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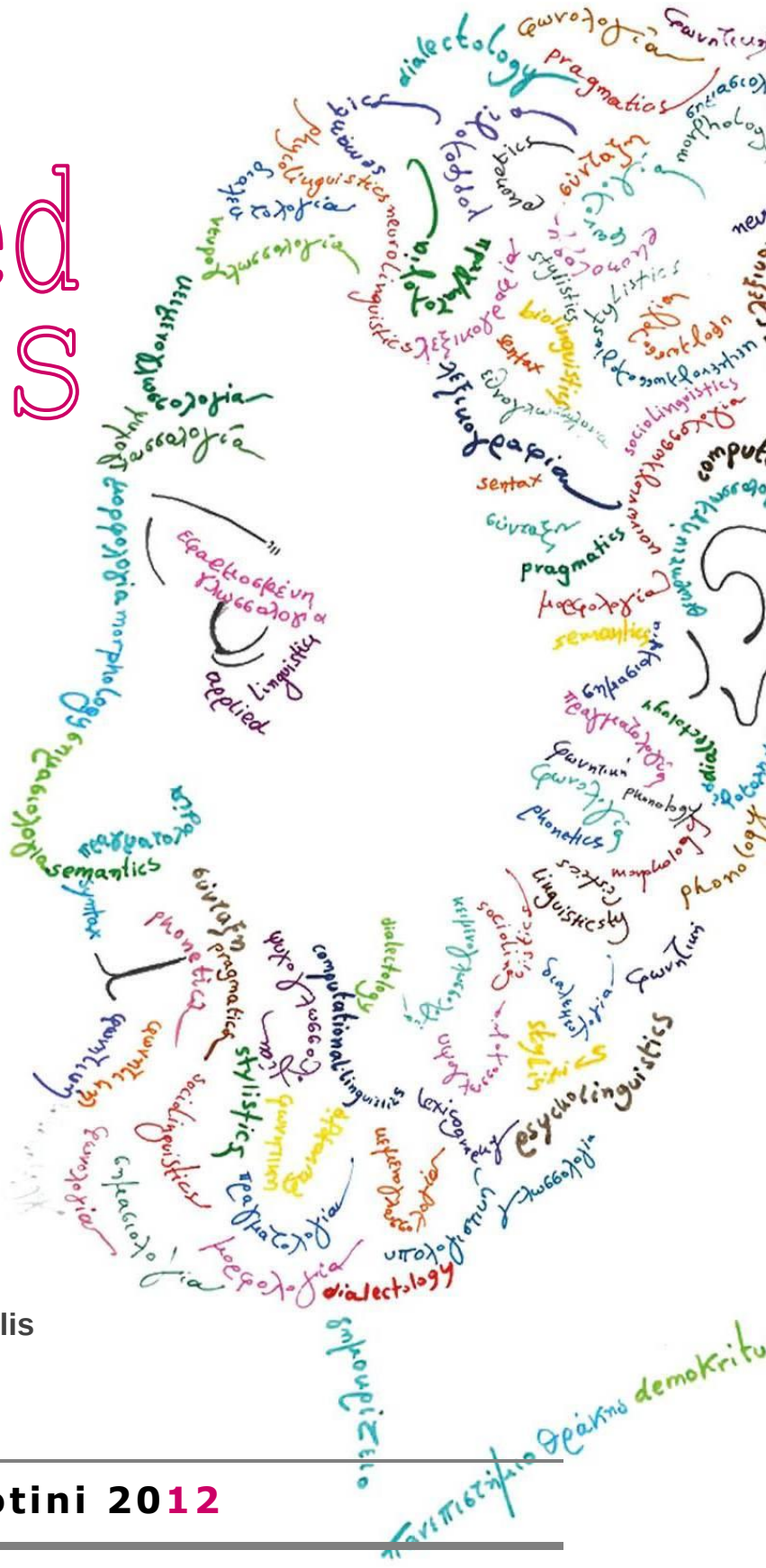

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NEOCLASSICAL WORD FORMATION IN ENGLISH AND THE ORGANIZATION OF THE LEXICON

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ABSTRACT

Neoclassical word formation is a relatively peripheral phenomenon in English and many other languages. Therefore, its peculiarities can offer interesting insights in the nature of word formation. Against the background of Jackendoff's Parallel Architecture, an account of the historical development and basic system of neoclassical word formation is proposed. The central remaining problem is that this system is available for naming new concepts, but not productive in the same sense as syntax is. In order to explain this, it is proposed to introduce a separate word formation component that acts on rather than being part of the lexicon.

1. Introduction

In English and other European languages, neoclassical word formation constitutes a subsystem of the lexicon. Some typical examples are given in (1).

(1) a. anthropomorphic
b. hydrophobia
c. mycophagous

The examples in (1) are typical because they consist of three elements. The final element is easily recognizable as a suffix, whereas the classification of the other two is less straightforward. They are special elements that have their origin in Ancient Greek and appear only in neoclassical word formation. I will call these here *neoclassical formatives* (NCFs). Some less typical cases of neoclassical word formation are the examples in (2).

(2) a. allomorph
b. anthropoid
c. geodesy

The examples in (2) are special in three different ways. In (2a), there is no suffix corresponding to the final element in (1). In (2b), there is only one NCF, the same as the first in (1a). In (2c), the second NCF does not occur in any other combination than with *geo-*.

Neoclassical word formation appears not only in English, but also in other European languages. In languages such as German and French, the system of neoclassical word formation is largely comparable to the corresponding one in English, although the suffixes and sometimes the spelling are adapted. The existence of such corresponding systems makes it often all but impossible to determine in which language a particular word was originally formed. Arguably, this question is of rather limited relevance. If we take the perspective of a speaker of English, whether (1a) was a borrowing from French or a formation in English does not change its place in the mental lexicon. What is important is that it can be analysed on the basis of rules that are part of the English speaker's mental lexicon.

The generalization to other languages is not absolute, however. The situation in Greek is special, because Modern Greek is a descendant of Ancient Greek. As described in detail by Mackridge (2009), there have been various attempts to change the Greek vernacular, which had been influenced by other languages, by taking over and adapting Ancient Greek words and rules. These attempts have interacted with the tendency to borrow terms that had appeared in neoclassical word formation in other languages. For a comparison of Modern Greek and English neoclassical word formation, cf. Petropoulou (2009).

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Here, I will only consider neoclassical word formation in English and languages where it behaves similarly.

Neoclassical word formation is interesting because of its marked nature. It is obvious that word formation is not organized around such special phenomena as neoclassical formation, so that any special properties that neoclassical formation exhibits must exploit the nature of existing mechanisms. Therefore, a precise characterization of these properties gives us additional power to distinguish between different analyses of word formation in general.

The rest of this article will be organized as follows. Section 2 gives an overview of the theoretical background assumed here, based on Jackendoff's (2002) Parallel Architecture (PA). Section 3 discusses how neoclassical word formation works. Finally, section 4 addresses the issue of productivity and formulates a proposal how the resulting analysis can be encoded in PA.

2. Lexicon and word formation in the Parallel Architecture

In Jackendoff's PA, the lexicon plays a central role in the formulation of thoughts and the comprehension of linguistic expressions. The components of PA and their connections are illustrated in Fig. 1.

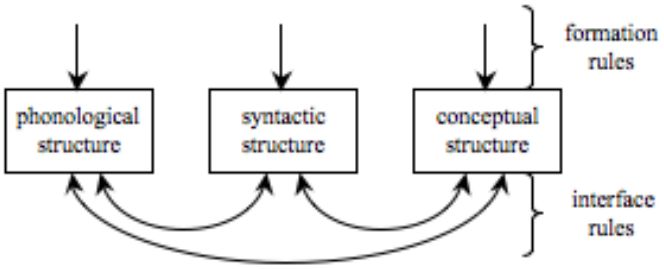

Figure 1 Jackendoff's (2002) Parallel Architecture

In PA, an expression has a phonological, a syntactic, and a conceptual structure. They are parallel in the sense that they are each based on formation rules generating the structure and interface rules mapping between the three structures. This idea is opposed to frameworks where syntactic structure is taken as central, as in Chomsky's (1981) Government and Binding theory, and to frameworks where semantic and phonological structures are the only basic representations, as in Generative Semantics.

One of the advantages of the architecture in Fig. 1 is that it accounts for processing in a highly intuitive way. As described by Jackendoff (2002), the production of an utterance involves the search for appropriate lexical entries that express relevant concepts. Components of the conceptual structure trigger lexical entries that can be used in the formulation. A selection of these entries is then combined to formulate the thought that started the process. In understanding an utterance, the starting point is the phonological structure. In the case of written text, it depends on the reading fluency whether the orthographic representation takes the place of the phonological representation in Fig. 1 or is mapped onto this phonological representation.

Word formation comes into play when a concept does not match any existing lexicon entry. However, there are several other mechanisms that can be used for this purpose instead of word formation. A first alternative is to describe the concept by means of a combination of existing words. This does not normally change the lexicon, but it enables the communication to pursue by using (syntactic) rules and existing entries. Another way to solve the problem is to use an existing lexicon entry in a different sense. It is essential, of course, that the receiver of the message will be able to understand it. Therefore, the selected entry should have a sense that makes the intended concept recognizable, e.g. by metaphoric or metonymic reasoning. A third alternative to word formation is borrowing. In this case, a name from another language is adopted as or (in the case of calques) used as a basis for the formation of a new name. Compared to the alternatives, word formation can be characterized as the only way to solve the naming problem that is at the same time rule-based and extends the lexicon.

Lexical entries are the basic building blocks of the language, stored in the minds of its speakers. In Jackendoff's framework, an example of a simple lexical entry is (3).

(3) a. <violin>
b. $N_{[+Count]}$
c. $[_{Thing}$VIOLIN]

A speaker of English who knows the word *violin* will have something like (3) in their mental lexicon. The information in (3) consists of two parts: first, the contribution this entry makes to each of the three types of structure; and second, the fact that these three pieces of information are linked to each other. In (3a), the phonological information has been replaced by the corresponding orthographic representation for the convenience of printing. (3b) gives some syntactic information. It should be noted that the only way to distinguish *violin* and *car* is by looking at the other representations than syntax. This reflects the insight that they are syntactically indistinguishable. The conceptual information in (3c) only represents the part that can be mapped into linguistic expressions. For other purposes, a picture of a violin stored as a mental image, or a mental image of the sound it produces, would be more suitable. This would then serve as a prototype. Depending on the speaker, the prototype will have more or less detail and will also vary in the details added.

Jackendoff (1997) argues that much of the lexical information stored in a native speaker's mental lexicon consists of units that are larger than individual words. This insight is in line with Wray's (2002) idea of *formulaic language*. PA offers a particularly elegant solution for the encoding of multi-word units. As an example let us consider (4).

(4) The teacher lost his temper.

The verbal expression used in (4) is usually given in dictionary format as *lose one's temper*. The contributions to the three different representations in PA could be formalized along the lines of (5).

(5) a. <lose> <temper>
b. $[_S$ DP_i $[_{VP}$ V $[_{DP}$ D_i N]]]
c. [INCH [BE ([X], [AT [ANGRY]])]]

In (5a), only the two words that are specific to the expression are given. Other words in (4) find their origin in other lexical entries. In (5b), a syntactic tree is given. Here the coindexation of *one's* with the subject is indicated by the subscripts on D and DP.[1] The meaning of the expression is summarized in (5c), which can be paraphrased as 'X starts being angry'. Although (5) specifies the contribution of the expression to each individual representation and implies that they are linked, a full representation should also give details on which components of the different levels are linked to each other. In (6), this information is added by means of indices.

(6) a. $<lose>_p$ $<temper>_q$
b. $[_S$ DP_i $[_{VP}$ V_p $[_{DP}$ D_i $N_q]]]_m$
c. $[INCH [BE ([X_i], [AT [ANGRY]])]]_m$

The indices *p* and *q* indicate where in the syntactic structure of (6b) the words in (6a) are located. The indices *i* and *m* link the variable X and the entire expression in (6c) to the corresponding parts of the (6b). As is typical of non-compositional expressions, the syntactic structure takes the role of a hinge between the phonological and conceptual structures in the sense that one set of indices links it to phonological and another to conceptual structure.

The architecture in Fig. 1 can be compared to the Saussurean model of the sign. Whereas Saussure only recognizes a phonological and a conceptual component of the sign, Jackendoff adds a syntactic representation. This solves the problem of encoding function words. An example is *it* in the sense used in (7).

(7) a. It seems strange to assume this.
b. It is unlikely that she will come.

[1] Jackendoff does not adopt functional categories and rejects the DP analysis as originally proposed by Abney (1987). However, in my view, the argumentation against the proliferation of functional categories of the type found in Pollock (1989) does not automatically extend to the DP analysis. After all, one of Abney's (1987) arguments is that the phrase *that house* can be replaced by *that* but not by **house*. However, nothing in this paper depends on the choice of D or N as the head of such phrases.

The information stored about *it* in the lexicon can be expressed as in (8).

(8) a. <it>
b. Det, 3sing., Neuter
c. ∅

Whereas a Saussurean sign does not have a natural place to encode the syntactic information in (8b), it requires a *signifié*, a meaning associated with the form. In PA, there is no claim about each of the three representations having to be filled. For *it*, at least in its use in (7), it is plausible to assume an entry with no conceptual information, as indicated in (8c). However, if we accept both structure in a lexical entry, as in (6b), and empty slots as in (8c), we can also encode formation rules as lexical entries. An example is (9).

(9) a. ∅
b. [$_S$ DP VP]
c. ∅

What (9) encodes is the rule S → DP VP, as used in the examples (4) and (7) to combine the grammatical subject with the verb phrase. Given that we have lexical entries such as (3), (6), (8), and (9), we can conclude that the lexicon in Fig. 1 includes both the linking rules and the formation rules. Jackendoff (2002) makes this point in more detail and with different examples. He shows that it is not possible to draw a principled boundary between formation rules and linking rules, by giving examples of various intermediate types of entries.

Fig. 2 does not include an obvious place for word formation. However, if all rules turn out to be lexicon entries, it is tempting to assume that the lexicon contains all of the information a speaker brings to their use of language in formulating and interpreting utterances and written language. This is also the hypothesis Jackendoff (2002) makes. Jackendoff (2010) elaborates this idea for word formation. In ten Hacken (2010), I proposed an alternative. As I hope to demonstrate, the analysis of neoclassical word formation provides an argument for the latter. Before describing the two theoretical options in detail, however, it is worth returning to the data of neoclassical word formation.

3. Neoclassical word formation

As an example for the analysis of neoclassical word formation, let us consider (1a), *anthropomorphic*. There are three questions to be answered about this word, listed in (10).

(10) a. What are the basic elements of the word?
b. What is the structure of the word?
c. What are the rules involved in the formation of the word?

As we noted at the start, *anthropomorphic* consists of three elements. The final element is the suffix *-ic*. For the other two elements, we can use the data in (11) to determine their form and status.

(11) a. anthropomorphic
b. philanthropic
c. morphotactic

A first observation regarding (11) is that *anthrop(o)* and *morph(o)* can each appear in first or in second position. Their semantic contribution is so similar that it would be unattractive to argue that *anthropo* in (11a) is not the same element as *anthrop* in (11b). In the same way, *morph* in (11a) is the same element as *morpho* in (11c). Although some dictionaries have separate entries for, for instance, *-phone* and *phono-*, e.g. COED (2011), such an analysis is not usually adopted in linguistic theorizing. The observation that these elements can appear in different positions implies that they are not affixes. At the same time, they are not normal stems. Neither **anthropo* nor **anthrop* can appear as a word in English (for *morph*, cf. further down). As mentioned in section 1, I will call them *neoclassical formatives* (NCFs) here.

A more difficult question concerns the status of the *-o-* at the end of the first element in (11a) and (11c). In general, it seems more attractive to assume that a final vowel is deleted in certain contexts

than that it is inserted. If we assume that *anthropo* and *morpho* are the base forms, we can easily devise a rule eliminating the final *-o* before *-ic* in (11b) and (11a), respectively. It is much harder to account for the putative insertion of *-o* in (11a) and (11c) if we assumed *anthrop* and *morph* as base forms. The first element in (11b) provides further evidence. The full form *philo*, as found in *philosophy*, is elided regularly before the initial vowel of *anthropo*. This means that it is not the second position, but the following vowel that triggers the loss of the *-o*. Therefore, we can answer (10a) such that we have the NCFs *anthropo* and *morpho* and the suffix *-ic*.

Turning now to (10b), we can in general have three possible structures for a form with three basic elements. They are indicated in (12).

(12) a. [anthropo [$_{\alpha}$morpho -ic]]
b. [[$_{\beta}$anthropo morpho] -ic]
c. [anthropo morpho -ic]

The question of which structure is the best depends on the status of the intermediate constituents α in (12a) and β in (12b). Evidence for α or β supports the relevant structure, whereas in the absence of any supporting evidence, (12c) becomes attractive. At first sight, α may be attractive as an intermediate node because *morphic* is a word of English. However, there are two types of evidence against *morphic* as a constituent node of *anthropomorphic*. First of all, *morphic* does not have the right meaning. According to OED (2011), it is most frequent in the expression *morphic resonance*, the influence an entity is supposed to have on facilitating the genesis of similar entities by generating a 'field' in which the new entities 'resonate'. Other meanings the OED gives are 'of or relating to anatomical shape' and 'of or relating to animal or plant morphs'. Moreover, all of these meanings post-date the attestation of *anthropomorphic*. Whereas *anthropomorphic* was attested in 1827, *morphic* was first attested in 1868. This seriously weakens the case for (12a).

The support for (12b) cannot be based on the existence of **anthropomorpho* as a word of English. However, there are a number of words that contain this stem, OED (2011) gives *anthropomorphous* and *anthropomorphism*, and have a related meaning. The argument is reinforced by the observation that similar word families of semantically related words can be found for many other neoclassical formations. This means that (12b) is also more attractive than (12c). Therefore, there are good grounds to adopt (12b) as the structure of *anthropomorphic*.

In order to address (10c), we need to take a closer look at the history of the phenomenon. As Mayr (2004) argues, historical accounts generally take the form of a *narrative*, i.e. a plausible story that takes into account all available evidence. In the case of Mayr, the field is evolutionary biology. Lightfoot (1979) applies the same paradigm to historical linguistics (cf. ten Hacken, 2007: 317-24, for a brief discussion).

In the case of neoclassical word formation, we can distinguish three phases. In the first phase, individual items were borrowed from Greek and Latin. This can be illustrated on the basis of (13).

(13)	a.	metamorphosis	μεταμόρφωσις	1533
	b.	anthropomorphous	ανθρωπόμορφος	1753
	c.	morphology	–	1830

In (13), the English word is followed by the corresponding Ancient Greek word (where it exists) and the date of first attestation as given by OED (2011). When *metamorphosis* appeared in English, it was a borrowing from Greek, probably through Latin. Borrowings do not have the structure of the word as in the original language. Thus, whereas German *Kindergarten* is a compound, English *kindergarten* is a simplex noun. There are no English word formation rules that could account for its structure. The peculiarity of neoclassical word formation is that the structure of the borrowed words was reconstructed in the borrowing language.

When *morphology* appeared in English, at first in the field of geology, it could not have been borrowed from Greek, as shown in (13c), because there was no corresponding Greek word. What must have happened is that words such as (13a-b) were reanalysed as complex and *morphology* was formed by the components resulting from the reanalysis. Somewhere around 1800, a system of NCFs came into existence in English. This meant that (13a-b) were reanalysed as containing an NCF *morpho*, which from then on could be used to produce new items such as (13c).

The system of NCFs marks the second stage in the evolution of neoclassical word formation. The actual phenomenon is difficult to observe directly. We would have to determine whether particular word formation rules were part of the linguistic competence of particular speakers. The way we can observe the existence of the system of NCFs is by means of words such as *morphology*, which cannot

have been borrowed. Further evidence for the nature and strength of the system, as opposed to the individual NCFs, comes from the borrowing of NCFs. This phenomenon can be seen in the contrast between *morphology* and *psephology*. The meaning of *psephology* is 'the statistical study of elections and trends in voting' (COED, 2011). OED (2011) gives 1952 as the date of the first attestation. An interesting difference between *morphology* and *psephology* is that, whereas *morpho* originated from the reanalysis of borrowed items, as indicated in (13), no such analysis can be assumed for *psepho*. Ancient Greek ψηφος means 'pebble'. One of the derived senses develops this into 'ballot' (cf. Liddell & Scott, 1925). In 17th century English, we find *psephism* and *psephisma*, but they are only used in specialized contexts relating to ballots in classical Athens. OED (2011) also gives *psephomancy*, which exploits the 'stone' sense of the word. None of these are likely origins of *psepho* as used in *psephology*. A much more likely scenario is that someone looking for a learned name for the concept consulted an English-Ancient Greek dictionary to find the relevant stem. In this sense, *psepho* was borrowed into English as an NCF.

This second stage is not the end of the development. A number of words appear to combine NCFs with other lexical elements. Some examples are in (14).

(14) a. pseudomodern, pseudomedieval
b. gastropub
c. webography, kremlinologist

In (14a), the NCF *pseudo* seems to combine with non-neoclassical adjectives. The most plausible analysis is that we do not see the same *pseudo* in (14a) as in, for instance, *pseudonym*. Rather, *pseudo* has developed into a prefix and it is this prefix that we see in (14a). This type of reanalysis of an NCF as an affix is relatively rare and only occurs for individual NCFs, not for large groups of them. A different type of phenomenon is seen in (14b). Here the NCF *gastro* seems to combine with the word *pub*. However, if *gastro* were the NCF in (14b), the meaning of *gastropub* should have 'stomach' as a component, cf. *gastritis*. In fact, COED (2011) gives the meaning 'a pub that specializes in serving high-quality food'. Therefore, *gastro* can be explained much better as a clipping of *gastronomy*.[2] In (14c), we seem to have NCFs based on non-neoclassical elements. We will come back to these cases later.

In order to explain the neoclassical word formation system, we can choose one of two perspectives. In a diachronic perspective, the questions are how the neoclassical word formation system emerged and how individual NCFs developed. In a synchronic perspective, the central question concerns the nature of the system of neoclassical word formation. These perspectives cannot be separated entirely. In order to study the emergence of the system, we have to know its nature. This is the classical Saussurean argument about the relation between diachronic and synchronic linguistics. Perhaps more controversially, however, I would like to argue that it is also not possible to study the system of neoclassical word formation without knowing its historical development.

The central point here is that in order to come up with an account for the system, we have to decide which data should belong to the scope of the account and which can be excluded. In particular, not all words that contain NCFs belong to the system of neoclassical word formation. There are two other ways a word can contain an NCF. First, it can belong to the third stage of development, illustrated by (14). The borderline in this case depends on a comparison of the analysis as a neoclassical formation and alternative analyses. In (14a), there are good arguments to consider *pseudo-* a prefix. In (14b), an analysis as a clipping is better able to explain the meaning of the word. The best analysis of (14c) depends on how these examples fit with our general theory of neoclassical word formation.

Another type of explanation for the appearance of an NCF that does not depend on neoclassical word formation is that a word was borrowed from Ancient Greek before there was a system of neoclassical word formation. Whereas most words such as (13a-b) were reanalysed in the emergence of the neoclassical word formation system, there are also words that contain unique constituents, e.g. *geodesy* mentioned as (2c). This word was borrowed, but there is no sign that it was reanalysed, because the second element was never used in other words. Therefore, it is not necessary for an account of neoclassical word formation to include such cases as (14a-b) or (2c) in its scope.

For words that belong to the system of neoclassical word formation, I propose that they are formed on the basis of NCFs. An NCF is an element that does not have a syntactic category (cf. Petropoulou & ten Hacken, 2002). As a consequence, it cannot be used in syntax. Therefore, it cannot appear as a word in an expression of the language unless it undergoes an operation that turns the NCF into a word.

[2] As the ending of a clipping is not visible and there is no semantic distinction, it cannot be determined whether it is the noun *gastronomy*, the adjective *gastronomic*, or indeed the NCF *gastronomo* which has been clipped.

English has a number of word formation processes that do not impose on their input the condition that it has to have a syntactic category. In the case of *anthropomorphic*, the stages in its formation can be summarized as in (15).

(15) a. anthropo, morpho → anthropomorpho
b. anthropomorpho → anthropomorphic

In (15a), two NCFs are combined into a compound that is itself an NCF. These NCFs do not have a syntactic category. In (15b), a suffix is added to the compound NCF and it becomes an adjective. The adjective is available for insertion into a syntactic structure. The sequence of steps in (15) reflects the structure as discussed above. It does not imply that *anthropomorpho* existed in a temporal sense prior to *anthropomorphic*. An alternative perspective on neoclassical word formation starts from an individual NCF. In (16), a number of different ways in which the NCF *morpho* can be input to neoclassical word formation are illustrated.

(16) a. morpho → morph
b. morpho → morpheme
c. allo, morpho → allomorpho → allomorph
d. morpho, logo → morphologo → morphology
e. anthropo, morpho → anthropomorpho → anthropomorphic

In (16), only the final element of each line is a word with a syntactic category. All elements before the final arrows are NCFs without syntactic category. Compounding, as illustrated in (16c-e), is typical of neoclassical word formation, but (16a-b) show that it is not necessary. As (16d-e) illustrate, *morpho* can appear as either first or second element in a neoclassical compound. There are many NCFs that can only appear as the first element of a neoclassical compound. Fewer NCFs can appear as second or only element in neoclassical word formation. NCFs such as *bio* and *geo* only appear as first element, even though their meaning is clearly that of a stem. The flexibility of *morpho* is also shown by its possibility to appear in conversions, (16a) and (16c). In conversion, the thematic vowel is lost. This indicates that the thematic vowel has a different status with respect to the NCF than its other constituent phonemes.

At this point, I would like to return to the examples in (14c). The question about these cases is whether they are neoclassical compounds with an unusual first element or words with a different origin that happen to include an element that is used as an NCF in other words. If they are neoclassical compounds, we have to assume that there is a third way NCFs can come into existence, apart from reanalysis of borrowings (as *morpho* from *metamorphosis*) and direct borrowing (as *psepho* in *psephology*). This third way consists of the addition of what in regular NCFs is the thematic vowel to an existing word in English. This would then result in the steps in (17).

(17) a. web → webo
Kremlin → Kremlino
b. webo, grapho → webographo
Kremlino, logo → Kremlinologo
c. webographo → webography
Kremlinologo → Kremlinologist

Whereas (17b-c) correspond to the regular steps in neoclassical word formation in (15), the step in (17a) is a more contentious assumption. However, we can only decide how attractive this assumption is by comparing it to alternative analyses.

One such alternative is that we are dealing here with suffixation. As illustrated in (14a), the reanalysis of an NCF as an affix is attested for other NCFs. In the examples in (14c), the resulting derivations would involve the suffixes *-ography* and *-ologist*. There are at least two arguments against such an analysis. First, the suffixes have an unusually rich and specific meaning. We find the definitions in (18) for the words in (14c).[3]

(18) a. *Webography*: a list of websites that pertain to a given topic.

[3] The definition in (18b) is compiled from the OED (2011) definition of *Kremlinologist* 'such an analyst' and the one for *Kremlinology*. The OED (2011) gives *webliography* but not *webography*. The definition in (18a) is from the Wikipedia (en.wikipedia.org/wiki/Webography, last modified 21 February 2012).

b. *Kremlinologist*: an analyst of the Soviet Government, and subsequently the Russian government, and their policies.

If we assume that *-ography* is a suffix, it has to contribute a large part of the meaning of (18a), because *web* only has a very small part in it. Such a distribution of meaning between the components is not so uncommon for compounds. Indeed, Jackendoff (2009) develops his system for expressing the meaning of compounds on the assumption that the relation between the components is produced by a generative system, so that relations of an in principle unlimited complexity can be generated. However, if *-ography* is a suffix, such possibilities are not readily available.

The hypothesis that *-ologist* is a suffix in (18b) has another problem. Here we have a family of words of a type that is familiar from neoclassical word formation. Alongside *Kremlinologist* we have *Kremlinology* and *Kremlinological*. It is not attractive to assume that there are separate suffixes *-ologist*, *-ology*, and *-ological*, because the highly specific meaning of the words they form is very similar. When we try to solve this by analysing *-ologist* into two suffixes, *-olog* and *-ist*, we are in the process of creating a parallel system to neoclassical word formation, with *-olog* taking on the role of a neoclassical stem. Therefore, an analysis of (18) as suffixation rather than NCF formation is not attractive.

Another alternative analysis of (18) is in terms of analogy. For (18a), there is an alternative, *webliography*, which is formally more similar to *bibliography*. Both *webliography* and *webography* are used, although a Google search (16 March 2012) gave a 10:9 preponderance in the number of hits for *webography* over *webliography* (497,000 vs. 447,000). The form of *webliography*, in particular the *-lio-* component, cannot be explained otherwise than by analogy with *bibliography*. By contrast, *webography* is less clearly analogical and can readily be explained along the lines of (17). For *Kremlinologist*, the basis of the putative analogy is less obvious. The formation of *Kremlinology* and *Kremlinological* took place at about the same time. OED (2011) gives dates of first attestation ranging from 1958 to 1961 for the three words. Therefore, the idea of an underlying compound NCF is much more attractive.

In sum, there are good reasons to assume (17) as the analysis of the examples in (14c). This analysis brings them within the scope of neoclassical word formation and assumes that the formation of NCFs on the basis of non-neoclassical elements is a possible origin of new NCFs.

4. Productivity

The notion of productivity has been a central pillar in all frameworks of generative grammar. At a time when the focus of the discussion in American linguistics was the opposition between Post-Bloomfieldian approaches and the emerging generative approach, Chomsky formulated the issue as in (19).

(19) The central fact to which any significant linguistic theory must address itself is this: a mature speaker can produce a new sentence of his language on the appropriate occasion, and other speakers can understand it immediately. [Chomsky (1964: 7)]

The view in (19) is not entirely new. In fact, Schultink's classical definition of morphological productivity in (20), although formulated without reference to a generative framework, is very much in line with (19).

(20) Under productivity as a morphological phenomenon, we understand the possibility for language users to create new formations unintentionally and in an in principle not countable number, by means of a morphological procedure that is at the basis of the form-meaning correspondence of some words they know. [Schultink (1961: 113), my translation PtH][4]

The central properties shared by (19) and (20) are the ideas of an infinite number of new expressions and their regular, unintentional formation. This type of productivity can be expressed in a very natural way in the PA framework of Fig. 1. It leads first of all to syntactic expressions, i.e. expressions that are

[4] Original Dutch: "Onder produktiviteit als morfologisch fenomeen verstaan we dan de voor taalgebruikers bestaande mogelijkheid door middel van het morfologisch procédé dat aan de vorm-betekenis-correspondentie van sommige hun bekende woorden ten grondslag ligt, onopzettelijk een in principe niet telbaar aantal nieuwe formaties te vormen."

not stored in the lexicon, but constructed on the basis the combination of information in lexical entries. It is not surprising that a school of linguistics taking (19) as its point of departure would concentrate on syntax.

Jackendoff (2002) takes as a point of departure that what constitutes a lexical entry is an empirical question. Each speaker has their own lexicon. As ten Hacken & Panocová (2011) demonstrate, this is entirely compatible with the view that a particular word has a specific meaning in a speech community. However, we have to acknowledge that there are two different routes to becoming a new entry, which we might label 'performance-based' and 'onomasiological'.

Jackendoff assumes that frequently used combinations are stored as entries because retrieval from the lexicon is more efficient than on-line construction from different lexical entries. Someone working at a supermarket till will have a repertoire of frequently used phrases stored in their lexicon, whereas customers may construct them. This does not affect successful communication. Jackendoff (2002) makes the point that this is also the case for productive morphology. In the case of English word formation, we might think of the formation of nouns in *-ability* on the basis of adjectives in *-able* in these terms. This is the performance-based route to lexicalization. Clearly, neoclassical word formation is not productive in this sense. When we characterize the productivity of neoclassical word formation, we can summarize it in the two observations in (21).

(21) a. Neoclassical word formation is available for naming new concepts.
b. Neoclassical word formation is not applied unintentionally.

If we want to consider neoclassical word formation productive on the basis of (21a), we need a new concept of productivity, which is compatible with (21b). Corbin's (1987) analysis of productivity is interesting in this respect. She does not refer to unintentional rule application as in (20) and does not align it with syntactic productivity as in (19). Instead, she distinguishes three interpretations of "productivity", and explains them as in (22).

(22) a. *régularité*: predictability of form and meaning of the output
b. *disponibilité*: availability of a rule for new formations
c. *rentabilité*: extent to which a rule can be applied to many bases and have many outputs

It is interesting to compare (20) to (22). It is not possible to quantify productivity in Schultink's sense in terms of (22c) directly, because the crucial point for Schultink is that the number is not finite, not that the number is high. His unintentionality is not adequately covered by (22a), although the two point in the same direction. The crucial difference seems to be that Corbin (1987: 177) goes on to argue that (22b) is the central sense of productivity, whereas Schultink's definition in (20) imposes additional constraints on the concepts in (22a) and (22c). It is easy to see that (22b) is logically prior to the other two senses of productivity. Whereas (22a) and (22c) target rule application, (22b) is about the existence of a rule. Therefore, Corbin's sense of productivity is weaker, less restrictive, than Schultink's.

Corbin's (22b) is eminently compatible with the scenario of finding a name for a new concept. This is the starting point of the analysis of word formation in Štekauer's (1998, 2005) onomasiological approach. This scenario differs from performance-based, unintentional lexicalization in the sense that speakers are generally aware of their name-giving activity. This is also what is intended in (21a). Therefore, neoclassical word formation is productive in Corbin's sense (22b), but not in Schultink's sense (20). Lexicalization of neoclassical formations takes place according to the onomasiological scenario, not the performance-based one.

Whereas the PA framework accounts for productivity in the sense of (19) and (20) naturally and without further assumptions, the onomasiological route to new entries is not straightforward in Fig. 1. Jackendoff (2010: 34) mentions the issue of what he calls "semiproductivity" as "one of the central issues of linguistic theory for the coming years." Earlier, Jackendoff (2002, 2009) proposed to account for it by means of redundancy rules that are *emergent*. This means that they are not rules that can be applied to produce new expressions, but only generalizations that facilitate storage and recall of existing expressions. If neoclassical word formation is a set of redundancy rules, each new form is produced by a kind of analogy. Jackendoff (2010: 28-34) proposes to encode semiproductive rules as lexical entries with a special feature that stops them from being applied freely. However, this system is meant also for the analysis of groups of words such as *receive*, *perceive*, *conceive*, etc. Such rules are not available in English and do not apply to items that can be described as complete lexical entries. The crucial difference between **ceive* and **anthropo* is that the latter has a meaning and can be used in new words, whereas the former does not have a meaning and only emerges as a formal component of some

borrowings. The reanalysis step that characterizes neoclassical word formation has not taken place for **ceive*.

A more attractive option is to modify the PA in such a way that it can accommodate the contrast between the different notions of productivity. Therefore, I propose to adopt the architecture in Fig. 2.

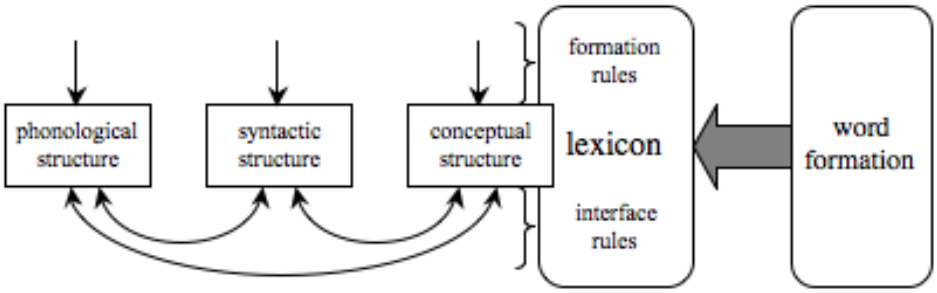

Figure 2 Modified Parallel Architecture

Compared to Jackendoff's version in Fig. 1, the architecture in Fig. 2 distinguishes between the lexicon and the word formation component. This means that productivity in the sense of Chomsky's (19) and Schultink's (20) can be encoded as entries in the lexicon, whereas productivity in the sense of Corbin's (22b) *disponibilité* can be encoded as rules in the word formation component. Where rules are not available for new formations, they are not encoded in either, which corresponds to Jackendoff's (2002, 2009) redundancy rules. In terms of ten Hacken & Panocová's (2011) distinction, the performance-based route to lexicalization involves (only) the lexicon, whereas the onomasiological route (also) involves the word formation component. Neoclassical word formation is a very clear example of a set of rules that belong in the word formation component.

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