Review of Nikolaeva, Irina, and Andrew Spencer. *Mixed categories: The morphosyntax of noun modification*. Cambridge University Press. xi,396.

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A scientific theory is judged by its ability to provide a principled explanation of less straightforward facts that lie at the margins of the data normally discussed and captured by other theories. To the extent that those data naturally follow from the new proposal, that theory is successfull in defining a new paradigm. *Mixed Categories*, by Irina Nikolaeva and Andrew Spencer, is an excellent example of how to deliver a maximally explicit morphological theory in a way that complies with these scientific desiderata. As always, one can agree or disagree with some of the assumptions made, but there is no doubt that this book makes a significant contribution to our understanding of grammatical categories and the relation between lexical and syntactic representations.

In this respect, the title of the book might be a bit misleading in that it suggests that the book is devoted to a particular empirical phenonenon. That is not the case, even if the empirical phenomenon that names the book is discussed in depth and analysed in a broad range of manifestations. This monograph goes far beyond the specific empirical domain that names it, as it defines in a maximally explicit way a full-fledged theory about the lexicon that adresses some of the foundational questions in morphology, from the divide between inflection and derivation to the integration of lexical information with syntactic structures.

But before we discuss Nikolaeva and Spencer's (henceforth, N&S) contribution to these foundational issues, let us do justice to the phenomenon that the authors chose as title of the book by presenting their specific analysis. N&S follow Spencer (2013) in defining 'mixed category' as "lexical types that have not only some properties of the morphology, syntax,or semantics of one category, but also some properties of the morphology, syntax, or semantics of another category" (p. 22). This categorial mixing is widely illustrated in the book, with examples that frequently have been obtained by the authors themselves, from a broad variety of languages. The Upper Sorbian possessive adjective *bratowe* (1, Corbett 1987) is a good example of mixed category in the nominal domain (p. 97).

(1)	mojeho	bratr-ow-e	dźěći
	my.M.GEN.SG	brother[M]-POSS.A -NOM.PL	child.NOM.PL
	‘my brother’s children’		

The categorial mixing is visible in that the possessive adjective acts both as an adjective and as a noun. Externally, *bratowe* is an adjective in that it agrees in case and number with the head noun that it modifies (nominative plural). Internally, *bratowe* behaves as a noun which licenses the presence of a possessive determiner mojeho which agrees with the nominal base *bratr-* in gender and number (masculine singular) and inflects for genitive case.

For some syntactically-inclined morphologists (such as myself), it has always been tempting to use these data to support a syntactic analysis of inflection and derivation. Roughly, the analysis would be to propose that the possessive adjective suffix *-ow* combines not with a morpheme 'brother', but with a syntactic phrase corresponding to 'my brother'. This Dual Projection analysis (discussed in detail by N&S in chapter 4) would correspond roughly to (2).

(2)	[$_{AP}$[$_{NP}$mojeho		bratr$_{N}$]	-ow$_{A}$]	-e
	my.M.GEN.SG		brother[M]	-POSS.A	-NOM.PL

N&S, however, show that this analysis cannot be right, specifically that the base of the possessive adjective cannot be a phrase (p. 137). A coordinated base is, for instance, ungrammatical.

(3) *[Hilža i Mar] -in bratr
Hilža and María -POSS.A brother
'Hilža and Maria's brother'

A dual projection analysis could try to argue that coordination is different from other phrases, but at any instance (3) shows that a phrasal analysis cannot be adopted without other (perhaps idiosyncratic) provisos. N&S then argue in detail that the solution for mixed categories is to be found in the lexicon, but in a very specific model of the lexicon that overcomes several traditional preconceptions. In their model of lexicon, the different levels of information related to a lexical entry are factorised in two ways. First, the information levels can be defined independently of each other. Second, the attribute values of each one of the levels (for instance, the syntactic information) can be defined as compound representations where one value subordinates another value.
Specifically, an example like (1) would be a case of transposition where the possessive adjective is a member of the base noun's paradigm: it is a noun that has acquired, in a very precise sense, semantic, syntactic and morphological properties of an adjective. Let us see how.
In this model, the grammatical category (N, V, A) is not a primitive value within the lexicon, but rather the manifestation of the word's semantic function role. There are three primitive semantic function roles, R (corresponding to the category noun), E (for verbs) and A* (for adjectives). Cannonical members of a grammatical category are defined by simple function roles, while transpositions are defined by compound function roles where one value subordinates another (for instance, <R<E...>> for a verb-to-noun transposition, or <A*<E...>> for a participle, a verb-to-adjective transposition).
The semantic function role defines other syntactic properties, such as whether the word is a modifier or not, and also the paradigmatic properties of the word. This definition of morphological (and syntactic) properties through the semantic function role is due to a principle of lexical underspecification called 'Default Cascade'. By Default Cascade, the semantic function role is formally manifested in the form of category-appropriate inflection. Each one of the cannonical grammatical categories N, V, A would be associated to a paradigm (nominal, verbal and adjectival paradigms, with their relevant syntactic values and their set of corresponding morphological forms). The noun 'brother' has the R function role, and therefore Default Cascade defines it as a noun, and relates it to the noun paradigm.
In the case of transpositions like (1), the compound function role has the effect to produce a mixed syntactic and morphological representation. The morphological signature of the lexical item includes a feature REPR(ESENTATION) (Spencer 2013) which relates the base category with a second category. REPR lists the two cannonical categories which would define the mix, and specifies in both content and form the set of features that are inflected according to the cannonical paradigms of each of the two categories. In our case –which is not fully analysed in the monograph, but for reasons independent of what we present here, see §8.5.5–, the possessive adjective would set the value of REPR to REPR: <<R, A*>, σ>, with σ further specifying the properties of the possessive construction construction.
This means that the possessive adjective is a noun, therefore part of the paradigm of 'brother', which shares some syntactic and morphological properties with adjectives because it carries a compound function role <A*<x<R>>>. This compound role specifies that the possessive adjective will externally inflect according to the paradigm of agreeing attributive adjectives –

and display an external adjectival syntax– while, internally, it will keep the base's category behaviour, keeping the gender and number of the base noun and allowing modification with a possessive that agrees with the base. Thus, the compound semantic function role, in a cascade, redefines the syntactic and morphological information of the item through the REPR feature.

Leaving the technical details aside for a second, even if these are precisely defined in the monograph, the essential properties of this novel proposal by N&S have direct consequences for some of the foundational issues in morphological theory. What I want to do at this point it to show that these components of their analysis stand as a suggestive and thought-provoking approach to lexical representations, even if one uses different technical implementations or disagrees in some of the details. Here are what I take to be the three core claims made in this monograph.

(i) lexical information is maximally factorised: grammatical categories or paradigms are not primitive entities, but aggregates of different levels of information that act to a great extent independently of each other, or can be combined into complex representations

(ii) lexical information is subject to a form of Elsewhere Principle: unless otherwise specified in the paradigm function, there is a default manifestation for the core properties of the lexical item. The ontological nature of the item (if it denotes a property, a thing, etc.) naturally manifests into a semantic function role, which in turn manifests as a set of syntactic and morphological properties that reflect cannonical grammatical categories. Thus, lexical entries can be derived by this default manifestation from a minimum of specified properties.

(iii) Transpositions are a natural result of the previous two properties: if the grammatical category is the result of (default) specifications for factorised properties, we expect these properties to combine in complex structures that, by Cascade, would define the syntactic and morphological properties of the item as belonging to two different cannonical grammatical categories.

This theory, moreover, elegantly solves the Paradigm-within-Paradigm problem posed by transpositions, and which is particularly relevanto for morphological approaches based on paradigms rather than individual morphemes. Think of a participle (§6.4): the participle is part of the verbal paradigm, but in a richly inflectional language, the participle inflects in part as an adjective, and therefore should also belong to the adjectival paradigm. The factorisation of lexical information solves this problem by allowing REPR define a complex semantic function role, which adds the A* feature to the E feature, and specify the set of morphological values that will be inflected according to the default manifestation of A*, an adjectival paradigm.

Finally, the theory also addresses the traditional problem of the division between inflection and derivation, in a very nuanced way that is another effect of the factorisation of lexical information advocated here. The distinction is clearly defined through lexical relatedness: if two forms share the same lexical index, their relation is inflectional; if not, it is derivational. However, the factorisation of properties explains that inflection might have different surface expressions, depending on the simple or complex definition of the function role, which in turn produces cannonical or mixed morphological suerface expressions.

We would not be doing justice to the diversity and richness of interests deployed in this monograph without a chapter-by-chapter overview that makes this explicit.

Chapter 1 acts as an introduction to the core problem discussed in the monograph, but goes beyond what one expects of a simple introduction. The chapter frames the problem of what a mixed category is through the central linguistic question of how categories are defined. Three main approaches are presented, discussed and ultimately criticised: approaches that rely on the presence of features where categories are atomic entities, prototype approaches that differentiate between cannonical examples of a category and more marginal cases, and functionalist approaches that integrate the grammatical category with its prototypical function in syntax and explain the divergences through markedness hierarchies. The account that N&S present in the monograph is rightly considered an integration of different aspects of each one of these theories. It shares with the feature-based approach the idea that categories must be represented somehow in the lexical entry, but differ from it both in how much underspecification is allowed and the atomic or derived nature of the category label. Like the prototype-based approach, N&S's theory allows for cannonical manifestations of the category, but in contrast to it the cannonical or mixed nature is not an effect of more unrestricted cognitive principles, but the result of maximally explicit feature combinations. Like the functionalist approach, the cannonical function of an element can define the grammatical category; however, the mapping is not always direct, as features like REPR can specify more or less idiosyncratically the syntactic content and the morphological shapes adopted within a paradigm. Their approach shares with other contemporary approaches to grammatical categories (for instance, Wiltschko 2014) the non-primitive nature of cannonical categories, at the same that it has an original view of the relation between conceptual information and syntactic labelling.
Chapter 2 presents the second empirical domain that defines the mixed categories studied in the monograph, the nature of modification in syntax. The chapter combines a theoretical and a typological perspective, and defines four classes of modification which are related to each other in an implicational hierarchy (4).

(4) $^{(1)}$Cannonical attributive modification > $^{(2)}$Modification by noun > $^{(3)}$Alienable possession > $^{(4)}$Inalienable possession

Cannonical attributive modification refers to (intersective) adjectival modifiers (*delicious pie*); modification by noun includes a relatively large set of constructions, among which the most relevant one for the purposes of this monograph is NN compounding (*apple pie*). Alienable possession is any type of (broadly defined) possessive relation involving a head noun that is not, in itself, relational (*John's pie*), and inalienable possession involves nouns that are lexically defined as relational in their grammar (John's father), with specific languages possibly diverging in the range of nouns that are defined as relational. The second and the third class are characterised by requiring a semantic function $\Re$ that expresses a (semantically underspecified) relation between the two related nouns. Typologically, the implicational hierarchy is confirmed by the observation that languages that use the same form for two or more of these categories always merge together adjacent categories in the hierarchy. For instance, some languages express in the same way the two possessive classes and the two modificational classes; other languages express in the same way the two classes involving $\Re$; other languages use the same manifestation for the four classes. Typologically, this creates a hierarchy, where some languages divide modification from possession; others divide modification by nominal concept from attributive
Chapter 3 focuses on the second class, modification by noun, and presents a more detailed overview of the semantic, syntactic and morphological nuances of its different subtypes. The chapter contains one of the best overviews of the grammar of NN compounding that I can remember, and in addition to it, makes the extra task of making explicit the relations and

differences with case adpositions, different classes of denominal adjectives and other available ways of creating attributive structures from nominal sources. Their presentation sometimes involves constructional assumptions similar to Goldberg (2006) in allowing non-primitive lexical combinations to define autonomously some aspects of meaning.
Chapter 4 provides an overview of the different analytical options for mixed categories, with particular attention to the cases where the mixing involves nouns used as modifiers. The different analyses are divided in two broad classes which are, again, presented in detail and discussed in depth: dual projection analyses, where two distinct syntactic nodes carry different feature endowments, and single projection analysis, where the same node contains mixed categorial information. These approaches are compared with Bresnan & Mugane's (2006) LFG analysis, which shares properties from both the dual projection and the single projection analyses. The arguments used to discuss these theories are both empirical and theoretical, the second based on economy and parsimony of analysis; for instance, analyses where one is forced to postulate nodes carrying information that would only apply to a very parochial set of lexical items are rejected. In this chapter, N&S define the desiderata for their own analysis, which is presented in the following four chapters.
Chapter 5 is the point where the reader realises that, beyond the empirical problem of mixed categories used as nominal modifiers, the intention of N&S in this monograph is to provide a maximally explicit morphological theory about the lexicon and its integration with syntax. This chapter in fact starts by addressing some of the most complex issues in the study of the lexicon: lexical individuation, lexical representation and lexical relatedness. This is the chapter where the factorisation of lexical information within the representations is argued for, and its underlying philosophy is spelled out. The basic idea is that lexical relatedness depends on the factorised properties that different forms contain, in such a way that forms hold multiple relations with each other that depend on the level of representation –semantic information, lexical index, syntactic information, morphological or formal information–. Similarly, through dynamic correspondence any of these four levels can be manipulated without affecting the others, producing inflectional or derivational forms that mainly differ on whether the lexical index has been affected or not.
After chapter 5 spelled out the main properties of the lexicon, *chapter 6* presents a new updated version of Generalised Paradigm Function Morphology (Spencer 2013), which is a fully-fledged theory about morphological processes. The components of the theory are presented in turn, in a maximally explicit way. The General Default Principle (GDP) guarantees that the level(s) of lexical representation that have not been altered by a general paradigm function will be inherited from the specifications of the base. For instance, when producing the present participle *driving* from *drive* –a transposition of the form <A*<E...>>– the semantic information and the lexical index would be unaffected by the Generalised Paradigm Function (GPF), and thus copied from drive by the GDP (p. 206):

(5) Δ = {DRIVE , {prs.ptcp}}, GPF⟨⟩ =

$$\begin{bmatrix} \text{FORM} & \text{FORM}\langle \text{DRIVE} , \{u\} \rangle \text{ -ing} \\ \text{SYN} & \text{Adjective} \\ \text{SEM} & \text{(GDP)} \\ \text{LI} & \text{(GDP)} \end{bmatrix}$$

An important attribute of FORM is the Morpholexical Signature of the item (MORSIG). This attribute specifies the set of features that are spelled out as part of the paradigm of the item; in most cases, these specifications are defined by default –that is, the item will inflect regularly–, but idiosyncratic specifications are allowed, resulting in different classes of

irregularity. The MORSIG is duplicated as content features in SYN. As an attribute of SYN, the MORSIG, rather than defining the morphological expression of those features, defines the abstract features for which the form inflects. In principle, there is a default match between the two MORSIG attributes, but the mapping between content and form can also be further specified to produce mismatches –for instance in syncretism–.

When there is no further specification, the matching between syntactic (content) and morphological (form) features is guaranteed by the Default Cascade Principle (DCP). This principle defines a hierarchy of levels and applies across the different levels of lexical representation The highest value in the Default Cascade is the ontological type of the lexical item, an attribute of SEM, which defines the default values in SYN –starting with the semantic function role, and following with the content MORSIG–. The SYN attributes, by DCP, then define the formal attributes, in particular the formal MORSIG. A general paradigm function, of course, can specifiy any of these values, interrupting the Default Cascade.

Finally, specifically for the case of transpositions, the MORSIG contains an additional feature, REPR(ESENTATION), which specifies a particular form as having in content and form properties of a second grammatical category in addition to that of the base. The REPR value of a noun-to-adjective transposition would then adopt the complex form <N,A>, together with a specification of possible construction-specific properties. This is the device that explains that the inflectional properties of a transposition will reflect those of a second grammatical category while carrying the same lexical index as the base. To the extent that REPR is related to the semantic function role, itself also complex, SYN would specify the internal syntactic properties of the item as those of the base category, and the external properties as those of the second term of REPR. By DCP, these syntactic properties would be reflected in the MORSIG form values, explaining the inflectional properties. Therefore, transpositions are part of inflectional processes, and fully defined within the lexicon through factorisation of properties.

Chapter 7 discusses how the morphological and lexical storage model that has been introduced in chapters 5 and 6 is integrated with the syntactic representation, extending proposals originally appeared as Ackerman & Nikolaeva (2013). In order to do so, N&S illustrate it with a formal theory where features are particularly crucial: HPSG. After a discussion of whether nominal constituents should be considered projections of nouns or of determiners, which N&S conclude the present theory and empirical base is in principle independent of, the discussion centers in the type of syntactic feature that would be used to establish modification relations. They eventually decide to use a feature MOD, which comes with a particular attribute specified that defines the class of elements that the word is a modifier of. The crucial idea is that this attribute of MOD is defined not by the traditional grammatical category, but rather by the semantic function roles, that can be themselves complex. Like that, some syntactic elements would be defined as modifiers of entities with a simple R function role –cannonically, then, nouns–, while other syntactic constructions would define the attribute of MOD as more complex function roles. Finally, the chapter discusses the location of the $\Re$ function that characterises alienable possession and modification by noun. In this respect, N&S conclude that in the case of modification-by-noun, this function is part of the semantic lexical entry of the modifying nominal when it is a relational adjective, but part of the constructional meaning in N-N compounds (p. 265). In the case of alienable possession, the $\Re$ function is added to the semantic lexical entry of the head noun.

In *chapter 8*, the morphological and syntactic model that has been presented in chapters 5-7 is applied to the set of facts introduced in chapter 1-4, therefore showing that the model is not just internally coherent and able to account for the core facts, but also able to explain the

puzzling case of mixed categories with a high level of precision. Something that strikes the reader in this chapter is the extremely detailed analyses which N&S propose for different types of mixed categories, pointing out the subtle differences in the lexical representation that ultimately explain their distinct empirical properties. N&S present six case studies in this respect: Chukchi relational adjectives (§8.3.2), Selkup relational adjectives (§8.4.1, §8.4.2), Tungusic derived adjectives (§8.4.3), Upper Sorbian possessive adjectives (§8.4.4), Awngi agreeing adjectives (§8.4.5) and Tundra Nenets compounds (§8.4.6), therefore covering all major empirical areas within noun-adjective mixes. The analyses always follow the same logic, but are used to illustrate fine-grained differences in the lexical representations that are obtained through manipulation of REPR –different types of construction-specific restrictions, different consequences for the SEM and SYN representations, etc.–. One clear example of the level of exigency that N&S impose to their own analyses is that they clarify that they consider their analysis of the Chukchi and Upper Sorbian possessive adjectives incomplete due to the lack of a more explicit model of possession (p. 347).

I do not think that it is a trivial fact that a monograph in principle concerned with a marginal phenomenon like mixed categories is able to make substantiated claims about foundational issues in morphology such as the identity between forms of a lexical item, the boundaries between inflection and derivation, the role of semantic information in the definition of grammatical categories or lexical storage. This theoretical depth is a clear sign that N&S have provided the field with a full-fledged proposal about the nature of lexical representations and processes. I am convinced that their core intuitions and proposals can in fact be transferred to other technical languages, within or outside word-and-paradigm approaches, and therefore trascend their specific choice of theoretical model. I will allow myself to say, even, that the specific technical implementation used in this monograph has the necessary role of making the proposal maximally explicit, but is in no way conditioning the internal logic of the arguments, which is only limited by fine-grained empirical observations and Nikolaeva & Spencer's vast knowledge of the long-standing questions in morphological research. I have no doubt that, across different theoretical approaches, the contribution of this monograph will have a broad impact in the linguistic community.

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