Exploring Nanosyntax

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CONTENTS

PREFACE

Nanosyntax (Caha 2009; Starke 2009, 2011) is a formal theory of language set in the Principles and Parameters framework (Chomsky 1986; Chomsky and Lasnik 1993; among others). The theory has developed out of the cartographic approach (Rizzi 1997, 2004a, 2004b, 2013; Cinque 1999, 2002; Belletti 2004; Kayne 2005, 2007; Cinque and Rizzi 2008/2010; Haegeman 2012) to grammar and can in many ways be considered a radical implementation of this approach that bridges the domains commonly identified as syntax and morphology. Nanosyntax aims above all to identify the fine-grained structure of language, a goal that, importantly, is framed in terms of the "one feature–one head" maxim (see Cinque and Rizzi 2008, 50). The outcome of the nanosyntactic approach is an extremely fine-grained decomposition of morphosyntactic structure, and it has also yielded a set of novel tools for doing precise empirical research.

In spite of the promising results that have emerged from nanosyntactic research, publications remain scarce and rather inaccessible, and as a result the framework is relatively unknown. The present volume is meant to fill this gap in the literature and make the framework more accessible to a wider audience. It brings together a selection of papers written by senior and junior scholars working within the nanosyntactic framework. The diversity of the contributors, the variety of topics discussed, and the wide range of languages studied provide a well-rounded introduction to the theory.

The goals of the volume are threefold: to introduce the main theoretical assumptions and the core technical machinery that nanosyntax makes use of, to highlight some of the results that have been achieved and show the potential of this line of research for empirical investigation, and to discuss a number of aspects of the theory that are in need of further elaboration. Correspondingly, the volume contains three kinds of contributions. The first three chapters (Part I: Background) address some of the foundational concepts of nanosyntax; all three chapters also provide some perspective on the relation between nanosyntax and a competing theoretical approach, namely Distributed Morphology. A second group of contributions (Part II: Empirical

Investigations) focuses on how the nanosyntactic line of argumentation can be implemented in empirical research; in some of these chapters the focus is less on the technical implementation and more on the use of nanosyntax as a tool for uncovering descriptive generalizations. A third group of chapters (Part III: Theoretical Explorations) explores more technical aspects of the theory, considering theoretical issues that are unsettled and currently being debated among researchers in the framework.

PART I: BACKGROUND

The three chapters making up Part I provide the foundation that will enable readers to navigate the rest of this volume. These contributions also aim at locating the theory of nanosyntax within the larger setting of theoretical linguistics.

The volume starts with a comprehensive introduction to the framework, "Nanosyntax: The Basics" by Lena Baunaz and Eric Lander. This chapter can be viewed as an essential reader's companion, as it sets out most of the technical details needed for understanding many of the contributions, such as the concept of submorphemic heads, phrasal spellout, syncretism and the *ABA theorem, lexical entries, the principles governing the relation between syntax and the lexicon, and spellout-driven movement. This chapter also crucially aims to set the framework in the broader context of generative grammar, especially with regard to cartography and Distributed Morphology.

Pavel Caha's contribution, "Notes on Insertion in Distributed Morphology and Nanosyntax," provides a comparison of nanosyntax and Distributed Morphology (DM), an approach to morphosyntax with which nanosyntax is often compared. Specifically, Caha compares the conception of spellout as it is understood and implemented in DM with the theory of phrasal spellout developed in nanosyntax. The author takes a partly historical perspective on the issue, starting back in 2006, when all work done in DM explicitly or implicitly denied the existence of phrasal spellout. At about this time, the first work in nanosyntax became public. Caha revisits several early case studies that were investigated in nanosyntax at that time (Starke's unpublished work; Caha 2008, 2009), which argued in favor of a theory of phrasal spellout and developed its basic mechanics, such as The Superset Principle and The Biggest Wins Theorem. This early work further suggested that adopting phrasal spellout simplifies the architecture of grammar by immediately eliminating a number of postsyntactic operations adopted in DM (minimally Fusion and Fission). Caha further highlights how these developments filtered through in DM. Although some of those working in DM have ultimately ended up adopting some version of phrasal spellout (Radkevich 2010), much of the mainstream

work still opposes it (Embick 2014). The author focuses on some of the counterarguments and also speculates as to where the debate is heading.

Tarald Taraldsen's contribution "Spanning versus Constituent Lexicalization: The Case of Portmanteau Prefixes" compares conceptual and empirical arguments for the "spanning" versus "constituency" approaches to nanosyntactic spellout. Spanning allows for a sequence of heads to be lexicalized even if they do not form a constituent, whereas the constituency approach requires a structure to be a proper constituent if it is to be lexicalized. He shows that there are both theoretical and empirical reasons to favor the constituency approach over spanning. The core of the chapter is a case study in Bantu nominal class prefixes, in which it is shown that the constituency approach makes correct predictions about prefix structure. Specifically, he shows that class prefixes in Bantu should be understood as portmanteaus corresponding to a constituent made up of Num, Cl, and a classifier-like N (which is distinct from the head noun).

PART II: EMPIRICAL INVESTIGATIONS

Overall the contributions in this part focus on empirical applications of nanosyntax, showing how the theory and methodology laid out in Part I can contribute to a better understanding of certain data patterns. In many cases the empirical material considered leads to certain theoretical issues being brought to the fore as well. Some of the tools and concepts discussed in this part include morphological containment, the relationship between syntactic and lexical structure, syntactic movement in nanosyntax, and—above all—syncretism and the ban on ABA patterns.

Michal Starke's squib, "A Note on Kim's Korean Question Particles Seen as Pronouns" is an illustration of how the Superset Principle can help to solve empirical puzzles. Starke discusses how Kim's (2011) analysis of Korean question particles as pronouns referring to the Addressee of the question suffers from one major flaw: If these particles are pronouns they are also expected to occur in declarative sentences, contrary to fact. Hence it seems impossible to capture both the interrogative and pronominal nature of these pronouns. Starke shows how the Superset Principle can overcome this dilemma by assuming that the lexicon contains lexical items that have the structure of pronouns contained within the structure of question particles.

In their contribution "Syncretism and Containment in Spatial Deixis," Eric Lander and Liliane Haegeman explore a fine-grained morphosyntactic analysis of spatial deixis. They propose that the universal core of spatial deixis is based on a three-way contrast: Proximal 'close to speaker,' Medial 'close to hearer,' and Distal 'far from speaker and hearer.' They then discuss how

crosslinguistic variation in the domain of spatial deixis can be understood in terms of syncretism: no syncretism (Dist vs. Med vs. Prox), Med/Prox syncretism, Dist/Med syncretism, or total syncretism (Dist/Med/Prox). They also present several patterns of morphological containment from a wide range of languages, showing consistently that Distal structurally contains Medial and that Medial structurally contains Proximal. The data point to a functional sequence made up of three additive Dx heads merged in a unique order, in line with the nanosyntactic approach.

In her chapter titled "Decomposing Complementizers: The Functional Sequence of French, Modern Greek, Serbo-Croatian, and Bulgarian Complementizers," Lena Baunaz looks at the form of declarative complementizers (equivalent to English *that*) in French, Modern Greek, Serbo-Croatian, and Bulgarian. Starting from the observation that Greek has two declarative complementizers *pu* and *oti*, each with its own distribution and selectional restrictions, she proposes that French, Serbo-Croatian, and Bulgarian also distinguish these two complementizer types but that French *que*, Serbo-Croatian *da*, and Bulgarian *če* happen to be syncretic elements. She proposes a nanosyntactic analysis of the French, Serbo-Croatian, and Bulgarian complementizers in terms of complex morphemes, which lexicalize complex structures of different sizes. Baunaz also shows that, depending on the size of declarative complementizers, weak, strong, or no islands are created, suggesting that declarative complementizers are interveners. Thus a nanosyntactic analysis of complementizers gives us insights into the principles underlying Relativized Minimality effects (Starke 2001; Rizzi 2004a, 2013, et al.).

Karen De Clercq uses syncretisms as a tool to investigate the morphosyntax of negative markers. In her contribution "Syncretisms and the Morphosyntax of Negation," she explores the negative markers (e.g. English *not*) of ten different languages. A crosslinguistic look at these negative markers allows her to identify four different types of negative markers: (i) negative scalar quantity markers, (ii) negative classifier markers, (iii) negative focus markers, and (iv) negative tense markers. Across these four different types of markers, syncretisms are prevalent. When these markers are ordered with regard to their scopal behavior (from narrow to wide scope), it turns out that the syncretisms follow the natural scope order of negative markers. The syncretism diagnostic relies on the assumption that nonadjacent syncretisms are excluded in principle, that is, by the *ABA theorem. The study of syncretisms is crucial to determining which features are merged adjacently in the functional sequence: Looking at attested syncretisms across languages permits the deduction of the linear order of the underlying functional features. From the syncretism patterns and pursuing an intuition first expressed for sentence negation by Poletto (2008), De Clercq develops a nanosyntactic analysis of negation that involves splitting up what is often thought of as an indivisible

unit NegP into at least five different submorphemic heads in a containment relation.

Inna Tolskaya's contribution, "Nanosyntax of Russian Verbal Prefixes," addresses the issue of widespread polysemy in Russian verbal prefixes and prepositions (P) and argues that multiple instantiations of a single prefix share a core conceptual meaning and receive specific denotations as a function of their syntactic position. She shows that each polysemous P in Russian can be assigned a single decomposed lexical structure, from which it is possible to understand its set of related meanings as well as its selectional properties. She argues that Pantcheva's (2011) decomposition of spatial paths can also be applied to scales of change and time. It is shown that the internal structure of a verbal prefix parallels the structure of the PP complement of the verb, and that the Superset Principle is crucial in deriving the observed selectional restrictions of the prefix on the complement.

PART III: THEORETICAL EXPLORATIONS

The four chapters in Part III are of a more conceptual and technical nature and explore a number of issues in nanosyntactic theory that remain unresolved at this stage of the theory. These open-ended issues include, broadly, the role of complex specifiers and constituenthood in spellout, clausal phenomena from a nanosyntactic perspective, pointers, and the interaction between distinct functional sequences.

Michal Starke's second contribution, "Complex Left Branches, Spellout, and Prefixes," starts by discussing how to distinguish between prefixes and suffixes in a principled and nonstipulative way. He then delves into the details of constructing prefixes. Whereas suffixes are argued to be part of the main spine in the primary derivation, prefixes are structures created in a secondary derivation as a last resort and inserted into the main spine as complex specifiers.

It is fair to say that most nanosyntactic work has thus far concentrated on the internal structure of words or lexical items. Indeed, a recurring issue raised by non-nanosyntacticians concerns the relevance and validity of the framework when it comes to sentence-level syntax. In his chapter "Word Order in Nanosyntax: Preverbal Subjects and Interrogatives Across Spanish Varieties," Antonio Fábregas explores how nanosyntactic proposals can be applied to the study of a set of phenomena that are standardly considered to fall within the realm of sentential syntax. In particular, he considers the distribution of overt subjects in *wh*-interrogatives across three varieties of Spanish (European Spanish, Venezuelan Spanish, and Dominican Republic Spanish). Although Verb–Subject order is compulsory in this kind of sentences

in European Spanish, some subjects can be preverbal in Venezuelan Spanish (Mérida), and all kinds of subjects can be preverbal in Dominican Spanish. Making use of the nanosyntactic tool of phrasal spellout, Fábregas claims that the variation attested in Spanish can be reduced to the size of the exponents contained in the lexical repertoire of each variety. Specifically, he shows that the minimal difference among these three varieties lies in the size of the exponent responsible for subject agreement.

Guido Vanden Wyngaerd's contribution, "The Feature Structure of Pronouns: A Probe into Multidimensional Paradigms," examines the validity of the *ABA diagnostic, which assumes that noncontiguous syncretisms are excluded in principle. He discusses both empirical and theoretical issues that bear on the validity of the *ABA diagnostic. His empirical material comes from Cysouw's (2003) extensive study of person marking, including personal pronoun paradigms and the patterns of syncretism they reveal. At the theoretical level, it is shown that morphemes that involve the fusion of multiple grammatical dimensions (such as person and number) require an analysis in terms of pointers (Caha and Pantcheva 2012). Because pointers introduce the possibility of ABA patterns, he also discusses a second analysis, based on a revision of the Superset Principle (the Revised Superset Principle, or RSP), originally proposed by Pavel Caha. He then discusses the empirical and theoretical merits of the pointer approach as compared with the RSP approach, showing that the two make different predictions.

In "Functional Sequence Zones and Slavic L>T>N Participles," Lucie Taraldsen Medová and Bartosz Wiland argue in favor of the existence of distinct "zones" of functional features (fseq zones). Under such an approach, elements that generally compete for insertion with each other form the same fseq zone, whereas elements that co-occur together form different fseq zones. On the basis of participles and thematic suffixes in Polish and Czech, they identify three such zones: root, theme, and participle. Each zone is argued to have a complex internal structure, drawing on and paralleling other work in nanosyntax (Starke 2006; Lundquist 2008) on the decomposition of lexical categories. Their approach is able to explain why only unaccusative verb roots in Czech and Polish can build adjectival L-passives, whereas unergative roots cannot, making crucial use of the "peeling" approach to case and argument selection in their analysis.

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Lucie Taraldsen Medová obtained her PhD in Slavic linguistics at Princeton and she is a driver for Tromsø taxi. Her work includes illuminating conversations with various customers in her taxi and articles on argument structure of Slavic and Romance languages. She claims that SE is an antipassive and was convinced she showed so in her dissertation, but the world still keeps turning as it did before, prior to this marvelous discovery. More than in linguistics, she is interested in mysteries of people's souls and in food-and-wine pairing.

Michal Starke is the creator of nanosyntax, of LingBuzz—the standard archive of linguistic papers—and of the popular Eastern Generative Grammar summer school. He has taught at NYU, the University of Geneva, and the University of Tromsø.

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PART I

Background

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

b. $[_{\text{MoodP speech-act}}$ 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).

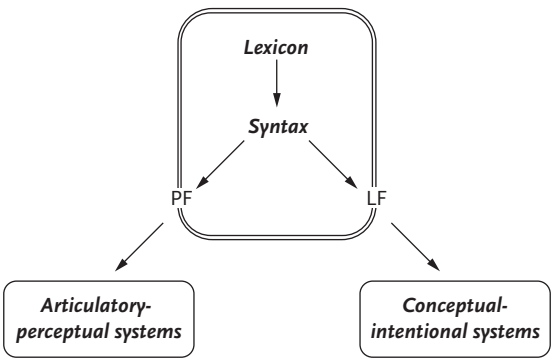

Figure 1.1 Architecture of grammar [based on Rizzi 2013, 10, his (22)]

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.

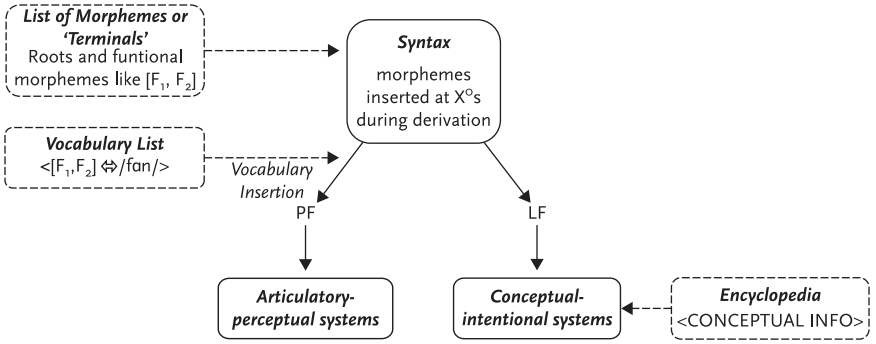

Figure 1.2 Model of grammar according to Distributed Morphology [based on Embick 2015, 20, his (12)]

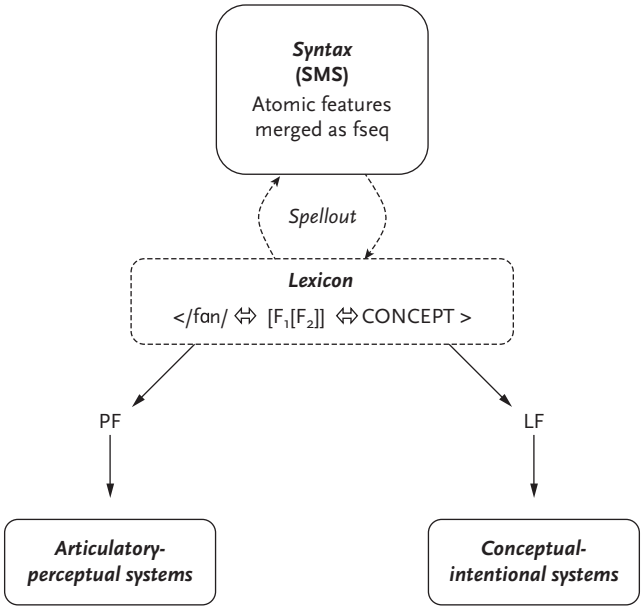

Figure 1.3 Model of grammar according to nanosyntax (Caha 2009, 52; Starke 2011)

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.FEM.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*,

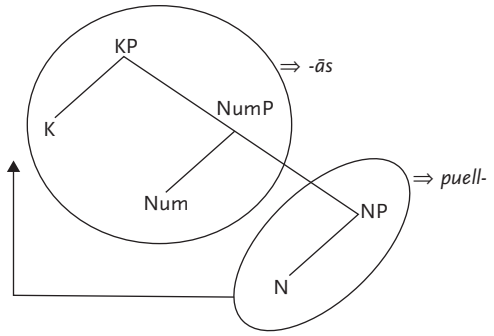

Figure 1.4 Spelling out *-ās* in Latin

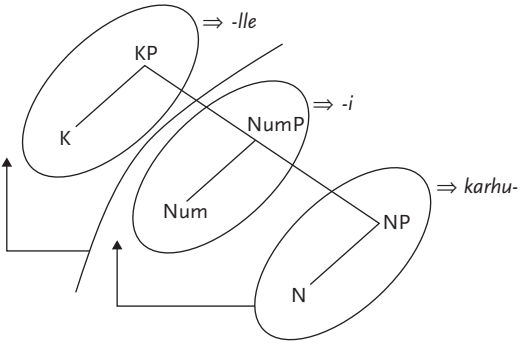

Figure 1.5 Spelling out *-i* and *-lle* in Finnish

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).