of morphology as well (see Muriungi 2008; Caha 2009; Lander 2015a, 2015b); as we see in Section 1.3, virtually every aspect of the theory has an important impact on the implementation of nanosyntax. Cinque's (i) and (ii)—namely the view that the fseq is universal and right-branching—are commonly assumed in the nanosyntactic approach. Restrictions (ii), (iii), and (iv) are reflected in the current nanosyntactic system of phrasal spellout and spellout-driven movement, as elaborated in Section 1.3.3.4.

1.1.4 A summary of cartographic assumptions

Driven by a set of assumptions centering around the OFOH maxim, the fundamental simplicity (and antisymmetry) of syntactic projection, and a strict mapping between syntax and semantics, the cartographic program has by means of detailed comparative work argued for a particular view of grammar, essentially summed up as follows: Syntax is made up of a limited set of atoms that are organized into a single, universal sequence (the fseq). In terms of empirical work, researchers in the framework embrace a comparative approach, with the goal of mapping out the universal fseq and describing crosslinguistic variation in a careful and detailed way.

1.2 THEORY AND TERMINOLOGY IN DISTRIBUTED MORPHOLOGY AND NANOSYNTAX

Terminological differences are common sources of confusion when moving between theoretical frameworks. Different terms may be used for the same (or very similar) concepts, and conversely the same term is sometimes used and understood in quite different ways. For these reasons we think it is worth having an explicit discussion of terminology in DM versus nanosyntax before moving on to the particulars of nanosyntactic theory.[2] See Caha (Chapter 2) for a more in-depth comparison of theoretical and analytical issues between the two frameworks.

1.2.1 Basic architectures compared

DM (Halle and Marantz 1993; Marantz 1997; Bobaljik 2007, 2012, 2015; Embick and Noyer 2007; Harley 2014; Embick 2015) has played an important and influential role in the development of nanosyntax. Both frameworks are late-insertion models (see Section 1.2.2) with a commitment to the idea that syntax is responsible not only for sentence structure but also for word structure. The main difference is that nanosyntax seeks to eliminate the various postsyntactic rules and operations available in the DM model. Nanosyntax also argues for a different perspective on the lexicon (conceived of as separate "lists" in DM, as seen in Figure 1.2). Most notably, nanosyntax does away with the presyntactic list of morphemes that feeds syntax, ultimately because in nanosyntax there is no distinction between the "features" of morphemes and the "heads" of syntax (consider OFOH, and the discussion in Section 1.3). The main architectural

2. We are grateful to the anonymous reviewers for their instructive comments and insightful questions, convincing us to write this section.

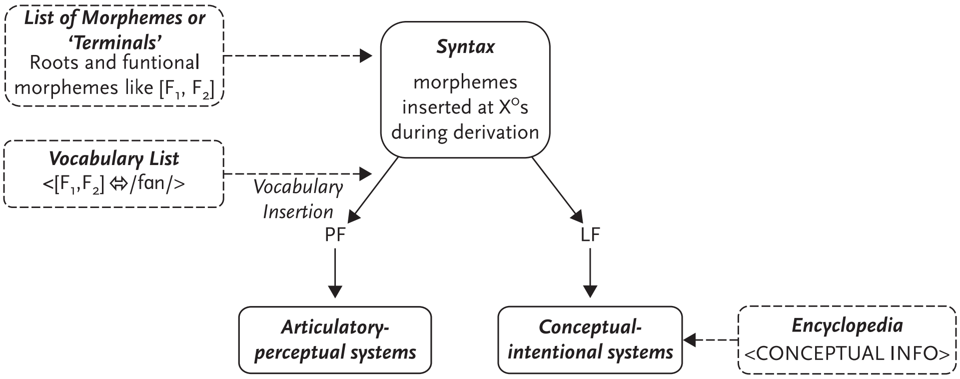


Figure 1.2 Model of grammar according to Distributed Morphology [based on Embick 2015, 20, his (12)]

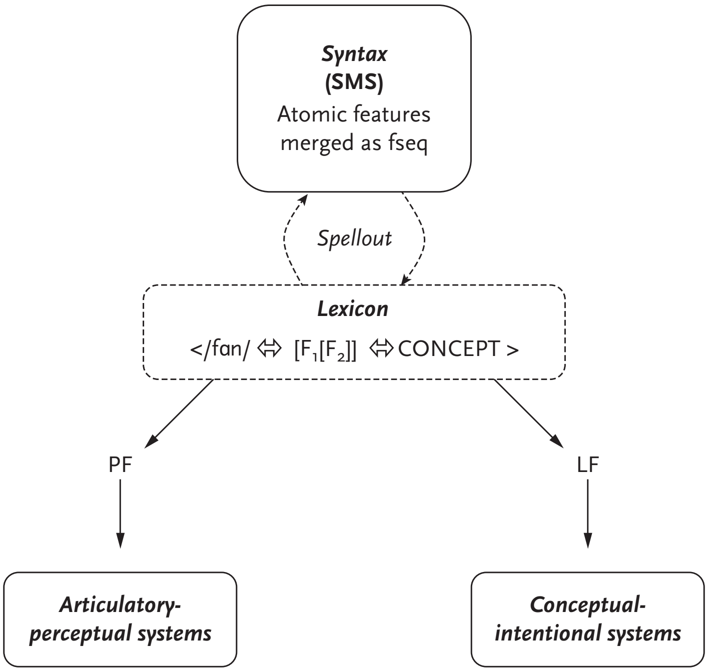


Figure 1.3 Model of grammar according to nanosyntax (Caha 2009, 52; Starke 2011)

differences can be seen by comparing Figure 1.2 for DM versus Figure 1.3 for nanosyntax.

In Figure 1.3, the abbreviation SMS stands for syntax, morphology, and semantics, which in nanosyntax are seen as one and the same module, to be identified with (the cartographic notion of) syntax.[3] This idea has a number of theoretical consequences that are considered in more detail in Section 1.3.

3. Note that the interface with the conceptual–intentional systems may in nanosyntax be called CF (conceptual form) (e.g. Caha 2009, 52), a way of distinguishing the nanosyntactic vision of a radically syntacticized formal semantics from the more

The rest of this section is organized as a discussion of four (clusters of related) terms: Morpheme and Vocabulary Insertion (Section 1.2.2); Vocabulary Insertion/Item/List versus lexical item/entry and lexicon (Section 1.2.3); allomorphy (Section 1.2.4); and morphophonology, suppletion, and portmanteau (Section 1.2.5). This is not an exhaustive overview, of course; rather, the goal is to preempt some common areas of misunderstanding and also hopefully to ease the transition into our discussion of nanosyntactic theory in Section 1.3.

1.2.2 Morpheme and Vocabulary Insertion

In American structuralist approaches (e.g. Bloomfield 1933; Harris 1951), a morpheme is considered to be the smallest unit consisting of a "sound" or "form" paired with a "meaning" or "function." In realizational, late-insertion theories like DM and nanosyntax, however, sound and meaning are not inherently linked but are separate entities, and it is only when the syntactic derivation reaches a certain point that the meaning is paired with (for some, replaced by) sound.

The structuralist notion of meaning is modeled in DM as a bundle of formal syntactico-semantic features, each (language-specific) bundle called a morpheme.[4] These abstract bundles of meaning are fed into the syntactic component, where functional morphemes are merged as syntactic terminals (say, the morpheme for third person singular present tense [3SG, PRES], merged as the head T^0). The (morpho)syntactic representation, now a syntactic tree structure with complex terminal nodes, then branches off to PF and the articulatory-perceptual systems. It is in this mapping between syntax and phonology that phonological forms are inserted, a process known as Vocabulary Insertion [note that various postsyntactic operations like Morphological Merger, Fission, Fusion, Impoverishment, feature deletion, and so forth, may need to take place before, and sometimes after (readjustment rules), Vocabulary Insertion]. The closest analogue of Vocabulary Insertion in nanosyntax is what is usually called *spellout* or *lexicalization*.

standard sense of "covert syntax" at LF (logical form). In this vein consider also Kayne (1998) on eliminating LF movement.

4. Note that *roots* are hypothesized in DM to have different properties (see Embick 2015, 6–7). We mainly focus our discussion on *functional* morphemes here. For a nanosyntactic perspective, see Taraldsen Medová and Wiland (Chapter 12) for a radical decomposition of the root domain, building on ideas from Lundquist (2008) and Starke (2009) on the internal structure of lexical categories.

1.2.3 Vocabulary Item versus lexical item/entry and lexicon

The correspondence between sound and meaning is in DM referred to as a Vocabulary Item, and the (memorized) inventory of Vocabulary Items is called the Vocabulary List. Although Vocabulary Item is sometimes used in nanosyntax as a term for stored correspondences of this sort, one is more likely to find the term lexical item or lexical entry. The lexical entry of nanosyntax is not exactly the same as the Vocabulary Item of DM. One of the main differences involves the placement of "encyclopedic" (i.e. noncompositional, extralinguistic) information.[5] A Vocabulary Item in DM involves syntactico-semantic structure and phonology only; noncompositional information comes from another, separate list called the Encyclopedia. In nanosyntax, on the other hand, a lexical entry is considered to have three available slots for storing linguistic information: the first for the phonological form, the second for the syntactico-semantic structure, and the third for conceptual (encyclopedic) information.

This allows nanosyntax to maintain that there is only a single *lexicon* (explicitly denied in DM, with its separate lists). The usage of lexicon and lexical item/entry (to the extent that this terminology is standardized within the framework) instead of Vocabulary List and Vocabulary Item, then, is actually motivated by an important difference in theoretical assumptions. As seen in Section 1.2.1, nanosyntax does not posit a presyntactic list of abstract morphemes as DM does. Thus the term morpheme is understood differently in nanosyntax, often being used in the more traditional sense as a sound–meaning pairing, or as a synonym for lexical entry.

1.2.4 Allomorphy

The term allomorphy in nanosyntax is understood in a restricted sense, as a *phonologically* conditioned alternation. A typical example of allomorphy in this sense is the English plural marker *-s*, which is phonetically realized as [-s] after voiceless obstruents (*tip-s, boat-s, riff-s, math-s*), as [-əz] after (post)alveolar fricatives (*mass-es, praise-s, bush-es, match-es, grudge-s*), and as [-z] everywhere

5. For example, even though *dog* and *cat* are, syntactically speaking, basically indistinguishable (i.e. they are animate singular count nouns), there is a great deal of idiosyncratic, "real-world" information that is not important for the syntax (or the phonology for that matter) but nevertheless connected to these lexical items: physical shape and appearance, that dogs are more social than cats, that cats do not like to be walked, etc. In addition to the idiosyncratic, real-world definition of words, there is also the possibility of special idiomatic usages that need to be stored as encyclopedic information [for example, that nouns like *ape* and *dog* can be used as verbs (i.e. 'imitate' and 'pursue intently') but *cat* cannot; Bobaljik 2015, 25–26].

else (voiced consonants: *rag-s, tab-s, tram-s, rail-s, wave-s*; vowels: *bee-s, tray-s*, etc.). The elsewhere environment is considered to point to the underlying representation /-z/, which is the phonological form stored in the lexical entry for the English plural morpheme (the allomorphs of /-z/—i.e. [-s], [-əz], and [-z]—do not need to be stored, because they are predictable).

As Bobaljik (2015, fn.8) points out, some researchers in DM choose to use allomorphy to refer to alternations that are lexically or grammatically conditioned, requiring an analysis in terms of morphology. An example of allomorphy in this sense might be irregular pasts as they are commonly analyzed in DM, as seen in (3):

(3) a. [PAST] ⇔ -t / $]_V$ __ where V = {√*dwell*, √*spell*, √*dream*, . . .}
b. [PAST] ⇔ -Ø / $]_V$ __ where V = {√*speak*, √*run*, √*fly*, . . .}
c. [PAST] ⇔ -d / $]_V$ __
[Bobaljik 2015, 6, adapted from his (14)]

This analysis assumes that there are three lexically conditioned allomorphs, each occurring in its own set of contexts: *-t* can be used in a subset of irregular verbs like *dwell—dwelt, spell—spelt, dream—dreamt* (3a). Ablaut in irregular verbs like *speak—spoke, run—ran, fly—flew*, and so forth, is modeled in terms of a null morpheme (*run—ran-Ø*, where the vowel change is the result of a later (morpho)phonological readjustment rule, occurring after Vocabulary Insertion) (3b). Finally *-d* is the regular (default, elsewhere) past ending (3c). Note here that the final element *-d* may then later on participate in phonologically predictable allomorphy, for example, devoicing in *wash-ed* /wɔʃt/, *trick-ed* /tɹɪkt/ or epenthesis in *batt-ed* /bæɾəd/, *trott-ed* /tɹɑɾəd/, and so forth.

The absence of an independently recognized notion of morphology (or more precisely the series of postsyntactic mechanisms affecting the output of syntax in the branch to PF) in nanosyntax means that it is impossible in this framework for allomorphy to denote anything other than a phonologically conditioned alternation. In nanosyntax, any kind of contextual allomorphy that is not phonological–phonetic in nature, such as grammatical or lexical allomorphy, must be encoded in some other way, for example in terms of a more fine-grained structural difference or a lexical entry storing an irregular form.

1.2.5 Morphophonology, suppletion, portmanteau

In DM, one may account for the vowel alternation in *run—ran* in terms of a somewhat superficial readjustment rule turning /ʌ/ into /æ/. A slightly more complex root alternation like *can—coul-d* (where *-d* could be analyzed as the regular past ending) would be accounted for in terms of suppletion, where a particular Vocabulary Item contains information that V^0 should be spelled out as *coul-* /kʊ-/ in a specific context, namely when the verb *can* is to the immediate left of [$_{T'}$ [PAST]]. This rule prevents the incorrect (but regularly formed) **can-d*. Extreme cases of morphological irregularity or unpredictability that are not segmentable at all can be called portmanteau elements.[6] For instance, forms like *were* and *was* are portmanteaus consisting of the verb *be* plus past-tense (and inflectional) features. Another example would be French contractions of certain prepositions with the masculine definite article, namely *au* for **à le* or *du* for **de le* (see Taraldsen in Chapter 3). Portmanteau elements are analyzed in DM in terms of fusion of syntactic heads/terminals, turning two (or more) heads into a single head (see Caha in Chapter 2 for references and discussion).

Although different in nature and applying at different stages postsyntax, all of these rules and operations are essentially morphophonological. In nanosyntax, however, there is a very strict division of labor between syntax and phonology, with no independent morphology of any kind between the two. This also means that morphophonological rules (applying between morphology and phonology in some sense) have no natural place in the architecture of nanosyntax. So whereas in DM an alternation like *tell—tol-d* involves both a lexically conditioned allomorph *-d* and a morphophonological readjustment rule (/ɛ/ → /oʊ/) (Bobaljik 2015, 7), in nanosyntax it is necessary instead to posit a more fine-grained underlying structure (see Caha in Chapter 2, fn. 8 and references there for *tol-* as a portmanteau, plus the regular ending *-d*) or the storage of specific structural configurations in the lexicon [for example, the lexical entry < /geɪv/ ⇔ [$_V$ *give*] + [PAST] > linking the regularly formed but incorrect **give-d* to the phonological form /geɪv/ (i.e. *gave*)].

1.3 NANOSYNTAX: THEORY AND METHODOLOGY

At this point we turn to why nanosyntax looks the way it does, with its "strictly modular" architecture (lacking any independent notions of morphology or morphophonology and with a single, postsyntactic lexicon). Nanosyntax is based on the reasoning that the general increase in the inventory of syntactic projections and the idea that features (rather than feature bundles) are the atoms or building blocks of syntax have important consequences for the demarcation (or lack thereof) between syntax and morphology and thus for the model of grammar in general. The purpose of this section is to explain the basic underpinnings and inner workings of Figure 1.3.

6. In practice the distinction between *suppletion* and *portmanteau* is, admittedly, not always clear-cut.

1.3.1 Submorphemic heads and phrasal spellout

As a descendant of cartography, nanosyntax assumes a strict syntax–semantics mapping, the OFOH maxim, and the view that syntactic structures are fundamentally quite simple. For a morpheme made up of the syntactico-semantic features X, Y, and Z, for example, it is not possible in nanosyntax to arrange X, Y, and Z in a "feature bundle" (4a); rather, one is forced to view these features as heads merged in a binary- and right-branching tree, putting them in a fundamentally asymmetrical relation with one another (4b) (see, for instance, Dékány 2009, 51):

(4) a. Unordered bundle (i.e. symmetrical relation)
 * [X, Y, Z]

 b. Ordered sequence (i.e. asymmetrical relation)
 ✓ $[_{XP}$ X $[_{YP}$ Y $[_{ZP}$ Z]]]

Many important aspects of nanosyntactic theory can be seen to emerge from this way of thinking about morphemes.

Let us begin with the well-accepted fact that there is not a strict one-to-one relationship between abstract features and their phonological realizations (i.e. *morphs*). In any one given language, there will always be more featural distinctions than there are morphs available, that is, there is generally a one-to-many relationship between morphs and features. Consequently, features can be described as being submorphemic, because single morphs usually correspond to several formal features. As seen in (4b), moreover, features are heads merged in a tree structure. If these heads are submorphemic and multiple heads make up a single morph, then it must be possible for spellout to target phrases (XPs) and not just heads, which is what is standardly assumed in frameworks like DM.

As an illustration of this concept, consider the split between agglutinating languages like Finnish and fusional–inflectional languages like most Indo-European languages (see also Halle and Marantz 1993: 116). Finnish tends to have distinct morphs for individual functional categories. For example, the allative case in Finnish is expressed by the morph *-lle*, and plural number is expressed by *-i*, as seen in (5). In Latin, on the other hand, the categories case (K) and number (Num) are typically expressed by a single morph. As seen in (6), the ending *-ās* expresses both accusative case and plural number (as well as feminine gender).

(5) a. karhu-lle (Finnish)
 bear-ALL
 'onto the bear'

b. karhu-i-lle
bear-PL-ALL
'onto the bears' (from Caha 2009, 73)

(6) puell-ās (Latin)
girl-ACC.F.PL
'girls.ACC' [from Rocquet 2013, 8, her (1)]

The Latin morph *-ās* is a portmanteau: The features for K and Num are submorphemic in Latin, as there is not a direct one-to-one correspondence between functional category and phonological realization, as there is in Finnish (where *-i* is Num and *-lle* is K).

As mentioned at the beginning of this section, the OFOH maxim requires positing two projections, KP and NumP. In addition, there are good reasons to think that K and Num are merged in a strict order. Consider, for instance, that in languages like Finnish in which K and Num are realized separately, the Num morph is systematically found closer to the nominal stem than the K morph is, meaning that the underlying hierarchy of functional categories is K > Num > N.

This leads to more general considerations of the framework. In the traditional model of grammar in Figure 1.1 and the DM version of this model in Figure 1.2, abstract morphemes from the lexicon are inserted at individual terminal nodes in the syntactic structure. As we just saw, K and Num are required to be separate heads under nanosyntactic assumptions.[7] For Finnish, then, there is no conflict between terminal insertion and separate K and Num heads, with one morph per head. For Latin, however, we are forced to say that the portmanteau *-ās* corresponds not to a single head but rather to (at least) two, namely K^0 and Num^0.

Different ways of handling such mismatches have been proposed, some of which were briefly encountered in Section 1.2.5, like Fusion; another approach might be to posit a null morph in either K^0 or Num^0, with the other head hosting the overt morph *-ās*, and a rule specifying the proper contextual environments for them.[8] Caha (Chapter 2) provides a detailed discussion of these issues in DM versus nanosyntax, but suffice it to say for now that the nanosyntactic strategy for dealing with portmanteau morphology is to make use of *phrasal spellout*. Rather than trying to preserve at all costs the idea that

7. We are of course simplifying for the purposes of exposition. K and Num can both be decomposed into multiple features, and thus multiple heads.

8. See also Kayne (2005) for application of this general approach to various syntactic phenomena. Null morphemes are also allowed in nanosyntax, of course, but only if there is evidence for it and the allomorphic alternation is phonologically plausible (see Section 1.2.4).

morphemes must correspond to syntactic heads (X^0s) (and thereby having to accept morphology-specific operations like Fusion, for example, to account for more problematic cases), nanosyntax instead adopts a system of spellout that can target phrases (XPs).[9]

In a phrasal spellout system, it is possible to model portmanteau morphology as larger chunks of structure, something a system restricting spellout exclusively to terminals cannot do. Thus the entire phrase $[_{KP}$ K $[_{NumP}$ Num]] can be targeted for spellout in the case of Latin *-ās* (Figure 1.4). In Finnish, KP and NumP are separately targeted for spellout (Figure 1.5).

Note that we choose to represent the Finnish morphemes *-i* and *-lle* as phrases (KP and NumP) rather than as heads (K^0 and Num^0). The stems *puell-* and *karhu-* are also represented as phrasal constituents (NPs). The reason for this ultimately has to do with considerations of *spellout-driven movement*,

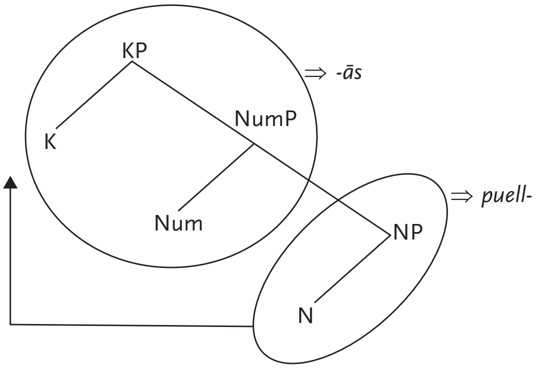


Figure 1.4 Spelling out *-ās* in Latin

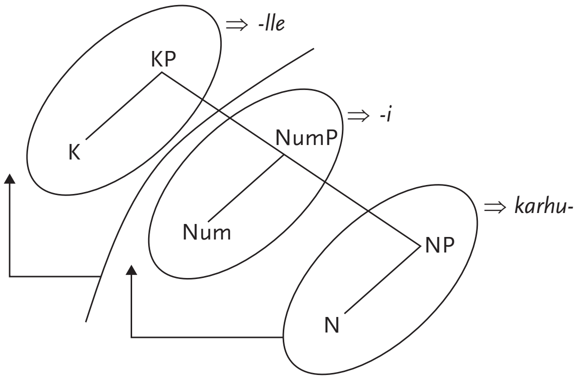


Figure 1.5 Spelling out *-i* and *-lle* in Finnish

9. Note that phrasal and terminal spellout are not necessarily mutually exclusive. It is possible to have a system in which both spellout mechanisms coexist (see in particular Pantcheva 2011, section 6.3.2).

the details of which we postpone until Section 1.3.3.4. As already sketched, spellout-driven movement of these XPs will result in the correct linear ordering of elements, with movement of NP to the left of K in Figure 1.4, giving *puell-ās*, and with roll-up movement in Figure 1.5, giving *karhu-i-lle*.

1.3.2 Overall consequences for the architecture of grammar

The introduction of phrasal spellout brings with it a deeper shift in the very architecture of grammar (here following the reasoning of Starke 2011a, 2011b). Phrasal spellout is a way to lexicalize multiple heads as a single unit, but without destroying the hierarchical ordering of these heads (i.e. the fseq) "inside of" the morpheme. Thus phrasal spellout allows for a direct and transparent (in fact, one-to-one) correspondence between syntax (the fseq) and morphology. Morphology is just like syntax in that it is built up by merging abstract features as heads in an fseq. Thus it is not the case that morphemes are constructed beforehand and fed into syntax as its primitive building blocks. Instead it is basically the other way around: Morphemes are built by syntax, and the primitive building blocks of syntax (from the cartographic perspective and OFOH) are features.

A consequence of this morphology-as-syntax idea is that there is no presyntactic lexicon of available feature bundles, because features cannot be combined *before* syntax but only *in* the syntax. Instead this lexicon must be postsyntactic, because a morpheme [that is, a syntactic (SMS) structure] can be stored away only if it has already been built in the first place. This should be thought of primarily in terms of language acquisition, during which the child must determine which SMS structures to store in her mental lexicon over time. In other words, the syntactic motor is running, continuously producing syntactic trees, some of which are considered crucial enough in the linguistic environment to merit storage in the lexicon. When a new lexical entry is created to store a certain SMS structure, furthermore, it becomes possible to link this structure to phonological and conceptual information as well.

As mentioned, the only thing that acts as input to the syntactic computation is the individual atomic features provided by UG, which syntax merges together as heads according to the universal fseq, resulting in a syntactic structure. At each step or cycle of the syntactic derivation, moreover, whatever has been built by syntax must be lexicalized by appropriate material from the lexicon, after which the syntax continues to build, followed by another round of lexical access, and so on. This spellout loop between syntax and the lexicon can be seen in Figure 1.3. Henceforth we refer to structures generated by the syntax (SMS) as *syntactic trees* or *S-trees* for short. Syntactic trees which are stored in lexical entries will be called *lexical trees* or *L-trees*. Although both S-trees and L-trees ultimately have the same source (the SMS component) and are thus made up of the same material, it is nevertheless important to distinguish the two. This becomes clear in Section 1.3.3.4 for the spellout process, the purpose of which is to match an S-tree with the appropriate L-tree (which, as one-third of a lexical entry, is linked to specific phonological and conceptual content too).

1.3.3 The basic tools and technology

In this section we introduce some of the common methodological tools in use in nanosyntactic research, as well as the spellout mechanism, which is a crucial component of the theory.

1.3.3.1 Mapping the fseq: From linear to hierarchical order

The basic nanosyntactic tools used in mapping out the universal fine-grained structure of language are the following: (i) semantics, (ii) syncretism, and (iii) morphological containment. We discuss each in turn.

(i) *Semantics*. One way of mapping out the universal structure of language is to study semantic compositionality. For example, in her work on the hierarchy of Path features, Pantcheva (2011) gives a number semantic arguments in support of her proposed hierarchy of Path features. *Route*, for instance, which can be paraphrased as '**from** X **to** Y,' can be seen as being composed of the features for *Source* and *Goal*. That is, in terms of structure, Route can be thought of as being built on top of Source 'from' and Goal 'to.' Semantic considerations like these can thus play a role in establishing fseqs and determining differences in structural size (see Ramchand 2008 on the semantic classes of verbs; detailed work on participles by Lundquist 2008 for Swedish and Taraldsen Medová and Wiland in Chapter 12 for Slavic; Fábregas 2009 on the semantics and morphology of indefinites and interrogatives, among others).

However, semantics on its own may not be sufficient; semantic facts need to be closely integrated and aligned with the syntactic and morphological facts as well (just as these need to agree with the semantics).[10] In the case of Path, for instance, Pantcheva (2011) provides empirical support from a broad range

10. Nanosyntax is not a revival of Generative Semantics, as sometimes claimed, as syntax, morphology, and semantics are all the same module, whereas in Generative Semantics (Lakoff 1971) there is a clear prioritization of semantics over syntax. As Cinque and Rizzi (2008, 53) put it: "there is a fairly restrictive universal set of properties that can be expressed by the functional elements entering into the different hierarchies associated to clauses and phrases." This limit on which parts of meaning are "grammaticalized" or "syntacticized" means that the universal hierarchy of syntax should not be reduced to semantics. Rather it is syntax that dictates "the pattern and the seams which delimit meaning and use" (Shlonsky 2010, 14).

of languages proving that the syntax and morphology of Path do indeed line up with the semantic facts (see also Tolskaya in Chapter 8 on Path prefixes and prepositions in Russian). The methodology for deciding "how much meaning" a feature can encode should be decided on morphosyntactic grounds, meaning that in principle every head in the fseq should be backed up by morphological evidence in some language (see Lander and Haegeman in Chapter 5).

(ii) *Syncretism*. Nanosyntax has been particularly successful as a theory of syncretism, and the intensive study of syncretism has played a central role in the development of nanosyntactic theory (see Caha 2009, 2010, 2013; Taraldsen 2009; Pantcheva 2011; De Clercq 2013, Chapter 7; Rocquet 2013; Vangsnes 2014; Baunaz 2015, 2016, Chapter 6; Baunaz and Lander 2017, to appear; among others). Caha (2009, 6) defines the phenomenon of syncretism as "a surface conflation of two distinct morphosyntactic structures." In other words, syncretism arises when two or more distinct grammatical functions are spelled out by a single form. As an example, consider the expression of Location, Goal, and Source readings in English (7) and French (8) (based on Pantcheva 2011, 238).

(7) a. I ran **at** the sea. — Location
    b. I ran **to** the sea. — Goal
    c. I ran **from** the sea. — Source

(8) a. J'ai couru à la mer. — Location/Goal
    I.have run at/to the sea
    'I ran **at** the sea.' *or* 'I ran **to** the sea.'
    b. J'ai couru de la mer. — Source
    I.have run from the sea
    'I ran **from** the sea.'

As seen in (7), English prepositions make overt distinctions between Location/Goal and Source readings. In French, however, a single preposition *à* expresses both Location and Goal readings, with Source expressed by the distinct form *de*, as seen in (8). In other words, there is a Location–Goal syncretism in French but not in English. Building on work by Svenonius (e.g. 2010), Pantcheva (2011, sections 8, 9) investigates syncretism patterns of Location 'at,' Goal 'to,' Source 'from,' and Route 'via' readings across languages.

Building on Blake (1994), among others, Caha (2009) performs a detailed crosslinguistic study of (nominative–accusative) Case systems. He demonstrates that Case syncretisms are constrained, in that the phenomenon targets only adjacent cases. If we take just five cases (NOM, ACC, GEN, DAT, INS), in Russian we see the syncretisms NOM–ACC, ACC–GEN, and GEN–DAT–INS. We can arrange the five cases in a table such that syncretism affects only adjacent cells, as seen in Table 1.1 (shaded cells highlighting syncretism).

Table 1.1 SYNCRETISMS IN RUSSIAN (FROM CAHA 2009, 12)

	'window' (SG)	'teacher' (PL)	'one hundred'
NOM	okn-o	učitel-ja	st-o
ACC	okn-o	učitel-ej	st-o
GEN	okn-a	učitel-ej	st-a
DAT	okn-u	učitel-am	st-a
INS	okn-om	učitel-ami	st-a

When Caha expands his empirical coverage to more languages and to more cases, he finds that it is possible to arrange the Case sequence in a single universal order such that attested syncretisms are always in adjacent cells. From this he formulates the generalization in (9):

(9) Universal Case Contiguity (Caha 2009, 49)
  a. Nonaccidental[11] Case syncretism targets contiguous regions in a sequence invariant across languages.
  b. The Case sequence: NOM—ACC—GEN—DAT—INS—COM

Note that the observation in (9a) that syncretism affects only adjacent case layers and the resulting Case sequence in (9b) are not simply a convenient way to organize the data on syncretism. Rather, they constitute a hypothesis that makes predictions about possible syncretisms. More precisely, given (9) we predict that we should not find a language where two noncontiguous cases are syncretic, for example a GEN–INS syncretism with a distinct DAT. Indeed, Caha finds that noncontiguous cases are never (or very rarely) syncretic. Two unattested syncretisms are illustrated in Table 1.2.

The hypothesis that syncretism targets only adjacent cells in a paradigm is known as the *ABA theorem, first formulated by Bobaljik (2007, 2012) in his work on comparative and superlative inflection in adjectives across languages.[12]

11. This refers to the possibility of homophony. Two morphemes with distinct underlying phonological representations can be affected by phonological rules that cause them to surface identically at PF. If this happens within a single paradigm, we end up with two very syncretic-*looking* morphemes, but this is purely an accident. For the purposes of the computation, these morphemes are structurally distinct and do not instantiate a genuine syncretism. For discussion see Caha [2009, 11, his (11)], among others.

12. Various questions about the *ABA theorem and the possibility of "gaps" in the functional sequence (e.g. Caha 2009, section 9.3; Starke 2013) have been raised recently, many of which are discussed in this volume (see Vanden Wyngaerd Chapter 11).

The contiguity/*ABA generalization about syncretism gives us a powerful tool for probing and teasing out the atomic ingredients of syntax. By looking at attested syncretisms across languages, it is possible not only to identify which fine-grained features are present, but also to deduce the linear order of these features.

(iii) *Morphological containment or nesting*. Syncretisms do not reveal everything about the structure of the functional features at stake. For instance, with respect to Case, although we can identify the feature sequence, we cannot identify the hierarchy, that is, just taking syncretism into consideration will not reveal if the underlying sequence is NOM > ACC > GEN > DAT > INS > COM or COM > INS > DAT > GEN > ACC > NOM. That is, syncretism reveals a linear order of features that can reflect one of two possible hierarchies; what syncretism cannot explicitly tell us is which of the two possible hierarchies is correct. In other words, in Figure 1.6 we cannot yet tell if A is NOM and F is COM, or if A is COM and F is NOM.

The hierarchy in Figure 1.6 should be understood as consisting of privative features that build on each other cumulatively as heads in the fseq. This

Table 1.2 UNATTESTED SYNCRETISMS: *ABA (BASED ON ROCQUET 2013, 32)

NOM	A	
ACC	B	
GEN	A	A
DAT		B
INS		A

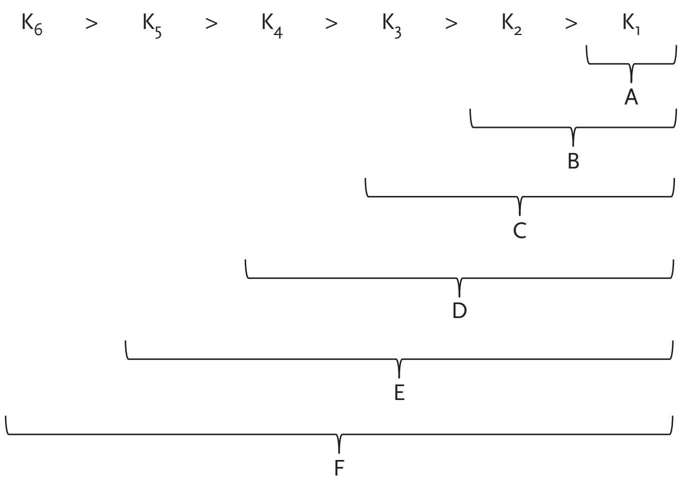


Figure 1.6 Case as a hierarchy of additive heads

means that cases are in superset–subset relations with one another, such that the lowest case is made up of one feature, the next case in the sequence is composed of this feature plus a second feature, the third case is composed of these two features plus a third, and so on. Because of this, Caha (2009) prefers to use K_1, K_2, and so on, instead of NOM, ACC, and so on, as seen in Figure 1.6.

With respect to the case hierarchy, to determine if A in Figure 1.6 should be identified with NOM or COM, other phenomena must be taken into account. First, the fact that NOM is crosslinguistically "unmarked" suggests that NOM is the simplest, structurally and featurally speaking (Caha 2009, 23). Second, the facts concerning morphological containment (see Bobaljik 2007, 2012), which we detail presently, suggest that NOM is the smallest case in Figure 1.6 as well. For instance, in West Tocharian the ACC plural ending *-m̥* is found overtly contained within the GEN/DAT plural ending *-m̥ts*, as seen in (10a). In (10b), we see that the Russian DAT.PL ending *-am* is overtly contained within the INS.PL ending *-ami*.

(10) a. West Tocharian (Caha 2009, 69)
$[_{\text{GEN/DAT.PL}}$ $[_{\text{ACC.PL}}$ -m̥] -ts] [GEN/DAT [ACC]]
b. Russian (Caha 2009, 12)
$[_{\text{INS.PL}}$ $[_{\text{DT.PL}}$ -am] -i] [INS [DAT]]

These and similar morphological facts show that certain cases are contained within others: ACC is contained within GEN and DAT, and DAT is contained within INS.

Similar facts are found for prepositional phrases (PPs). If we assume that prepositions are like case morphemes in being composed of K features, then we see that the way prepositions select their DP complements also reflects a containment relation. In English the GEN preposition *of* selects an ACC complement (11a), as represented in (12a). In Arabic the DAT preposition *li* selects a GEN complement (11b), as represented in (12b). In German the INS preposition *mit* selects DAT (11c), as represented in (12c).

(11) a. of him (English)
b. li-l-binti (Arabic)
to the girl.GEN
c. mit einem Hammer (German)
with a.DAT hammer

These facts tell us that GEN contains (i.e. is larger than) ACC, that DAT contains GEN, that INS contains DAT, and so on.

(12) Case selection by prepositions as containment (Caha 2009, 37)

a. English [*of* + DP-ACC]$_{GEN}$ [GEN [ACC]]

b. Arabic [*li* + DP-GEN]$_{DAT}$ [DAT [GEN]]

c. German [*mit* + DP-DAT]$_{INS}$ [INS [DAT]]

Figure 1.7 is a more detailed illustration of the configuration in (12c) from German.

The highest layer (K_5) in the sequence corresponds to the preposition *mit* whereas the lower part (from K_4 down to K_1) is realized as the dative case ending. (DP will undergo spellout-driven movement to the left of K_4 to pick up dative inflection.)

As we have seen, morphological containment—when it can be observed—is an especially clear way of observing the nesting of underlying functional structure. For Case in particular we have seen that DAT is larger than GEN, GEN is larger than ACC, and so on. Thus we can safely conclude that the correct hierarchy is the one in Figure 1.8.

We turn now to the inner workings of the spellout process in nanosyntax.

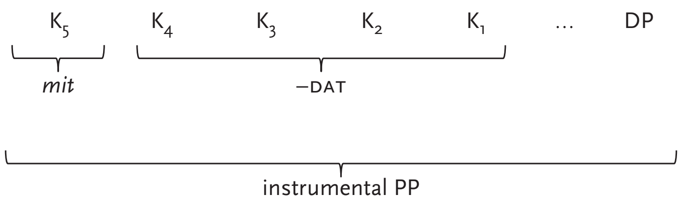


Figure 1.7 Containment of dative within instrumental PP

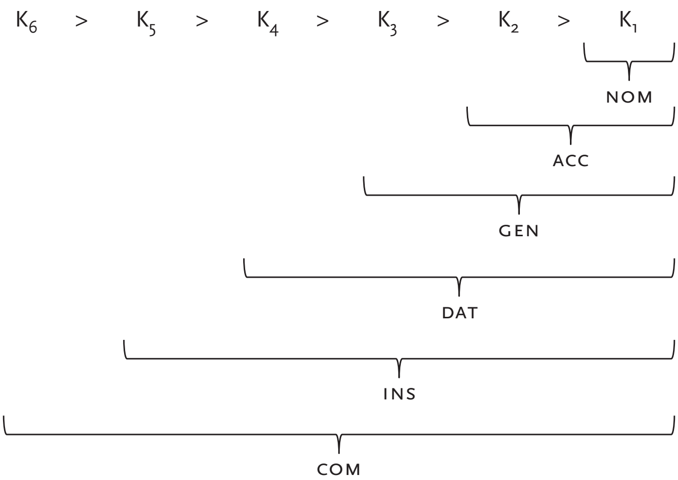


Figure 1.8 The Case hierarchy

1.3.3.2 The principles of spellout

Syncretism involves a single form that is applicable in more than one structural environment. For example, French *à* in (8a) functions either as a Place marker with the meaning 'at' or a Goal marker with the meaning 'to.' To put it differently, there is a single lexical entry (a single morpheme) stored in the lexicon, with an L-tree that is able to match multiple S-trees. To flesh out this idea, we need to be more explicit about the interaction between S-trees in SMS and L-trees in the lexicon. As we will see, the availability of phrasal spellout becomes crucial here.

As alluded to in Section 1.2.1, a lexical entry is made up of three elements which are linked together: (i) phonological structure, (ii) syntactic (SMS) structure (i.e. an L-tree), and (iii) conceptual structure. This is illustrated in Figure 1.9 for the nonce-item *blicket*.

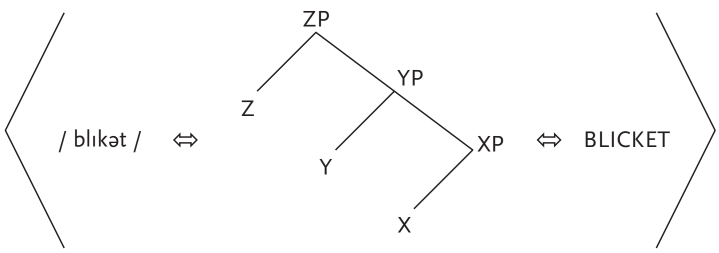


Figure 1.9 Lexical entry

Lexical entries are arbitrary in the sense that each language (in fact each idiolect; Kayne 2016) will have its own idiosyncratic inventory of lexical entries pairing phonology, syntax (SMS), and conceptual (extralinguistic, pragmatic) information. It is the successful storage of these entries over time, essentially, that constitutes acquisition of language.

Every single possible syntactic structure or S-tree does not necessarily correspond to a specific lexical entry in a given language. Indeed, the fact that syncretism is prevalent in a language shows that a single L-tree will often have to map onto multiple S-trees of various sizes. As we discuss toward the end of this chapter, this says something quite profound about the nature of crosslinguistic variation.

For our purposes in this chapter we are focusing on the L-tree (the second slot in a lexical entry). S-trees generated by the SMS module are abstract, requiring proper lexicalization or spellout. This involves matching an S-tree with an appropriate L-tree. Because this L-tree is part of a lexical entry, moreover, the matching process establishes a connection not only between the S-tree and an L-tree, but also between the S-tree and a certain phonological form (the first slot) and concept (the third slot), each of which is interpreted later on when the syntactic derivation "branches off" in the model of grammar assumed by generative linguists. In other words, the lexicon, with its three-slot lexical entries, is in many ways what binds this model together.

There are three principles of spellout governing the proper matching of L-trees to S-trees: (i) the Superset Principle, (ii) the Elsewhere Principle, and (iii) the Principle of Cyclic Override (see Starke 2009). We discuss each of these in turn.[13]

(i) *The Superset Principle*. The first principle of spellout is known as the Superset Principle, stated in (13).

(13) Superset Principle (Caha 2009, 67, but see Vanden Wyngaerd Chapter 11)
A lexical tree L can match a syntactic tree S if L is a superset (proper or not) of S. L matches S if L contains a node that is identical to a node in S and all the nodes below are also identical.

Informally put, the Superset Principle allows for an S-tree to be spelled out by an L-tree as long as that L-tree is the same size or bigger (and assuming that they are made up of the same features).

We first give an example of how the Superset Principle works by using Cardinaletti and Starke's (1999) classification of pronouns (who build on Kayne 1975). This constitutes a good example of the kind of superset–subset relations we are interested in here (see also Rocquet 2013). Table 1.3 is an overview of the French pronominal system, with a distinction made among strong pronouns, weak (subject) pronouns, and clitic (object) pronouns. Note that weak pronouns and clitic pronouns are grouped together as "deficient," as will become clearer.

According to Cardinaletti and Starke (1999), these three pronoun classes must be distinguished in terms of semantics, syntax, morphology, and prosody. We sum up the differences here but refer to their paper for more details.

Semantically, strong pronouns must be referential, whereas weak and clitic pronouns do not need to be (i.e. deficient pronouns can be expletive and impersonal). When they refer, weak pronouns and clitics need to be associated to a prominent discourse antecedent. That is not the case for strong pronouns (see Cardinaletti and Starke 1999, section 2.5, for a more thorough definition of referentiality).

The strong pronouns appear in thematic positions, but not the weak and clitic ones. Syntactically, strong pronouns can be coordinated, be moved to left-peripheral positions, and be modified by adverbs. Even though weak

13. The reader should note that two of these "principles" (Superset and Cyclic Override) are sometimes referred to as *theorems* in the literature (see Starke 2009, 2011b and Starke Chapter 4), as they follow logically from the basic theoretical assumptions or "axioms" of the nanosyntactic approach. We continue to refer to them as principles.

Table 1.3 FRENCH PRONOUNS

			STRONG		WEAK (SUBJECT)	CLITIC (OBJECT)
SG	1		moi		je	me
	2		toi		tu	te
	3	M	lui		il	le
		F	elle		elle	la
PL	1		nous		nous	nous
	2		vous		vous	vous
	3		eux	M	ils	les
				F	elles	

pronouns and clitics are grouped together as deficient, they must also be distinguished from each other, in that weak pronouns occupy XP positions, whereas clitics crucially do not. Morphologically, clitics are more deficient than weak pronouns, and weak pronouns tend to be more deficient than strong pronouns. In terms of prosody, only deficient pronouns may restructure, that is, only weak pronouns and clitics can “form a single unit with an adjacent lexical element” (Cardinaletti and Starke 1999, 159).

Cardinaletti and Starke (1999) analyze these differences in terms of structural deficiency and structural containment. The more deficient a pronoun is, the less structure it displays. Whereas strong pronouns contain heads with referential and human features, weak pronouns and clitics do not. Strong and weak pronouns share the head that realizes prosodic features (Σ in Figure 1.10), whereas clitics do not. Finally, clitics are the most deficient as their structure is composed of phi-features only. Summarizing: The structure of strong pronouns contains that of weak pronouns, and weak pronouns, in turn, contain the structure of clitics. This can be expressed as the superset–subset relations in Figure 1.10.

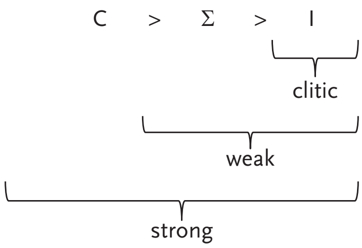


Figure 1.10 Superset–subset relations in pronouns

Now consider (14), where it can be seen that strong pronoun *elle* ‘she’ and weak pronoun *elle* ‘she’ are syncretic. In (14a), *elle* ‘her’ is in a thematic position (after the preposition *quant à* 'as for'), and as such it is a strong pronoun. Moreover it does not prosodically restructure with the preposition. In (14b), *elle* 'she' is in the subject position and prosodically restructures with the verb *joue* 'play,' that is, it is a weak pronoun.

(14) a. Pierre travaille. Marie, quant à **elle**, joue sur la plage.
Pierre works Marie as to she$_{\text{STRONG}}$ plays on the beach
'Pierre is working. As for Marie, she's playing on the beach.'

b. **Elle** joue sur la plage.
she$_{\text{WEAK}}$ plays on the beach.
'She's playing on the beach.' [Rocquet 2013, 23, her (41)]

For Cardinaletti and Starke (1999), the structure of *elle*$_{\text{STRONG}}$ 'she' contains the structure of *elle*$_{\text{WEAK}}$. In Figure 1.11 we have a very simple lexicon filled with a single lexical entry, as well as two S-trees, S1 for the strong 3F.SG pronoun and S2 for the weak 3F.SG pronoun.

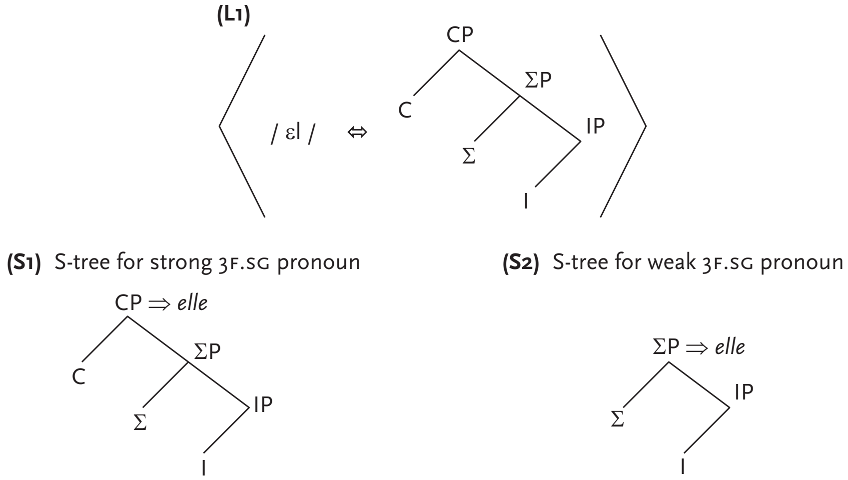


Figure 1.11 Strong–weak syncretism in *elle*

By the Superset Principle, L1 can spell out either S1 or S2. For S1 there is a perfect match with L1, so S1 spells out as /ɛl/ (*elle*), as this is the phonological form specified in L1. As for S2, though it is not perfectly matched by L1, L1 is nevertheless a superset of S2. That is, the L-tree [CP [ΣP [IP]]] contains the S-tree [ΣP [IP]]. Thus S2 also spells out as *elle*.

The Superset Principle is at the heart of how syncretism is accounted for in nanosyntax, because it is precisely this principle that allows for a single L-tree to match multiple S-trees. In Figure 1.11, there is a single lexical entry that applies in multiple syntactic environments. The element *elle* instantiates a strong/weak syncretism.[14]

(ii) *The Elsewhere Principle*. The second principle of spellout is known as the Elsewhere Principle (see also Kiparsky 1973). This principle guarantees that a more specific lexical entry will take precedence over a more general lexical entry.

(15) Elsewhere Principle
If more than one L-tree can lexicalize the same S-tree (by the Superset Principle), then the L-tree with the least amount of superfluous material is chosen.

This can also be called, more informally, the Best Fit Principle or Minimize Junk.

Let us return to our French example in (14) (see also Rocquet 2013, 24–25). In French, the strong 3M.SG pronoun is *lui* 'him.' From our preceding discussion of the Superset Principle we might expect that *lui* 'him' will be spelled out in both strong and weak environments, parallel to *elle* 'her' in (14a) and (14b). After all, the lexical structure of the strong pronoun *lui* 'him' is [CP [ΣP [IP]]], which is a superset of the structure of the weak pronoun, [ΣP [IP]]. This is not the case, however, because there is another, separate lexical item that competes with *lui* 'him,' namely the weak 3M.SG pronoun *il* 'he.' As seen in (16), after the preposition *quant à* 'as for' the weak pronoun *il* 'he' cannot be used (16a), whereas it can perfectly occur in the subject position in (16b).

(16) a.

Marie	travaille.	Pierre,	quant à	lui	/	*il,	joue	sur	la	plage.
M.	works	P.	as to	$\text{him}_{\text{STRONG}}$	/	he_{WEAK}	plays	on	the	beach

'Marie is working. As for Pierre, he is playing on the beach.'

b.

Il	/	#Lui	joue	sur	la	plage.
he_{WEAK}	/	$\text{he}_{\text{STRONG}}$	plays	on	the	beach

'He is playing on the beach.' [Rocquet 2013, 24, her (24)]

The Elsewhere Principle accounts for this. For this example our lexicon includes two lexical entries, as seen in Figure 1.12.

As in the previous example, the maximal structure in L2 is once again a suitable match for S3. The other lexical entry, L3, on the other hand, is not a suitable match for S3 because L3 lacks the top head, C. Thus S3 spells out as *lui* 'him.' Now consider S4 in Figure 1.12. Note that by the Superset Principle, both L2 and L3 are suitable matches for S4. That is, L2 is a superset of S4, and

14. More can be said about the Superset Principle. For example, the Anchor Condition (Abels and Muriungi 2008; Caha 2009, 89) can be seen as a condition on the Superset Principle. It states that the lowest feature in an L-tree must be matched by the S-tree, which has implications for cases in which more than one entry competes to lexicalize the same feature. Such details, however, go beyond the scope of this introduction (but see Taraldsen Chapter 3, 90–91).

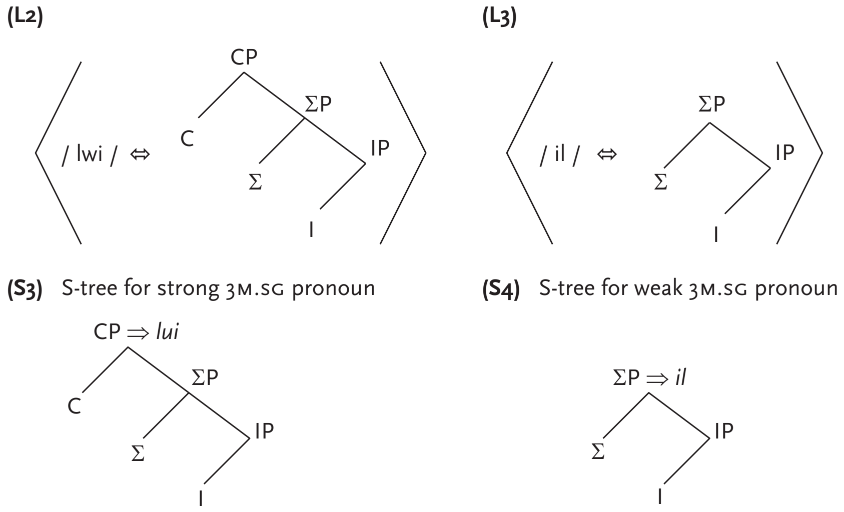


Figure 1.12 Strong *lui* vs. weak *il*

L3 matches S4 exactly. Here the Elsewhere Principle steps in as referee: L3 is a better fit for S4 (because L2 has an extra feature C, which is absent in L3), and for this reason L3 gets to lexicalize the S-tree, and S4 spells out as *il* 'he.'

Now that we have discussed and exemplified these two principles, we are in a position to understand the *ABA theorem, which plays an important role in syncretism and thus in determining which features are merged adjacently in the functional sequence. Caha (2009, section 2.3) shows that the *ABA theorem, on nanosyntactic assumptions, actually derives from a combination of the Superset Principle and the Elsewhere Principle.

The *ABA theorem is about syncretism patterns. It states that spellout patterns such as the one in Figure 1.13 should not be possible.

The principles of spellout can account for the ban on ABA patterns. In an attempt to generate the pattern in Figure 1.13, we might posit the lexical entries in Figure 1.14.

By the Superset Principle, L5 can map onto either S5 [XP] or S7 [ZP [YP [XP]]], which is what would be needed in the ABA pattern in Figure 1.13. L4,

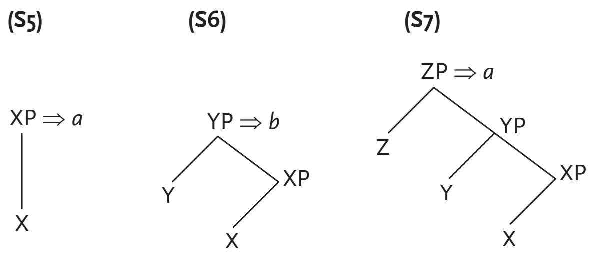


Figure 1.13 *ABA pattern

(L4) (L5)

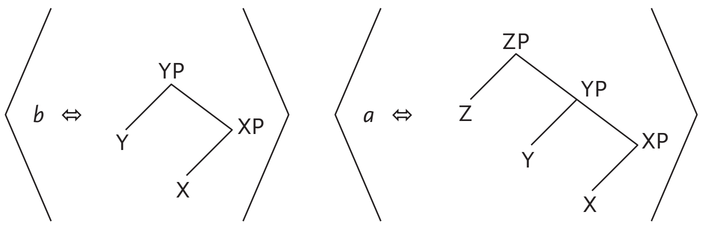


Figure 1.14 Two hypothetical lexical entries for *b* and *a*

furthermore, perfectly matches S6 [YP [XP]], as is also required in Figure 1.13. Thus, if we had only the Superset Principle to govern spellout, then the ABA pattern in Figure 1.13 might (in principle) very well be possible.

However, once we take the Elsewhere Principle into account, the derivation of the ABA pattern is blocked. Even though L5 in Figure 1.14 *can* map onto the S-tree [XP] by the Superset Principle, it will be prevented from doing so because L4 is a better match. This is because L4 has only one extra feature (Y), whereas L5 has two extra features (Y and Z) compared with the S-tree [XP]. The spellout results are summarized in (17).

(17)	*S-tree*		*Spellout*	
	[XP]	=>	*b*	(both L4 and L5 match, but L4 is a better fit)
	[YP [XP]]	=>	*b*	(both L4 and L5 match, but L4 is a perfect fit)
	[ZP [YP [XP]]]	=>	*a*	(only L5 is a match)

Thus the Elsewhere Principle, by constraining the application of the Superset Principle, ends up blocking the ABA pattern.

(iii) *The Principle of Cyclic Override*. The third principle of spellout is known as the Principle of Cyclic Override (or the Biggest Wins Theorem), stated in (18).

(18) The Principle of Cyclic Override
Previous lexicalizations are overridden or canceled out by later lexicalizations.
In a derivational system that builds structure from the bottom up, the application of this principle is quite intuitive. To illustrate let us complete our paradigm of French pronouns by expanding our lexicon once more to include three lexical entries (Figure 1.15), one for the clitic *le* 'him' (L6), one for the weak pronoun *il* 'he' (L7), and one for the strong pronoun *lui* 'him' (L8).

Consider now the derivational history of *lui* 'him' in Figure 1.16.

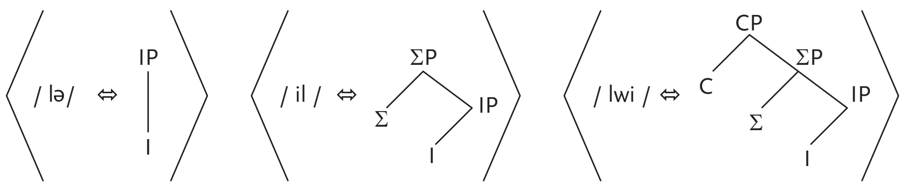


Figure 1.15 Lexical entries for *lui, il*, and *le*

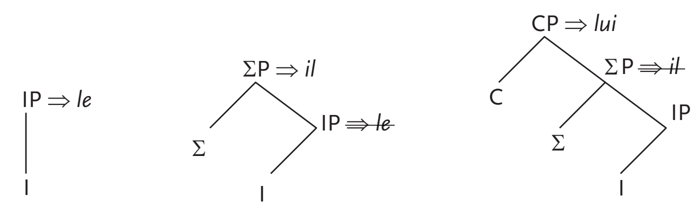


Figure 1.16 Cyclic Override in the derivation of *lui*

Structures are built one feature at a time. The first step in building *lui* 'him' is to build IP (S8), which spells out as *le* 'him' because L6 is the best match by the Elsewhere Principle. Next the feature Σ is added, resulting in S9. This structure, [ΣP [IP]], spells out as *il* 'he' because L7 is the best match. The spellout of *il* 'him,' moreover, overrides the now-redundant, previous spellout *le* 'him.' Finally, the feature C is added (S10). The resulting structure [CP [ΣP [IP]]] spells out as *lui* 'him' because L8 is the best match. The spellout *lui* 'him' overrides the lower-level spellout *il* 'he.'

Note that Cyclic Override does not cancel the SMS structure in any way. Rather, it ensures that the system stays "up to date" with the latest and most efficient matches between SMS and the lexicon. This has the most crucial effect on phonology: Although both grammatical (SMS) and conceptual information can be built up compositionally, phonology (being constrained by linearization) must be constantly choosing the latest best form for pronunciation.

1.3.3.3 Phrasal spellout and idioms

Idioms with their various idiosyncrasies are often considered to pose problems for standard theories of syntax. However, in a system that allows for phrasal spellout, such as nanosyntax, idioms are easier to understand.

> Idioms are *prima facie* an important source of support for [the nanosyntactic notion of] phrasal spellout. Within the traditional approach, there is no easy way

> to handle multi-word idiomatic expressions, as witnessed by the clunkiness of existing attempts at handling idioms while at the same time confining spellout to terminals. Under phrasal spellout, idioms are natural: they are cases in which a relatively high-level constituent has been stored.
>
> *(Starke 2011a, 6)*

Note that this "high-level constituent" is not confined to simple VPs or NPs but can include functional layers for aspect, tense, definiteness, and so forth.

There are two basic kinds of idioms: phonological and conceptual. Phonological idioms are cases when a phonologically irregular form replaces a "regular" form, such as when *children* replaces **child-s* or *mice* replaces **mouse-s*. Conceptual idioms, on the other hand, involve idiosyncratic conceptual information replacing the regular concepts in a certain phrase, such as when the basic conceptual information associated with the individual items in *kick the bucket* is replaced by the concept 'die,' or when *hold your horses* is interpreted as 'be patient.'

First consider phonological idioms. As seen in Figure 1.17, the irregular plural of *mouse* is *mice* rather than the regularly formed **mouse-s*. We can say, then, that *mouse-s* is built regularly at some point in the derivation but that this particular combination of lexical items is phonologically overridden at a higher node by *mice*.

In Figure 1.17 we see that there is a lexical entry containing the SMS structure [$_{NP}$ *mouse*] + [PL] linked to the phonology /maɪs/ (i.e. *mice*).[15] Learning an irregular form, then, amounts to storing a particular lexical entry in the lexicon to ensure that **mouse-s* surfaces as *mice* instead (Starke 2009; see also Caha Chapter 2 for discussion).

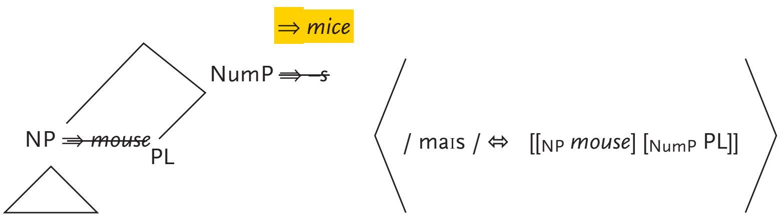


Figure 1.17 The form *mice* as a phonological idiom

15. When a lexical entry itself refers to other, independent lexical entries (i.e. [$_{NP}$ *mouse*] and the plural marker), then we are making use of "pointers." A pointer is a way to refer to a lexical item within another lexical item. The idiomatic entry for *mice* contains (or points to) two other lexical entries: one for the NP *mouse* and another for the plural marker. The idiomatic entry for *hold your horses* 'be patient' points to at least four other lexical entries: *hold, your, horse*, and the plural marker. It has been suggested that pointers can also be used to encode more complex paradigmatic patterns involving multiple dimensions of grammatical features (e.g. case, gender, number) (Caha and Pantcheva 2012; Starke 2013). See Vanden Wyngaerd (Chapter 11) for more details.

Consider next a conceptual idiom like *hold your horses*, with the special interpretation 'be patient.' What we need to say about this idiom is that the individual concepts associated with *hold, your*, and *horses* are replaced, or at least receive an additional interpretation, at the highest node.

In Figure 1.18 we again see that there is a lexical entry containing a certain SMS structure, basically [$_{VP}$ *hold your horse-s*], which is linked to special conceptual information that cannot be accessed or deduced simply from the conceptual information associated with the individual items *hold, your*, and *horse(-s)*. The special interpretation of 'be patient,' then, is due to the fact that there is a lexical entry linking the specific phrase *hold your horses* to additional conceptual information concerning patience.

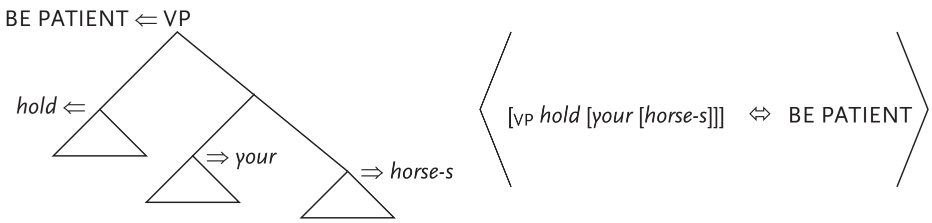


Figure 1.18 *Hold your horses* as a conceptual idiom

There are some important points about the nanosyntactic view of idioms that should be highlighted here. First, idioms illustrate that not all lexical entries have their own phonology and conceptual content. Conceptual idioms do not have their own phonology because they simply hijack the phonology of already-existing lexical items like *hold, your*, and *horses*. Similarly, phonological idioms do not have their own conceptual content, because they refer to the conceptual content of already-existing lexical items like *mouse*.[16] Either way, however, some kind of SMS structure must be in the central slot.

Second, the Principle of Cyclic Override is strictly relevant only for phonological idioms, not for conceptual idioms. As a reviewer points out, phonological idioms involve obligatory override (in the sense that **mouses* instead of *mice* or **goed* instead of *went* is simply ungrammatical), whereas conceptual idioms can have both the literal and idiomatic interpretations available. We suggest that this is due to the relative complexity of the systems involved. As previously mentioned, although it is impossible to say two things at once

16. It is interesting to note that this view of the lexicon—that structures of all sorts and sizes can be stored in the lexicon, and that some lexical entries are "deficient" in some sense—is similar to Jackendoff's (2002, ch. 6) conception of the lexicon and lexical storage.

(forcing the choice of one form over another), it is perfectly possible to think about multiple things at once.[17]

1.3.3.4 Spellout-driven movement

There are three principles of matching and phrasal spellout: the Superset Principle, the Elsewhere Principle, and Cyclic Override. These principles and the way they determine how phrasal spellout proceeds result in a dynamic view of language that emphasizes "size differences" to account for a range of syntactic phenomena both within a single language and across languages.

In this section we show how these principles are put to use in the course of a full derivation. Importantly, we see that syntactic structure needs to be altered to provide an appropriate structural configuration for spellout to succeed according to the principles just discussed. This alteration of structure for the purposes of aiding spellout is known as spellout-driven movement.[18] Here we present one influential view, developed by M. Starke (e.g. Starke 2011b; see also Starke Chapter 9), which can be characterized as the "strict constituenthood condition" on spellout. According to this view, only constituents can be targeted for spellout. Before continuing, a proviso: Not all researchers adopting nanosyntax share this particular implementation of nanosyntax, spanning approaches being one prominent alternative. See Taraldsen (Chapter 3) for discussion of the two approaches.

When a syntactic structure has to be lexicalized, the lexicon is consulted to see if any lexical entries are available to match the syntactic structure. This happens in a stepwise fashion: Nanosyntacticians often assume that structures are built one head at a time, and at each layer the structure

17. Directly related to this is an important issue raised by a reviewer, namely why functional elements appearing within an idiom often have a completely regular, compositional effect on the interpretation of the idiom, especially in terms of lexical aspect (see Marantz 1997; McGinnis 2002; Harley 2014; among others), whereas the nanosyntactic approach might seem to suggest that the idiomatic interpretation linked to a given constituent would destroy any such internal structural regularities because of Cyclic Override. It is crucial here to recognize the division between syntactic (SMS) structure and conceptual information. Any aspectual regularities observed in the interpretation of idioms clearly belong to the domain of SMS. Cyclic Override does not cancel SMS structure in any way; rather, it makes sure that the latest phonological realization is up to date with the derivation. In other words, the SMS structure stays the same no matter what; any special "encyclopedic" information that may (or may not) end up becoming associated with this structure is *additional*, not affecting the functional or grammatical core of the phrase.

18. Not all movement is spellout-driven. Determining the exact nature of non-spellout-driven movement (e.g. *wh*-movement) and how it fits into nanosyntactic theory is still a topic for future work. See Starke (2011a) for discussion.

must be successfully lexicalized (an approach known as Cyclic Exhaustive Lexicalization; Fábregas 2007; Ramchand 2008; Pantcheva 2011). At each cycle, the structure has multiple attempts at successful lexicalization, corresponding to the steps in (19). Crucially, ultimately there can be no parts of the structure that remain unlexicalized.

To start with, spellout-driven movement is governed by the algorithm in (19).

(19) STAY > CYCLIC > SNOWBALL

See Aboh (2004b) for Snowball movement and Cinque (2005) for Cyclic and Snowball movement.

First let us illustrate the application of algorithm (19) in abstract terms, before providing a concrete example. Suppose that, in the course of a derivation, $[_{HP}$ [GP] . . .] has been formed and spelled out and that at the next step the feature F has been added to the structure $[_{HP}$ [GP] . . .], as in Figure 1.19. In this structure $[_{HP}$ [GP] . . .] has been spelled out, but F has not. To spell out the feature F, the structure first *stays as is*, and the lexicon is checked for a lexical entry containing the structure $[_{FP}$ F $[_{HP}$ [GP] . . .]] (Figure 1.19). If there is no suitable entry, then *the leftmost daughter of the sister of F, GP, is evacuated to the left of F*, and the lexicon is checked for a lexical entry containing the constituent that is left over, namely [FP [HP . . .]] (Figure 1.20). If there is no suitable entry, then *the cyclic movement is undone and the sister of F is evacuated to the left of F*, and the lexicon is checked for the constituent that is left over, namely FP (Figure 1.21).

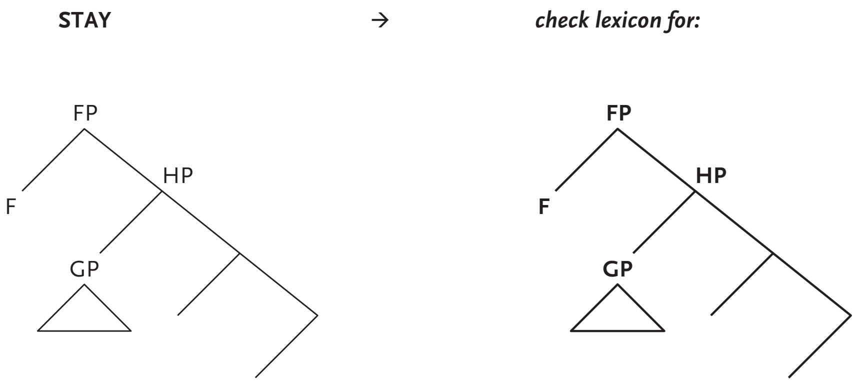


Figure 1.19 STAY in the spellout algorithm

Spellout-driven movement is a mechanical procedure for generating new constituents that are candidates for lexicalization. We note here also that spellout-driven movement owes much to Cinque's (2005) U20 theory (see Section 1.3): A constituent containing the head of the extended projection (which is embedded within GP above) undergoes phrasal movement to the

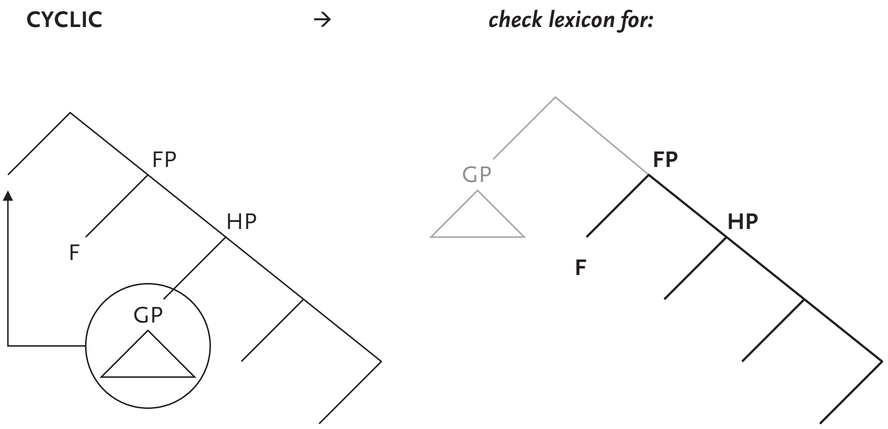


Figure 1.20 CYCLIC in the spellout algorithm

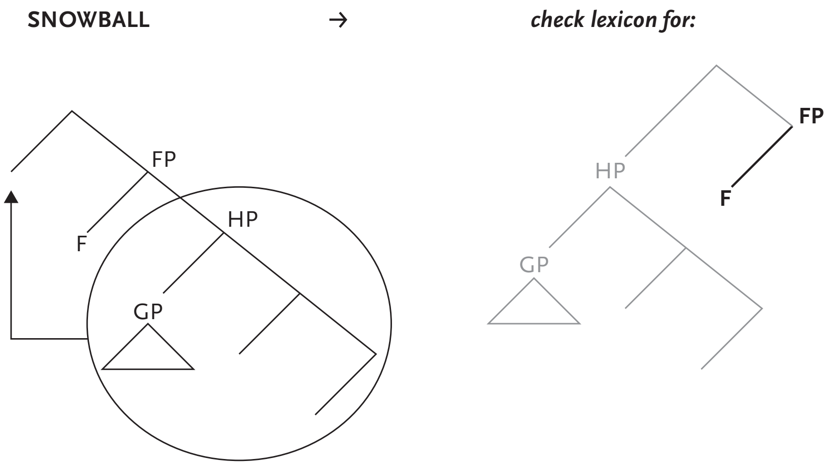


Figure 1.21 SNOWBALL in the spellout algorithm

left and may involve different degrees of pied-piping.[19] It is often assumed, following much other work in the framework, that the landing site for spellout-driven movement is an unlabeled specifier and that this kind of movement leaves no traces (Starke 2011b, as well as Chapter 9 of this volume).

Let us now turn to a concrete example of spellout-driven movement, using Pantcheva's (2011, section 7.3) nanosyntactic account of the ON-series, a set of morphemes related to the word for 'on,' in Karata. In (20) we see the morphological expression of Place, Goal, and a syncretic Source/Route 'from/through' in Karata.

19. Although in this case the kind of pied-piping involved is of the *whose book* type, pied-piping of the *book of who* type also arises (see Cinque 2005, 321), as subsequently seen.

(20) a. bajdan-ţ’-a
square-ON-LOC
‘on the square’

b. bajdan-ţ’-a-r
square-ON-LOC-GOAL
‘to the square’

c. bajdan-ţ’-a-gal
square-ON-LOC-SOURCE/ROUTE
‘from/through the square’ (Pantcheva 2011, 137)

Pantcheva proposes the functional sequence in (21a) with the lexical entries for the morphemes in (21b).

(21) a. Route > Source > Goal > Place > AxPart > . . .DP
b. < *-ţ’* ⇔ AxPartP ⇔ ON >
< *-a* ⇔ PlaceP >
< *-r* ⇔ GoalP >
< *-gal* ⇔ [RouteP [SourceP [GoalP]]] >

AxPart stands for ‘axial part,’ referring to an object’s position with respect to some axis (i.e. ‘front,’ ‘back,’ and so on; see Svenonius 2006). The Karata morpheme *-ţ’* encodes the AxPart ON. The morpheme *-a* is a locative marker, correponding to PlaceP. The morpheme *-r* is used to express the Goal reading, and it too builds on top of both the Place and AxPart markers. Thus *-r* corresponds to GoalP. Finally, we see that *-gal*, which is syncretic between Source and Route readings, corresponds to the full structure [RouteP [SourceP [GoalP]]].

To derive the Route structure *bajdan-ţ’-a-gal* ‘through the square,’ the derivation proceeds as follows. We start at Figure 1.22, where DP has been built and matched with *bajdan* ‘square.’

Next, in Figure 1.23, the AxPart layer is added to the structure. With the first two steps in the algorithm not producing a suitable match,[20] finally the third step results in a match for AxPartP.[21]

20. Although we do not take a stand on whether individual-terminal spellout can or should be allowed in the spellout system, here we assume that terminals cannot be lexicalized (Starke 2011b, though see Pantcheva 2011, section 6.3.2, for a system that consistently allows for terminal spellout). See also Lander (2015b, section 5.1.2) for discussion.

21. Note that antilocality (Abels 2003) does not apply here, as phases are not relevant for us. Furthermore, it is important to note that the kind of movement discussed here (spellout-driven) seems to be different from more traditionally studied long-distance syntactic movement (not least because the latter leaves traces, and the former does not; Starke p.c.).

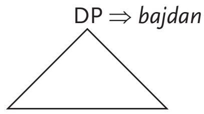
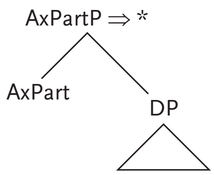


Figure 1.22 Spelling out DP

STAY: no match in the lexicon for [AxPartP [DP]]



CYCLIC: not applicable (NA)

SNOWBALL: move DP to the left of AxPart, match AxPartP with < -*ţ’* ⇔ AxPartP ⇔ ON >

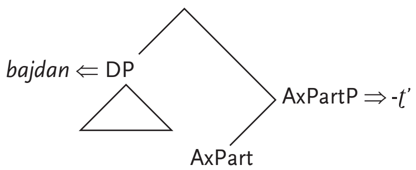


Figure 1.23 Spelling out the AxPart layer

Next, in Figure 1.24, Place is added to the structure. Once again there is no suitable match until the third step in the algorithm, when PlaceP can be lexicalized.

It is worth noting that at this point we have a complete structure expressing Location and meaning ‘on the square,’ *bajdan-ţ’-a*. In this example, however, the syntax is aiming at the Route expression ‘through the square,’ meaning it has to build all the way up to RouteP. Thus the syntax continues building the fseq, with the Goal layer. Note in Figure 1.25 that at the SNOWBALL step there are two matches for GoalP (both < -*r* ⇔ GoalP > and < -*gal* ⇔ [RouteP [SourceP [GoalP]]] >) by the Superset Principle, but that -*r* wins by the Elsewhere Principle, yielding the Goal structure.

Next the syntax adds Source. As seen in Figure 1.26, a successful match occurs at the second step in the algorithm (because by the Superset Principle the S-tree [SourceP [GoalP]] is a subtree of the L-tree [RouteP [SourceP [GoalP]]]), yielding the Source structure.

Finally, in Figure 1.27, the derivation reaches the Route layer, and again the second step in the algorithm delivers a successful match.

The final product in Figure 1.27 is the structure with the Route reading of -*gal*. Now, as seen in (20c), -*gal* syncretizes Route (‘through the square’) and

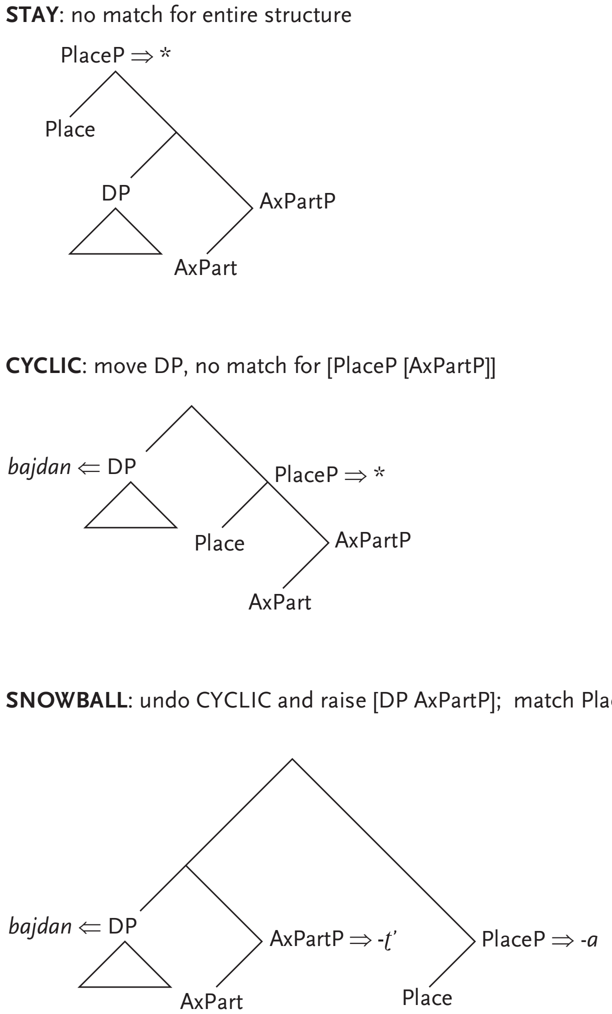


Figure 1.24 Spelling out the Place layer

Source ('from the square') readings. This is structurally captured by the L-tree [RouteP [SourceP [GoalP]]], where Source is a subset of Route.

1.3.3.5 Pre-elements

As an addendum on the topic of spellout-driven movement, it is important to recognize that the system sketched here is perfectly suited to accounting for suffixes, that is, "right-adjoined" morphemes. All the morphemes discussed previously have been suffixes, and these are easily derived because so far we have always moved parts of the complement to the left to spell out constituents on the right. On the other hand, the question of how to derive "pre-elements" like prefixes and prepositions is less clear, because these need to stay in situ and

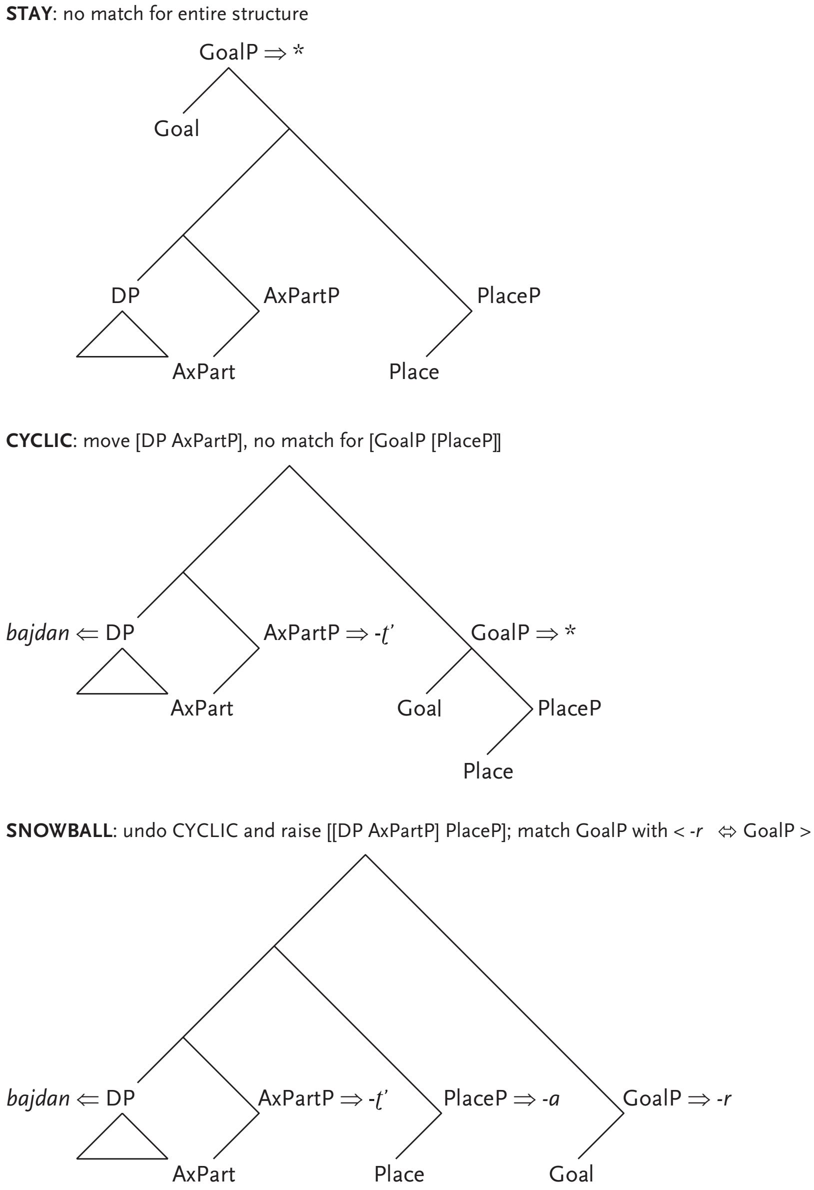


Figure 1.25 Spelling out the Goal layer

precede the item they combine with rather than being swapped by spellout-driven movement (which would turn them into suffixes and postpositions). There are various proposals in the literature. Using the German preposition *mit* as an example, we look at three ways to account for pre-elements: spanning, head movement, and the use of an additional workspace.

On the first view, namely spanning, spellout does not require strict constituenthood in order for matching to take place. A *span* can be defined as "a nontrivial sequence of heads" (Taraldsen Chapter 3, 88). For instance,

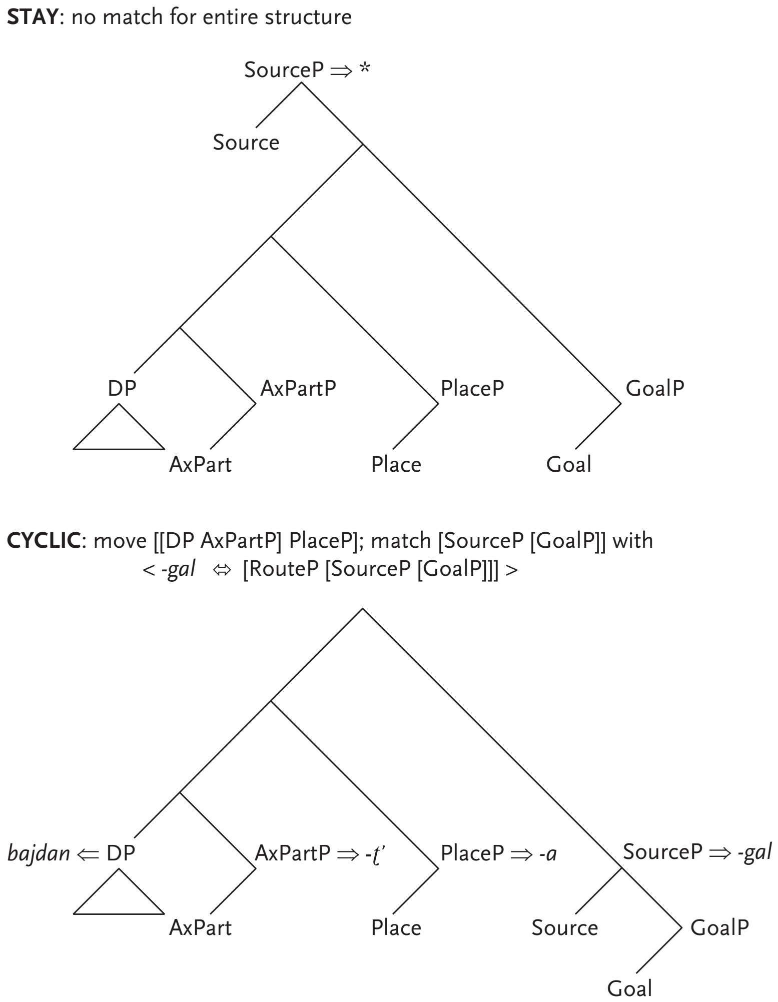


Figure 1.26 Spelling out the Source layer

consider the case of the comitative preposition *mit* in German, which selects a dative complement (see Caha 2009, 65–67; also Caha 2010). As seen in Figure 1.28, comitative *mit* corresponds to K_6 and K_5, but there is no node containing only K_6 and K_5 to the exclusion of the dative DP. Thus K_6 and K_5 do not form a constituent. On the spanning view, the preposition can be lexicalized in situ, even though it does not constitute a strict constituent.[22]

For this kind of approach see Abels and Muriungi (2008), Ramchand (2008), and Dékány (2009).

22. Had the preposition been an instrumental, corresponding only to K_5, then we might need to resort to terminal spellout. We do not commit to one or the other approach.

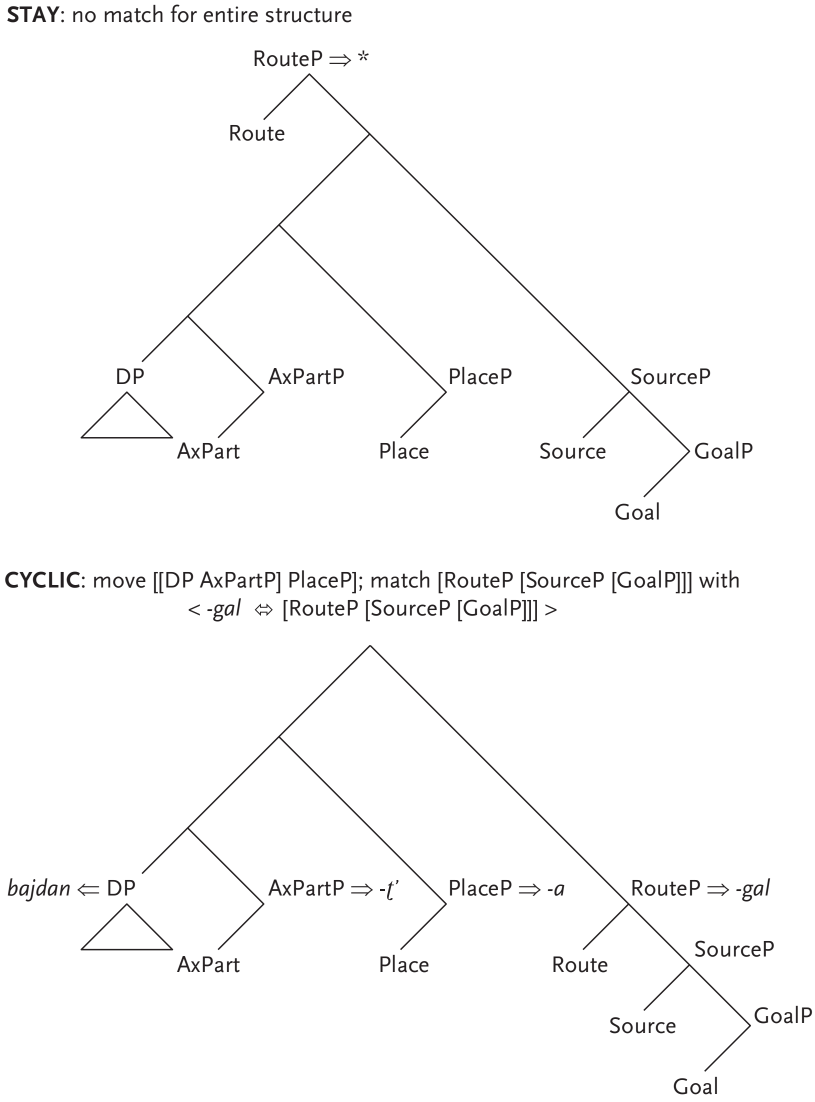


Figure 1.27 Spelling out the Route layer

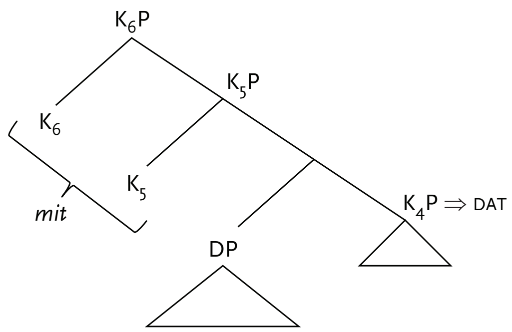


Figure 1.28 Spelling out nonconstituent *mit* by spanning

A second suggestion proposed by Caha (2010) is that prefixal structures are formed by something like traditional Travis (1984)–Baker (1988) head movement.[23] This would mean that head movement is allowed in certain cases, contra the strict U20-style approach referred to in Section 1.1.3.[24]

In the approach illustrated in Figure 1.28, the order of heads in the functional sequence is kept intact (i.e. $K_6 > K_5$). In Figure 1.29, however, the heads are reversed by movement (i.e. $K_5 > K_6$). Caha (2010, 28–29, fn.12) points out that although this approach defies the U20 ban on head movement, "such a movement is only allowed in case [K_5] and [K_6] are spelled out by a single morpheme, which renders their ordering opaque . . . thus, admitting head movement in such a constrained fashion does not, in fact, lead to orderings incompatible with the generalizations observed in [Cinque (2005)]." An important point is that *mit* is a constituent in Figure 1.29, which makes this approach stricter than one that requires *mit* to correspond simply to a span of features as in Figure 1.28.

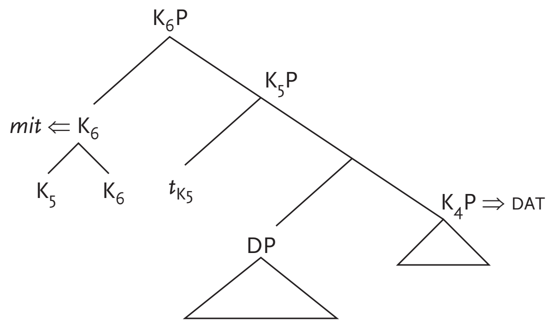


Figure 1.29 Travis-Baker head movement for *mit*

A third approach that requires constituenthood in order for spellout to obtain has been advocated by Pantcheva (2011), Starke (2013 and Chapter 9 of this volume), and Taraldsen in (Chapter 3). To illustrate this line of thinking, we must first imagine that syntactic structures can be built in more than a single cognitive "workspace." One way of deriving prefixes, then, would be to posit that a complex head structure can be constructed in a secondary workspace (Workspace-2 in Figure 1.30) and then subsequently merged into the primary workspace (Workspace-1 in Figure 1.30). Because the complex head

23. Baker (1985) observes that the order in which affixes appear correlates with the order of the syntactic operations they trigger. This is known as the Mirror Principle. Mirror Principle effects can be derived if complex words are formed by head movement, which is subject to the Head Movement Constraint (Travis 1984).

24. Note that even if a system disallows individual-terminal spellout, this does not mean that only XPs can be targeted for spellout. Complex heads (such as the set [$_{K6}$ K_5 K_6] in Figure 1.29) can also be targeted because they are made up of more than a single individual terminal.

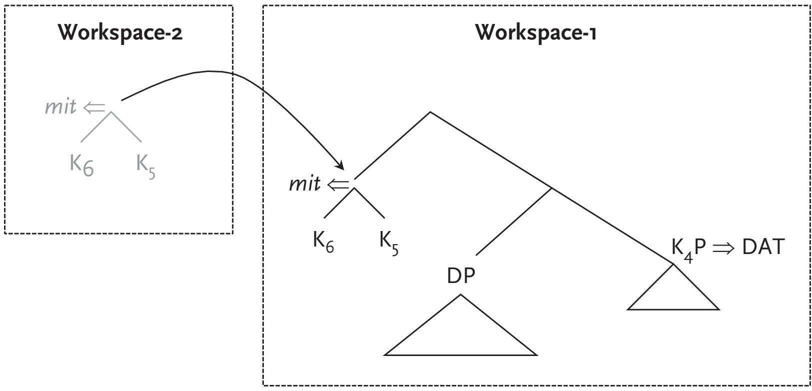


Figure 1.30 Building *mit* in a separate workspace

is in this case constructed separately in its own workspace and does not result from head movement, its internal ordering of features follows the fseq (i.e. $K_6 > K_5$).

Again, the complex head merged into the primary workspace is a proper constituent.[25,26]

Important questions remain, however, as to how exactly we should integrate the building of complex heads (pre-elements like prepositions and prefixes) into the spellout algorithm discussed previously. At this stage we may think of the need to accommodate prefixal or complex head structures as adding another step to this algorithm, either STAY > CYCLIC > SNOWBALL > HEAD-MOVE (see Figure 1.29) or STAY > CYCLIC > SNOWBALL > CONSTRUCT (see Figure 1.30).

1.4. PRINCIPLES AND PARAMETERS

In nanosyntax, the atoms of linguistic structure are understood to be syntactico-semantic features merged as syntactic heads according to an invariant and universal fseq. To determine what this set of universal features is,

25. Yet another option is brought up by Caha (2009, 66), who discusses a remnant movement analysis for spelling out prepositions. However, he rejects this option on the grounds that it does not conform to Cinque's (2005) U20 rules for movement (i.e. the requirement that all moved phrases contain the head noun, meaning no remnant movement is allowed).

26. According to Starke (2013 and Chapter 9, Section 9.1.1), the lexically stored difference between a suffixal and a prefixal structure, then, can be thought of in terms of what kind of a set is found at the bottom of the tree. The bottom of a suffixal tree will be a singleton set, because its complement has been evacuated to the left. The bottom of a prefixal tree will be a binary set, because this kind of structure is built from scratch, and merge always joins two elements together (see Kayne 1984).

nanosyntacticians rely on the detailed study of morphosyntactic phenomena in a wide range of languages. In terms of the Principles and Parameters model (Chomsky 1981, 1986), the universal fseq—along with basic architectural properties of the language faculty, principles of merge and movement, the spellout algorithm, among others—would constitute the invariant Principles of language or UG.

As we have seen in Section 1.3, the shape of L-trees determines how the spellout algorithm proceeds. In other words, because L-trees differ crosslinguistically, the way S-trees are matched by L-trees during spellout will also differ across languages. Thus languages spell out structures differently according to the content of their lexicon. In this way, variation can be explained purely in terms of differences in the lexicon (see Chomsky 2001, 2; see Starke 2011a for more discussion). Even though the fseq is the same across languages, lexically stored structures (i.e. the way the fseq is packaged up) will vary from language to language. This packaging can be thought of as the Parameters of language.

To take a concrete example, let us consider another example from Pantcheva's (2011) study of Path expressions. The Macedonian item *nakaj*, 'to(ward),' can be decomposed into the locative morpheme *kaj* 'at' (call this Place) and *na-* 'to' (call this simply Path), as sketched in Figure 1.31. Dutch *naar* 'to(ward),' on the other hand, is not overtly decomposable: It is an indivisible portmanteau of Place and Path, as sketched in Figure 1.32.

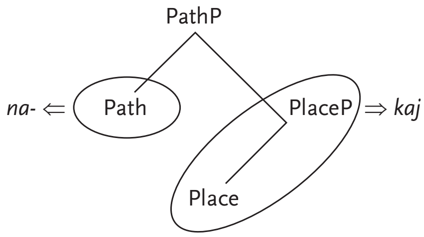


Figure 1.31 Macedonian *na-kaj*

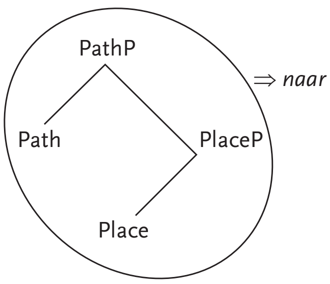


Figure 1.32 Dutch *naar*

Although simplified, this example illustrates how Macedonian and Dutch package the fseq differently: Macedonian splits it up into two L-trees, one for *na-* and one for *kaj*, whereas Dutch stores it as a single unit *naar*.

To take another example of crosslinguistic variation, consider Finnish versus English case endings. Consider the partial paradigms for 'bear' in Table 1.4 for Finnish and Table 1.5 for English.

In Finnish the ending *-n* shows a GEN–ACC syncretism, with a distinct NOM ending (-Ø), as illustrated in Figure 1.33. In English, on the other hand, the ending -Ø shows a NOM–ACC syncretism, with a distinct GEN ending (*-s*), as in Figure 1.34.

The way the fseq is lexically partitioned in Finnish versus English leads to a crosslinguistic difference once spellout occurs.

Table 1.4 FINNISH (CAHA 2009, 115)

	'bear' (SG)
NOM	karhu-Ø
ACC	karhu-n
GEN	karhu-n

Table 1.5 ENGLISH

	'bear' (SG)
NOM	bear-Ø
ACC	bear-Ø
GEN	bear-s

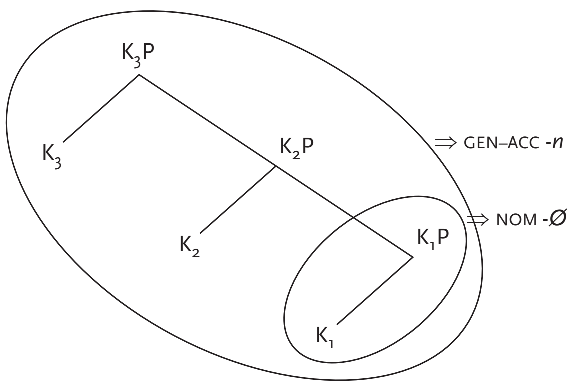


Figure 1.33 Lexical packaging of NOM, ACC, GEN in Finnish

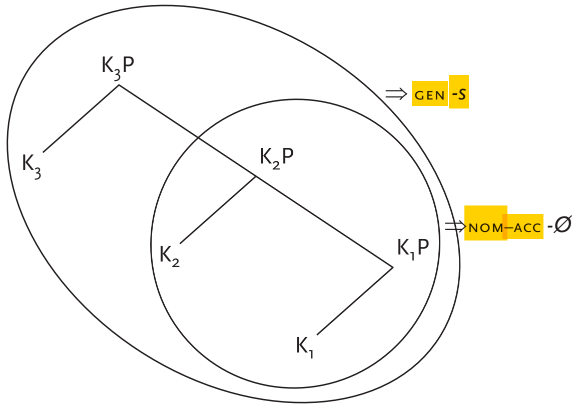


Figure 1.34 Lexical packaging of NOM, ACC, GEN in English

The nanosyntactic approach to variation in terms of lexical storage can also be usefully applied to phenomena at the clausal level. For an account of microvariation in *wh*-movement in different varieties of Spanish, see Fábregas (Chapter 10).

1.5 CONCLUSION

Nanosyntax is in essence a cartographic approach to linguistic structure, and the internal structure of morphemes in particular. Like other cartographic approaches, nanosyntax assumes a strict syntax–semantics mapping, simplicity of syntactic projection (i.e. trees are binary-branching and right-branching), and the OFOH principle, according to which every syntactico-semantic feature corresponds to a head in the syntactic spine.

Nanosyntax allows for phrasal spellout, meaning that spellout does not need to target heads or terminals but can target entire phrases. Phrasal spellout is the nanosyntactic response to the observation that morphemes have an internal structure, that is, that syntactic features and heads are submorphemic. Accordingly, syntax becomes responsible for constructing morphemes, and thus syntax feeds the lexicon.

A central concern of the theory is to determine precisely how spellout takes place, that is, how syntactic structures are lexicalized by being matched by structures in the lexicon. This process of spellout is governed by three principles: the Superset Principle, the Elsewhere Principle, and the Principle of Cyclic Override. In the course of the derivation, syntactic structure can be altered in particular ways to create the structural constituents that will be appropriate candidates for being matched by lexically stored structures (according to the three principles mentioned); these alterations are achieved by movement. This is known as spellout-driven movement, and it is governed by the algorithm STAY > CYCLIC > SNOWBALL.

More broadly, nanosyntax views syntax, morphology, and formal semantics as unified in a single module, the computational system SMS. The SMS module takes atomic features and merges them as heads according to the ordering imposed by the fseq. This fseq is taken to be universal, belonging to the Principles of language, whereas the language-specific way this fseq is divided up into lexical entries across languages constitutes the Parameters of language variation. This is, in short, the nanosyntactic view of the Principles and Parameters framework (Starke 2011a). In this way nanosyntax contributes to the continuing search for what is universal in language, what is language-specific, and how the two interact.

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