

REPRESENTATION AND SELECTION OF EXPONENTS: AN INTRODUCTION

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ABSTRACT: This article provides the reader with a general introduction to the main issues in the study of the lexicon, setting the context in which the articles presented in this volume appear. We concentrate on three questions that we consider crucial for a study of listedness: what is listed, how it is listed and how alternation and variation are expressed. We address these issues in the three main areas covered in this volume: phonology, syntax and morphology.

KEYWORDS: lexicon, representations, underspecification, rules, listing

1. THE LEXICON: A USER'S GUIDE*

A longstanding question in linguistics is the division of work between listing information and deriving it from the interaction of rules with what is listed. If we think of a child acquiring Navajo, how much information will she have to memorize and store in a list and how much information will she be able to derive from what she has stored, given productive and to a great extent predictable rules in her language? At a minimum, languages differ in unpredictable ways with respect to the association between form and meaning. Unless we hold the position that Plato held in the *Cratylus* –that sounds should be naturally paired with concepts– we must agree that there are no rules of grammar able to explain or predict that Italian uses the sequence of sounds /páne/ to represent the baked food made of flour, water and yeast that Russians associate to /xléb/ and Greeks call /pso:mí/. That much is agreed upon, and therefore the fact that some information must be listed and memorized has been left aside in the otherwise lively debate between Lexicalism (Halle 1973, Aronoff 1976, Scalise 1983, Anderson 1992, Ackema & Neeleman 2004) and Neo-

* Acknowledgements to be introduced.

Constructionism (Baker 1985, 1988, Lieber 1992, Halle & Keyser 1993, Borer 2005a, 2005b, 2013, Svenonius et al. 2009). The debate concentrates on whether, in addition to the inescapable list of idiosyncratic information, morphology should be postulated as a distinct component, and to some extent, on whether the lexicon is one single list or should be divided into several lists, each one accessed by different linguistic components.

In this cursory and necessarily brief introduction we will present the main questions that are being discussed about the nature of lexical representations. There will be a lot of issues that we will not be able to touch, and we will not be able to present anything with the depth it deserves. Our goal is to give the reader a roadmap that provides the necessary information to understand the context in which the articles that are in this volume are produced, and to have an idea of what other lines of research are currently being developed by the linguistic community.

1.1 Main questions in the study of the lexicon

The debate with respect to lexical representations concentrates on three issues: (a) how much information is listed (b) how it is listed and (c) how are alternations in and non-deterministic realization of that information captured. The following sections will address these three questions in phonology, syntax and morphology.

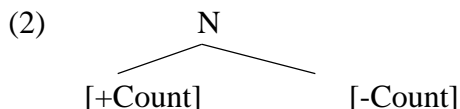
With respect to the first question, in general, the approaches differ with respect to what the pieces of information are that have to be listed in a lexical entry and how specific that information must be. All authors agree that, somehow, a lexical item must be paired with some phonological information and, in many cases, with some unpredictable semantics; also generally included in a lexical entry are the grammatical information that the item corresponds to –e.g. is this item plural? is it a deponent verb?– and the grammatical information that has to be present in the context where the item can be used. As we will see, the questions revolve around how specific or how underspecified these representations must be, a problem particularly acute in phonology.

The second problem is how this association between idiosyncratic meanings is performed: how do we link an idiosyncratic phonological representation, as our example /pane/, to an arbitrary set

of grammatical features and an arbitrary meaning? Since Chomsky (1965), the standard way of doing this is through a lexical entry that associates sets of features to each other –where features are simply ‘grammatically relevant properties’. (1) is taken from Chomsky (1965: 85):

(1) (sincerity, [+N, -Count, +Abstract])

Part of the debates concentrate on what exactly the features are that languages use to represent this information in the lexicon –do we need a feature like [abstract]?–, how many values they have –are they binary features? equipollent? privative?– and, perhaps more crucially, whether the representation they form is internally structured or, on the other hand, is flat, as the example in (1) suggests. In the representation in (1), the N feature is in the same hierarchical position as the feature [-Count], suggesting that any of them could appear without the other. The other option is to arrange features in a hierarchical structure –a feature geometry (eg., Harley & Ritter 2002, Cowper 2005)–, such that the presence of one feature entails the presence of another, and some contrasts are only defined when a particular feature is present. Assume, as many linguists would, that the contrast between being count and non-count is only relevant for nouns. This could translate such that the feature [Count] depends on the feature [N], and we could choose the representation in (2) for that.



Over the years, feature representations have tended more and more towards a hierarchical structure (pace proposals such as Noyer 1997, where the representations are still flat), arriving at the situation where, to a great extent, features reproduce in the lexicon aspects of the syntactic hierarchy; this has lead some researchers (especially within Nanosyntax, see Ramchand 2008, Caha 2009, Starke 2009) to propose that lexical items are actually associated to syntactic (sub)trees and, in practice, lexical items are stored trees paired with a phonological representation and, optionally, semantic concepts.

Still within the question of how the information is stored, in

recent times more and more authors have explicitly proposed the idea that the idiosyncratic association between types of information is not represented in one single list, but in two, perhaps three, different lists that are accessed by different components of grammar. This is known in Lexicalism as the Separation Hypothesis (Beard 1995; see also Ackema 1995), and in Neo-Constructionist approaches as the Feature Disjointness Hypothesis (Embick 2000). The crucial idea is that morphosyntactic properties, which determine how the syntactic derivation proceeds, are only relevant for syntax, but not for phonology, and are stored in one list which syntax accesses, while morphophonological information –such as whether a word starts with /p/, is bisyllabic or a clitic– is relevant only to phonology, and is thus stored in a second list to which syntax has no access. This implies, obviously, that there must be two lists, and in a sense two lexicons: one where morphosyntactic information is stored in the form of bundles of abstract features, as in (3a), and another one where morphophonological information is stored as exponents (3b), and paired to those features.

- (3) a. [X, Y], [+P], [Z, B, H]...
 b. /cok/ <-> [X, Y]; /trat/ <-> [+P]; /zi:t/ <-> [Z, B, H]...

This is not all; some authors also note that, while some words have an interpretation that directly follows from their formal feature endowment, others add some conceptual information that is otherwise unpredictable. Plausibly, the semantic contribution of the English /-z/ exponent, used to express plural, is accounted for by the way in which the feature [plural] that it spells out is read in the semantic component, but the concept that exponents such as *dog*, *NATO*, *bomb* or *trip* introduce cannot be determined by the feature [N], or for that matter, any other morphosyntactic features that we could plausibly postulate. To solve this, some authors propose a third list, the Encyclopaedia, which is accessed only by semantics, and which associates exponents with unpredictable concepts, including the meaning of single morphemes (4a), the meaning of whole lexicalized words (4b) and the meaning of sets of words, i.e., fixed expressions and idioms (4c). This information is relevant to assign a complete meaning to an utterance, but is irrelevant for phonology and, as we will see in §2, for some authors also for syntax.

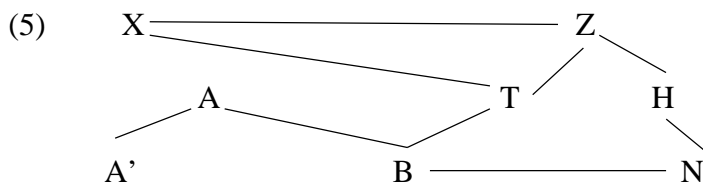
- (4) a. /dɒg/ <--> ‘animal, frequently used as pet, which barks, likes bones...’
b. trans+mit <--> ‘communicate, send’
c. kick # the # bucket <--> ‘die’

If we move now to the study of alternations and variation, the empirical problems are two: first, the problem of how to capture the situation where there are two related forms, say A and A’, each one of them used in a distinct context –alternation. The alternation can be sensitive to many kinds of information, and A and A’ might differ in their phonological properties –in which case they are allomorphs, like -s and -z in the English plural–, their semantics –in which case they are alloemes, as when *global* means either ‘general’ or ‘related to the earth’– or morphosyntactic properties –in which case they would be different forms of one word, as in the members of an inflectional paradigm, as in *die* and *dies*. However, the question is always the same: how are these two forms related in the lexicon such that the connection between them is strong enough, but their properties are sufficiently distinct to explain why each one is used in a different context? Again, we will see that there have been a variety of solutions to this problem.

The second empirical phenomenon is variation. On the one hand we have alternation of two distinct forms, A and A’, in different contexts. On the other we have only one form –B– which is used in different contexts, fulfilling different roles. Syncretism is one example of this: the same morphophonological representation, B, materializes sets of morphosyntactic features that are distinct, as when *-ed* is used both to express past tense and to build participles. Reversing the kinds of information, sometimes the same set of morphosyntactic features, say [N], are expressed with different exponents –such as *-ation* in *explan-ation* and *-ment* in *displace-ment*–, giving rise to affix rivalry.

Again, there is no easy solution to these problems, but in some approaches, especially within the frameworks of Cognitive Grammar (Lakoff & Johnson 1980) and Construction Grammar (Goldberg 1995, Booij 2010), a particular direction is getting more and more attention. It involves conceiving of the internal structure of the lexicon not as a list that contains statements about how features of different levels are associated, but as a constellation of items which can hold multiple

connections with each other, as schematized in (5).



Note that this conception of the lexicon can capture the situation where one form is strictly an alternant of another (as A'): it only establishes an association with one other form, A. All of its properties, with the exception of the one that alternates, could be shared with A. The situation where the same form, B, is used for two different tasks could be captured if it were related to two different sets of items, like A and T, sharing properties of both, and depending on the context, one of the two sets of properties would be more relevant.

2. PHONOLOGICAL REPRESENTATIONS

Let us start with phonology, because most of the questions about representations that we have introduced are explicitly addressed in this field, and occupy a central position. What is said about phonology will help understand the role of the same questions in other levels, such as syntax and morphology, where the problems have not been discussed as explicitly.

2.1 *What is represented?*

The relation between representations and exponents poses a range of challenges to phonological theorizing. Let us start at the level of individual segmental features. Phonological features can be detected by contrast, and by phonological activity in categorial processes (such as assimilation). Whether features should contain instructions for the execution of exponents is a matter of debate. At the segmental level we find surface variation due to phonological context. Such allophonic variation led to extreme abstractness in Structuralist/Phonematic approaches and to the introduction of feature-changing rules in generative grammar.

Once we look at rules or processes, we quickly realize that it is

not always the case that rules are applied when their conditions are met in the concatenation of morphemes, which are traditionally represented as sequences of phonemes or segments with associated features. Such features and even processes can be morphemes too. Examples are the insertion or shifting of tones to indicate morphosyntactic information in many languages or the so-called mutations, segmental processes, such as lenition, that most often are exponents of cases. In prosodic morphology, or root-and-pattern morphology, morphemes appear to be prosodic organization templates, as in Semitic binyanim or reduplication. Can the satisfaction or violation of constraints on prosodic well-formedness be exponents of morphemes? A further issue arises in reduplication patterns. A reduplicative morpheme has to be phonologically empty to be able to copy the content from the base of affixation. Furthermore it was believed until recently that reduplicative morphemes also have to consist of some prosodic form template (a syllable, a foot...). As it turns out, these can be derived by independently motivated constraints as well. The question of how far general phonological processes are involved in the shaping of allomorphs is related to these issues. At one extreme, outright suppletion, as in the textbook example paradigm *go – went – gone* is very unlikely to follow from general phonological processes. At the other extreme, the variation in voicing and presence/absence of a vowel in regular English past tense formation (or 3rd person present tense, or plural on nouns...), as in *lacked* [lækt], *lagged* [lægd], *nodded* [nɒddɪd] doesn't have to be encoded in terms of lexically listed allomorphs, since voicing assimilation and vowel epenthesis are fairly unspectacular phonological processes. In between these extreme cases we find a grey zone in which phonological generalizations aren't as straightforward or exceptionless.

- Segmental representations vs. prosodic information: listing and rules
- Syllable structure and stress

2.2 *How is it represented?*

Roman Jakobson (<in the mists of prehistory) tried to define each phonological feature in three ways, articulatory, acoustically, and perceptually. SPE (Chomsky & Halle 1968) returned to a more

modest approach in which features are defined mostly articulatorily. However, while some SPE features refer to the active articulator, such as the back of the tongue (dorsum), as in the place feature [dorsal], others are defined acoustically by reference to modulation of airflow, such as [\pm continuant] or [\pm strident]. Some scholars try to define the radicals of Element Theory (<>references) in terms of spectral properties, i.e. acoustically (Harris & Lindsey 1995). Articulator- as well as signal-based definitions of features have substantive weaknesses: The exponents of a feature vary a lot (even if we don't consider systematic allophones for the moment) since the same articulatory gesture can be used to produce a range of sound effects just as the same acoustic effect can be accomplished via a range of differing articulations (see, e.g., Simonsen, Moen & Cowen 2008 on retroflex stops in Norwegian; Kingston 2007 on articulatory readjustments in bite block experiments). Listeners can perceive contrasts under pretty bad circumstances, identifying phonemes even if a distorted signal is produced by a speaker with a bad cold, bite block, cleft palate, dysarthria etc. In addition, signed languages show the same properties of contrast and processes as spoken languages. Even if phonological features are not assumed to be innate, parsimony and learnability considerations make a set of features that is available for both modalities a desideratum. However, features defined on the basis of the involved articulators or acoustic properties of exponents are entirely useless for the analysis of sign languages.

Morphological operations that involve phonological processes or phonotactic constraints pose a similar parsimony problem. Should individual morphemes in templatic morphology be represented as templates or should their phonotactic properties be derived by independently motivated constraints?

- tiers, planes, hierarchies, etc.
- identifying the features and their structure is informed by acquisition: INTRODUCE GRIJZENHOUT THIS VOLUME HERE]

2.3 Alternations and variation

So far we have mainly discussed issues of exponence at the

phonology-phonetics interface and questions about the nature of lexical specification. Contextual phonological as well as free phonetic variation is often taken as evidence of phonological underspecification. In languages displaying vowel harmony, the vowels in affixes that show alternations depending on the feature specification of the neighbouring stem vowel are often analysed as underspecified; even more justifiably so if there are also affixes that resist harmonization, the vowels of which would then not be underspecified.

Considering alternations and variation further, we come back to the questions emerging in allomorph selection. The nature of potential representations of morphemes that have different exponents cannot always be as easily determined as in the case of English past tense formation. While there are compelling arguments to store past tense forms such as *left* or *drove* as separate suppletive forms, the allomorphs /-ɪd/, /-d/ and /-t/ can be derived by application of phonological rules and thus can be regarded as three exponents of /-d/. The decision for a representation is more complex in cases where more arbitrarily different allomorphs are selected in phonologically predictable contexts. For example, in Yidjɪn some inflectional morphemes vary in length depending on the length of the Stem. The dative subordinate in the examples below is realized as bisyllabic when added to stems with an even number of syllables but shows a monosyllabic allomorph when added to stems with an uneven number of syllables (Dixon 1977, Martínez-Paricio, forthcoming). In the data below, the allomorphies of the past marker and the dative subordinate marker have in common that they optimize word size to an even number of syllables.

(6) Yidjɪn syllable-count dependent allomorphs

| <i>Citation form</i> | <i>Past</i> | <i>Dative subordinate</i> | |
|-------------------------|--------------------------|----------------------------|-----------|
| gali-n | gali-ɲ | gali-ɲunda | ‘go’ |
| mad ^y inda-n | mad ^y inda-ɲu | mad ^y inda-ɲu:n | ‘walk up’ |

This kind of behaviour causes serious problems if this alternation isn’t analysable as regular deletion or augmentation processes in the phonology. Furthermore the context for each allomorph could be analysed as a matter of optimization, i.e., the allomorph is selected

that fits best in the prosodic environment provided by the stem (e.g., parsing of syllables into binary feet), or as subcategorization (Bye 2007). In the latter case each allomorph contains the description of the phonological environment in which it is chosen as part of its lexical entry.¹

The alternations observed in reduplicative morphemes pose another challenge for our understanding of exponence, since they potentially violate the principle of Consistency of Exponence, which holds that phonological material cannot change its morphological affiliation (see van Oostendorp 2007 for a rare discussion of the matter). The surface exponents of a morpheme that is realized by copying all or parts of the phonological material of its morphological host have potentially switched affiliation. In Optimality Theory, inconsistency of exponence would be part of the too many solutions problem (Blumenfeld 2004) if it hadn't been banned by hypothesis (i.e., the Consistency of Exponence Hypothesis; Prince & Smolensky 1993/2004). The too-many-solutions problem arises in OT whenever there are more conceivable than typologically attested potential winning forms that avoid a certain constraint violation or conflict (that is, predicted but unattested repair strategies). In our particular context phonological material could just betray its morphological affiliation to, for example, escape a neutralisation process.

In the mirror image of reduplication, truncating morphology, the exponent of a morpheme can't be analysed as a phonological representation either, since it is a process, i.e., deletion of parts of the stem (see Alber & Arndt-Lappe 2012). In a sense this property groups truncation together with mutations, which are often analysed as processes as well. Alternatively, mutations have been analysed as floating features or not phonologically determined at all (see Iosad, this volume).

lexicon-phonology timing issues (when in the derivation is a morpheme selected?)

¹ In this case, this subcategorization information would probably have to refer to the concepts of even and uneven numbers, which in itself is something linguistic systems are not expected to make use of.

3. THE REPRESENTATION OF SYNTACTIC INFORMATION

3.1 *What is represented?*

One crucial point in the debate is whether notions such as the grammatical category and the argument structure of a predicate should be listed in the lexicon. The traditional approach, of course, is that they do. Classic works such as Lieber (1981), Lapointe (1980), Williams (1981), DiSciullo & Williams (1987) and Jackendoff (1990) agree that any item listed in the lexicon must be paired with a grammatical category –either through one single label, such as N, A, V, P, or through abstract features, such as Chomsky’s (1965) +/-N and +/-V. Similarly, and this is especially clear in lexico-conceptual work, predicates have been listed with completely specified theta-grids (see Levin & Rappaport 1995 for a clear example), and in some cases, with statements determining how the arguments should be syntactically projected.

This has changed as the combined result of two factors. On the one side, the influential work of Baker (1988), with his proposal of the Uniformity of Theta Assignment Hypothesis (UTAH), according to which the same theta roles are always assigned in the same syntactic positions, opened the door for a view of theta-structure where the lexical specification was redundant, as arguments could be defined as the interpretation that DPs in particular syntactic configurations inside lexical projections received. In other words: a predicate has the arguments it has, with their interpretations, because of the syntactic projections that appear in its immediate context (see Hale & Keyser 2002 for a related view). This made it unnecessary to specify in the lexicon how arguments projected, and for some authors (significantly, Borer 2003) this also made it unnecessary to specify before syntax the kind of theta roles that the predicate requires. This produced the so-called Exo-skeletal approaches to argument structure, where syntax defines –according to its internal rules, that is, the formal properties of the heads involved in the syntactic derivation– a particular argument structure and, at a later stage, grammar checks if the resulting theta-grid is compatible with the situation the predicate denotes. In contrast with Endo-skeletal approaches, where the lexicon, based on a semantic representation, imposes an argument structure on syntax, Exo-skeletal approaches only access the lexical information after

syntax has been built, and that information acts as a filter that, for instance, tells us that (10a) is impossible, because the predicate *die* cannot be interpreted as an externally caused event, and (10b) is interpretable provided we conceptualize *think* as a verb of communication, that is, provided we accept telepathy.

- (10) a. *John died Mary.
 b. John thought the answer to Mary.

Secondly, Neo-constructionist approaches have attempted to reduce the amount of stored syntactic information, in favour of configurational approaches where notions such as the grammatical category of an item is underspecified in the lexicon, and emerges as a result of syntax, when the item is dominated by functional projections whose formal features ascribe them to a particular category. This approach, in practice, is translated as the claim that roots lack a grammatical category (in Distributed Morphology, Marantz 1997, Arad 2003, or similar approaches, like Borer 2005a,b). The root *hammer* would lack lexical information about whether it is a noun or a verb. In (11a), being dominated by a DP, it is categorized as a noun; in (11b), as a verb.



3.2 How is it represented?

The traditional approach directly links exponents to features; however, the underspecified approach of Neo-constructionist theories makes the problem of how to restrict the syntactic projection of items acute. If items are not paired in the lexicon with a grammatical category and an argument structure, how do we explain the fact that *hammer* cannot project as an adjective? One solution that has been attempted (see Harley & Noyer 2000 for an illustration) is to specify the context of insertion of the exponents. Remember that Neo-constructionist approaches assume Feature Disjointness. If roots, in the morphosyntactic lexicon, are underspecified, then part of what is

stated in the morphophonological lexicon is the ingredients that the immediate context where the piece is inserted must have. For instance, determining that *die* cannot appear with an agent (remember **John died Mary*) involves stating in this morphophonological lexicon that *die* cannot be introduced in a configuration where *v* has an external argument. Note that this solution is still a lexical solution: the problem is solved by listing. A different approach, advanced in the previous section, would be to derive it from a semantic rule, such as ‘*die* expresses an internally caused event’. The same problem arises when we consider the grammatical category: one could imagine a lexical approach where exponents are licensed only in certain contexts, and a semantic approach where the requisites of a head determine whether it must project as a noun, verb, adjective... (cf. Hale & Keyser 2002, which is partially this kind of theory).

Another point of disagreement has to do with whether items must be associated to feature structures which correspond to one single head, or it is in principle possible to associate them to phrasal constituents, in what is known as Phrasal Spell Out. In some traditional approaches (see especially McCawley 1968) this second option, which is standard in Nanosyntax, was already explored. The idea is that a single exponent can be linked to a phrasal representation, such as (12a), where features project distinct heads; this contrasts with a representation where features are represented –possibly hierarchically– in one single head (12b). Here we illustrate for the Italian second person singular pronoun. [INTRODUCE HERE DEMIROK]

- (12) a. tu <--> AddresseeP
- ```

graph TD
 A[AddresseeP] --- B[Addressee]
 A --- C[ParticipantP]
 C --- D[Participant]
 C --- E[Person]

```
- b.    tu    <--> [Addressee, Participant, Person]

Part of the discussion, independent of this contrast, concentrates on how to identify the relevant features that are involved in lexical entries and that differentiate one lexical item from another. [INTRODUCE HERE COWPER AND CURRIE]

### 3.3 Alternations and variation

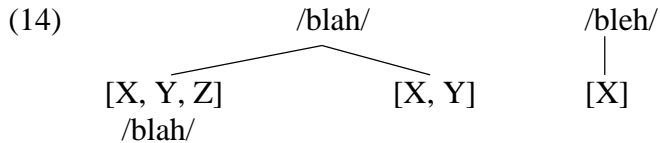
The analysis of alternations and non-deterministic realization reflects how specific the entries are. In Lexicalist approaches that can be characterized, broadly, as Endo-skeletal, as the items are fully specified, specific lexical rules have to be posited that relate the two instantiations of the first item. This is so in cases of conversion, as *hammer<sub>V</sub>* ~ *hammer<sub>N</sub>*, with theories disagreeing whether the relation between the two elements should be characterized as a rule or as a lexical association between fully specified words in the lexicon (see Bauer & Valera 2005 for a summary of the options). Similarly, for predicates which display two or more argument structures –*John boiled the milk* vs. *The milk boiled*–, some of these theories would propose lexical alternation rules that operate over the stored argument structure (see Reinhart & Sioni 2005). Neo-constructionist theories, on the other hand, would place this variation in the syntax: in each case, different functional heads would be used, resulting in a different definition of grammatical category and argument structure.

The study of syncretism, to the extent that it involves one single exponent to express two or more different morphosyntactic representations, is also relevant here. The alternatives differ with respect to whether the syncretism is represented lexically or not. In Distributed Morphology, syncretism is solved by a rule, generally an impoverishment rule, that applies to the syntactic representations. Assume the two feature bundles spelled out by the same exponent are (13a) and (13b); in the lexicon they are distinct, but the language would have a rule of impoverishment, like (13c), which will erase one of the features from (13b), resulting in a representation that is now non distinct to (13a), (13d). An exponent such as the one in (13e) can now spell out either (13a) or (13b), after impoverishment.

- (13) a. [X, Y]  
b. [X, Y, Z]  
c. Z -->  $\emptyset$  / Context C  
d. [X, Y, --]  
e. /blah/ <--> [X, Y]

In other theories, syncretism is represented lexically. One alternative is, as in the network morphology and paradigm

morphology approaches that we will present in §4.2, to have some form of statement in the lexicon that determines that the same exponent /blah/ is equally associated to the two morphosyntactic representations, be it in the form of a referral rule (§4.3) or through a network as the one in (14).



#### 4. MORPHOLOGICAL INFORMATION

Let us now take a look at morphological information and how it is lexically represented.

##### 4.1 *What is represented?*

Lexicalist theories tend to assume that the lexicon has to be richly specified for morphological information. Obvious candidates for listing are the conjugation class of verbs and the declension class (and/or gender) of nominal categories, whether an item is regular or irregular, the position of affixes –whether they are suffixes or prefixes, for instance– and perhaps other features, like [native] and [non-native], that have been claimed to play a role in restricting word formation. There are other likely candidates for listing. For instance, there are restrictions on affix combinations –which affix can follow which affix– that do not seem to derive from syntactic or semantic conditions (Fabb 1988); presumably, these restrictions should be listed somehow in the lexicon. Also, affixes whose role seems to be essentially the same from a syntactic and semantic perspective do not equally combine with all bases. Recall the contrast between *explain*, that takes *-ation* to nominalize (*explan-ation*) versus *displace*, which takes *-ment* (*displace-ment*).

Almost all theories would agree that all of these are pieces of information that one must list in some lexicon. Neo-constructionist approaches would tend to list it just as lexicalism does, but they would do so in a list which is not accessed before syntax. They would be, then, among the many idiosyncratic constraints that are part of the

morphophonological lexicon, which introduces properties that are not relevant to syntax.

The alternative of deriving these pieces of information through rules has not been developed in the necessary detail, but some aspects have been studied from this perspective. Jablonska (2007) tries to derive the conjugation classes in Polish from the aspectual structure of verbs, and DiSciullo (2005) tries to derive at least part of the positional restrictions of affixes from syntactic considerations; see also Embick (2010) for an attempt to derive as much as possible of affix selection from structural conditions combined with linear adjacency considerations. [INTRODUCE HERE SVENONIUS, IF HE PRESENTS HIS POSTER, AND SVENONIUS + BYE IF THEY PRESENT THEIRS]

#### *4.2 How is it represented?*

There are many morphological theories where the lexicon is not flat, but contains some kind of internal ordering or hierarchy. The influential theory of Lexical Strata (Kiparsky 1982) is a prime example of this: lexical entries are organized inside ordered levels, with many properties of the listed items being in principle derivable from their ascription to one stratum (eg., with respect to whether they change stress of their bases). This theory has some modern descendants, such as Constraint Coindexing (Ito & Mester 2003) and Stratal Optimality Theory (Bermúdez-Otero 2012), but it is by no means the only way in which morphological information can be structured in the lexicon.

Another important alternative is Paradigm Morphology (Stump 2001): lexical entries –which in this theory are whole words rather than morphemes– are not directly associated to sets of information, but the link is performed through a higher-order structure, the paradigm, that defines a morphosyntactic space and the association between the cells and the lexical entries. This proposal has been explored specifically in inflection, but there are attempts to extend it to derivation (cf. Van Marle 1984 for an early proposal).

One recent development in paradigm theories, which connects with the constellation-approach to lexical entries presented in §1.1, is Network Morphology (Baerman, Brown & Corbett 2005, Brown & Hippisley 2012). The crucial proposal here is that the paradigm is



structured as a network in which nodes inherit information from other nodes they are connected to. Consequently, different morphological manifestations of the same information, irregularities and alternations are the result of different kinds of ramifications inside the network. [INTRODUCE HERE CAMILLERI]

Templates (Inkelas 1993) are another higher-order unit which is used to organize the association between items and information. A template contains an ordered series of positions, with statements about what kinds of items can appear in them and what kind of information they express, and is used to capture the constraints on affix combinations, and affix ordering.

### 4.3 Alternations and variation

The ways of capturing alternations and variation are clearly influenced by the assumptions the theory makes about the organization of lexical entries. In the approaches where there are networks, paradigms or other higher-order units mediating between information and a lexical entry, these phenomena are performed through operations that manipulate those higher-order units. A prime example is Stump's (1993) referral rule (RR). This kind of rule is a statement on the structure of the paradigm, specifying that the form for a word A bearing a set of features [X, Y...] is identical to the form used with another set of features [U, W...].

$$(15) \text{ RR}_{[X, Y...]} ([ \square ]) = [ \square ] / U, W...$$

Theories where such higher-order units do not exist, such as Distributed Morphology (see Bobaljik 2002 against the notion of paradigm) have to resort to rules (such as impoverishment, §3.3) or to enriching the lexical entries themselves to include additional information. One obvious option to explain why some affixes only appear with some bases is to add diacritic signs to the lexical entry of the base (as in 16a) and state in the entry of the affix that its context of insertion must contain that diacritic (as in 16b). Affixes that combine with a multiplicity of bases would lack reference to a diacritic in their entries, and bases which can combine with two or more affixes of the same kind would lack a diacritic. Of course, this comes at the cost of significantly increasing the quantity of idiosyncratic information that

speakers have to learn with their language.

- (16) a. Base <--> [Y, □]  
b. Affix <---> [X] in the context of [ □]

[INTRODUCE HERE KREMERS]

## 5. CONCLUSIONS AND PENDING QUESTIONS

In this very short and general introduction, some topics have emerged repeatedly.

First, the question of how specific or how underspecified the lexical information has to be. This is reflected in phonological representations, argument structure, grammatical category, affix ordering, etc. Solutions sometimes prefer abstract general representations, with general rules deriving the details, and sometimes prefer maximally specific representations, where all of the load is in the lexicon.

Secondly, the question of whether the lexicon is a flat component or has an internal structure has appeared several times. Almost no theory currently believes that the lexicon can be only a list of entries which hold, in principle, no relation to each other. Higher-order structures, organizing these entries asymmetrically and arranging the relations established between them, have been proposed in the last decades, going from strata to paradigms, networks and constellations.

Thirdly, another recurrent issue is whether the information internal to one single entry is flat or has internal structure. Here also almost all theories would claim that information inside an entry has some form of structure, be it a feature geometry, a division in planes and tiers or a structure of a different order.

These three problems –underspecification, the structure of the lexicon and the internal structure of lexical entries–, we believe, are largely unresolved. Much progress has taken place in the field in terms of empirical data, which has improved our understanding of past problems, and has helped delimit to some extent the hypothesis space, but there is still a lot of discussion, debate and analysis that must be performed before we arrive at any solid conclusions. We hope that the

papers included in this volume will help keep the discussion going, and the debate between approaches.

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