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Morphological complexity due to lack of productivity

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Abstract
A quite widespread tendency of human behavior is to create stereotypes about all sorts of concepts. As a consequence and for various reasons, linguistic systems acquire specific associations. Well-known examples are related to French and German with a romantic label for the former and a tag of high complexity for the latter. Since quite often these categorizations are not based on any reliable criteria, they could become very problematic. For instance, they can generate negative attitudes or undesired expectations from the part of language learners or users. From the work on language universals on there have been some attempts to operationalize language characteristics, though. In this natural-morphological contribution we will present a definition of complexity, which is based on the total number of morphological elements of the given language. Based on some external evidence from the area of language acquisition and language learning we will propose a modification of the notion of complexity. We believe that linguistic complexity should be measured according to the productivity content of the analyzed part of speech.

1. Introduction

Rather diverse concepts such as mathematics, physics, society, economical systems, human relations, etc. are fairly often related to the idea of complexity. Although in numerous cases people cannot explain what this exactly means, everyone has experienced complexity in some way. Hence, individuals have at least an intuitive understanding of connotations and denotations implicated in this concept. One consequence of this is that the idea of complexity is quite often only a subjective perspective.

While the notion of morphology and that of complexity are alike concerning their polysemous value, they differ in a pivotal point, which refers to the fact that morphology lacks the intuitive understanding that complexity encloses. Thus, we will begin with an introductory explanation of the notion of morphology.

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2. Morphology: form, meaning and function

The word 'morphology' is a neoclassical compound built from the Greek elements *morphē* 'form' and *logía* 'treaty', which can be translated as 'the treaty of form'. Goethe coins this word with the etymologically derived meaning 'general theory of form'. This term has been reduced in some areas to the study of form of some specific subject area, e.g. geology, geography, biology, astronomy, etc. Likewise we find morphology in the speech sciences. Wilhelm von Humboldt and August Schleicher introduced the term into linguistics showing a clear influence of Goethe's sense of morphology. (Wurzel 2000 § 2.2)

By making reference to the etymological meaning of morphology Wurzel (2000 § 1.1) presents three different denotations of form that vary according to their abstraction level. Wurzel describes the most concrete meaning as the sensory perception of the object, i.e. its external shape. An example would be the materialization of language in the speech chain, which reaches acoustically language users. This author's next semantic level of form refers to the internal structure of the object. We could mention here the structure of a text, a sentence, a word, a phoneme, etc. Each grammatical level can be subdivided into smaller meaningful items, which are perceived as the internal form of a given bigger unit. His most abstract level makes reference to the relation among structures, i.e. structures that reflect in some way the structure of the world. An exemplification of this level is the necessity of humans to utter with some form, what they have perceived as meaningful. This would refer to the relation between meaning and form that we find across languages.

The conception of morphology within linguistics is not homogeneous, but there is some consensus in the following definition:"[I]n der Morphologie [geht es] um die Form (des Wortes) unter dem spezifischen Gesichtspunkt des Zusammenhangs von Bedeutung und Ausdruck" (Wurzel 2000:5)

In this definition Wurzel (2000:5) points out that morphology often refers to the second abstract level of form, i.e. to the internal structure of the object. Further he argues that all subdisciplines of grammar study form using this meaning, e.g. phonology studies the sound structure, syntax the sentence structure and

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semantics the structure of meaning. In the same sense, morphology studies the word structure. This author adds that morphology studies the interrelation between the structure of sound and meaning within the word.

Besides form and meaning there is another aspect that needs to be taken into consideration, i.e. function. Wurzel (2000:3) defines function as the performance of a specific task that a dynamic system reaches. Morphology studies the interrelation between form, meaning and function of the internal structure of words. Accordingly, Wurzel (2000:5) points out that morphology's object of study is the semiotic form of the word. The scope of this paper will be inflectional morphology in the area of conjugation.

2.1 Natural Morphology

In accordance with Wurzel's (2000) definition of morphology the theoretical framework of this contribution is the Natural Morphology, cf. Dressler et al. (1987), Kilani-Schoch (1988), Kilani-Schoch & Dressler (2005), which is a functionalist theory that tries to explain language development in the different linguistic – external and internal – evidence. Dressler (2000:288) defines linguistic naturalness within Natural Morphology as language phenomena, which are "cognitively simple or easily accessible (esp. to children), elementary and therefore universally preferred, i.e. derivable from human nature". This notion of naturalness derivates from Jakobson's (1965) and the Praguean conception of 'markedness' and from Stampe's (1971) Natural Phonology.

Dressler's (2000 § 1.1) concept of naturalness is gradual and phenomenon-specific. He exemplifies the naturalness grades by using the English inflection in plurality of *knife*, *wife* and *foot*. The most natural plural formation is a simple addition, which is met by *knife-s*. A less natural plural signalization is represented by a root modification plus phonological addition, like in *wive-s*. Even less natural is the modification of a root without any phonological addition, as in *feet*. The very low naturalness content of *feet* makes both children and English language learners produce the plural formation *foot-s* or *feet-s*. Dressler explains this gradation as iconicity of markedness. This means that "plural is a morphosemantically more

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marked category than singular, the addition of morphosemantic markedness in the plural is iconically best reflected in the addition of morphotactic markedness." (Dressler 2000:288) Morphosemantic markedness refers to the greater complexity of the concept and morphotactic markedness to the formal marker used, e.g. a suffix.

The theory of the Natural Morphology is subdivided into three subtheories. These subtheories are Universal Naturalness (Mayerthaler 1981), System Adequacy (introduced by Wurzel 1984) and the theory of Typological Adequacy brought in by Dressler (1985, 1988). Each subtheory is parameterized by extramodular or extralinguistic principles with cognitive, neurological or semiotic motivation. Crucial for this theory are both the external and the internal evidence. Some areas of external evidence are diachronic change, language attrition, first language acquisition and second language learning. We are focusing here on the latter within the subtheory of System Adequacy.

2.2 System Adequacy

The subtheory of System Adequacy – firstly called System Dependent Morphological Naturalness – was developed by Wurzel (1984) within the area of inflectional morphology. According to the morphological categories, subcategories and markers, he establishes various at times competing system-defining structural properties. The most dominant ones in a specific language system belong to the System Adequacy of that language, cf. Dressler (2000 § 5.1.). The subtheory of System Adequacy was maintained in Dressler's version of the Natural Morphology, but with strong modifications. Instead of taking frequency as a primitive property of the system (= dominance in Wurzel's terminology) Dressler elevates productivity to a "primitive property of grammatical patterns" (Dressler, 1998:15), cf. Dressler & Thornton (1991, 1996).

2.2.1 Static and dynamic morphology

In Dressler's (1998) version of System Adequacy productivity plays a central role, because he considers this language property as the core of morphology.

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Based on this assumption Dressler makes a differentiation between static and dynamic morphology.

> "Nous proposons en effet deux morphologies en relation de superposition: a) d'une part la morphologie dynamique, avec au centre la notion de productivité, qui concerne les patterns de la morphologie productive […], b) d'autre part la morphologie statique, domaine des formes flexionnelles mémorisées dans le lexique mental, qui concerne l'organisation des représentations stockées dans ce lexique mental[…]." (Kilani-Schoch & Dressler 2005:218)

The differentiation between static and dynamic morphology does not have clear cut boundaries, though. In the next lines, a short description of this morphological subdivision based on Kilani-Schoch & Dressler (2005:171-21) will be presented.

The most important characteristics of static morphology are its lack of productivity and the high frequency of the elements belonging to it. Static morphology builds a closed class because *ipso facto* the unproductive morphological patterns, classes and rules that belong here do not accept new members. The major conduit through which this morphological component grows is by absorbing members from the dynamic morphology. These are not new lexemes adopted in the language, though. These lexemes have acquired high frequency, probably due to extralinguistic reasons. Their high frequency has permitted them to be memorized in the mental lexicon, which is another important characteristic of the static morphological component.

Although neologisms do not come to the static morphological component very often, there is a pathway that makes this possible: analogy. As example we cite here the Spanish verb *interferir* 'interfere', borrowed in the 20th century from English: *interfere*, which is part of the Latinate vocabulary. *Interferir* was adopted in the unproductive conjugation with theme vowel *-i-*. This is a case of superficial analogy with the verbs: *preferir, diferir, proferir, referir, transferir* and *inferir*. *Interferir* suffered a folk etymological morphological reanalysis. Spanish speakers perceived *interferir* as taken from Latin – not from English – formed with a prefix *inter-* and a bound lexical morpheme *-ferir*. The integration of *inferir* in the Spanish static morphology occurs due to phonological similarity with already existing

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members, cf. Galván Torres (2007). This is the peculiarity of superficial analogy; it works only by means of phonological similarities.

The most important characteristic of dynamic morphology is the productivity of the patterns, rules and classes that belong here. This means that this morphological component represents an open area, which *ipso facto* accepts new lexemes. Another characteristic of dynamic morphology is that the elements belonging to it are computed in the lexicon by means of a symbolic rule. This is a consequence of the productivity content of the members of the dynamic morphological component. Not all productive patterns are part of dynamic morphology, though. The productive patterns, classes and rules that have high level of frequency become part of static morphology. The assumption behind is that through frequency these elements become stored in the mental lexicon and thus they do not make use of the symbolic rule for retrieval or production. Hence, they are part of static morphology.

2.2.2 Productivity

Productivity is the decisive language property for the subdivision of static and dynamic morphology.

> „Onder productiviteit als morphologisch fenomeen verstaan we dan de voor taalgebruikers bestaande mogelijkheid door middel van het morfologisch procédé dat aan de vormbetekeniscorrespondentie van sommige hun bekende woorden ten grondslag ligt, onopzettelijk een principe niet telbaar aantal nieuwe formaties te formen.“ (Schultink 1961:113)

As Shultink (1961:113) points out, morphological productivity refers to a morphological phenomenon that enables language users to coin new words on the bases of already existing patterns. For Dressler (1997, 2003) productivity is gradual, going from high productivity to low productivity all the way through lack of productivity. Following table shows the criteria for the productivity gradation:

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Table 1. Levels of morphological productivity according to Dressler (1997, 2003)

Productivity level	**Extension**	**Obstacles**
Full productive	Foreign words with unfitting criteria (secondary productivity)	Foreignness Unfitting criteria
High productive	Foreign words with fitting criteria	Foreignness
Low productive	Indigenous neologisms (conversion, shortenings)	Lack of constructional iconicity
Very low productive	Inflection class change	
Unproductive	It does not apply	

In full productivity the morphological operation applies to foreign words with unfitting criteria (secondary productivity in Wurzel 1984). In this case the morphological operation has two important obstacles to overcome, one is the foreignness of the acquiring word and the other is the unfitting criteria. Unfitting criteria can be of phonological or morphological nature, e.g. gender, theme vowel, etc. The morphological operations that apply to foreign words with already fitting criteria are also considered to be high productive (Wurzel's primary productivity). The only obstacle to overcome is the foreignness of the word. Low productive operations are those that only apply to indigenous neologisms. A very low level of productivity is found in inflection class change. The importance of this productivity level is that it keeps the inflection class stable. In the following lines the highest levels of productivity will be exemplified:

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Table 2. Gallicisms in English verbs [1]

English verb	Coinage	French Etymon	English verb	Coinage	French Etymon
boil	c. 1225	O.Fr. *boillir*	*exclaim*	c. 1489	M.Fr. *exclamer*
cancel	1399	Anglo-Fr. *canceler*	*gain*	1530	M.Fr. *gain*
cheat	c. 1375	*O.Fr.* *escheat*	*amuse*	1480	M.Fr. *amuser*

Due to the interesting phenomenon that English very seldom adopts verbs from Spanish, we used here French borrowings to illustrate the productivity of the English past suffix –*ed*. In table (2) we have a list of such English verbs. If we look at the examples we have enlisted we will notice that all the verbs belong to the full productive conjugation class with suffix -*ed*: *boiled, canceled, cheated, exclaimed, gained, amused*. This situation has dominated since the first centuries of the last millennium, as the examples confirm. Now let us look at Anglicisms in Spanish verbs. In table (3) we find a list of Spanish verbs with English origin. All the verbs belong to the full productive conjugation class with the theme vowel -*a*- without root modifications or segmental additions. As a consequence the inflectional class into which these verbs are adopted is the one of *cantar* 'singen', cf. Figure 1. E.g. past tense of *puchar*: *puché, puchaste, puchó, puchamos, pucharon*.

Table 3. Anglicisms in Spanish verbs

Spanish verb	Coinage	English Etymon	
clickear	20th century	*to click*	Own example
puchar	20th century	*to push*	Chicano Spanish, cf. Reyes (1978:83)
flirtear	21th century	*to flirt*	Peninsular Spanish, cf. Aguirre & Dressler (2006:77)

The examples included here are only of the highest productivity levels. If the morphological operation adopts foreign words, it will automatically apply to indigenous words as well. Each higher level implies the other lower levels of productivity.

[1] Examples taken from: *Online Etymology Dictionary*: http://www.etymonline.com/ (10.09.08)

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2.3. Morphological complexity

Dressler (1999) makes a distinction between morphological richness and morphological complexity based on the distinction between positive and negative complexity found in one of the approaches in Zurek (1990). Dressler (1999:587) chooses a computational model of complexity, where this concept is measured according to the logical depth, e.g. the necessary time to generate the intended object. In this vain Dressler proposes morphological richness to be embodied in the productive morphological patterns. At the same time Dressler suggests that morphological complexity encompasses all the morphological patterns of the language, irrespective of their productivity content, including suppletion.

> "Mentre la **complessità** morfologica contiene tutti i patterns morfologici di una lingua, sia produttivi sia non-produttivi, la ricchezza morfologica deve essere calcolata solo riguardo a categorie, regole e microclassi morfologiche produttive." (Dressler, 1999:589, original emphasis)

According to these conceptions of richness and complexity we can compare the morphology of different languages. We will look at the submodule of inflection of some romance languages, which are *ipso facto* genetically related. Focusing on the verbal inflection let us take French, Italian (Dressler 1999) and Spanish (Aguirre & Dressler (2006). Following table shows the productive categories of the synthetic inflection of the just mentioned languages:

Tabelle 4. Productive morphological categories Aguirre & Dressler (2006), Dressler (1999)

Category	French	Spanish	Italian
Person	1st, 2nd, 3rd	1st, 2nd, 3rd	1st, 2nd, 3rd
Number	Singular Plural	Singular Plural	Singular Plural
Modus	Indicative Imperative Conditional	Indicative Subjunctive Conditional Imperative	Indicative Subjunctive Conditional Imperative
Tempus	Present Imperfect	Present Past	Present Imperfect

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		Future	Future Passato prossimo
Aspect		Perfect Imperfect (only in past tense)	
Non-finite forms	Infinitive Participle	Infinitive Gerund Perfect participle	Infinitive Gerund Past participle
		(Dressler, 1999; Aguirre & Dressler, 2006)	

The amount of productive morphological categories measures the morphological richness of the language. We can see in table (4) that although the French verb has less morphological richness, the level of richness among these languages does not differ dramatically. There are only some differences in relation to tempus, aspect and infinite forms. From this point of view Dressler's differentiation between morphological complexity and morphological richness is a useful tool for the description of languages.

Let us now look at the morphological complexity using the same languages. In order to save space, the conjugational classes of French and Italian will be presented in a table format, while Spanish will be presented in a more complete tree diagram.

Tabelle 5. Inflectional classes

French:	(1) parler (prod.), (2) appeler, (3) céder, (4) payer, (5) finir, (6) luire, (7) conduire, (8) assaillir, (9) sentir, (10) (c)ouvrir, (11) venir, (12) plaire, (13) perdre, (14) répondre, (15) plaindre, (16) connaître, (17) devoir
Italian:	(1) finire (prod.), (2) sentire, (3) coprire, (4) temere, (5) pacere, (6) perdere, (7) pèndere, (8) rispondere, (9) pi(a)ngere, (10) togliere, (11) concedere, (12) leggere (13) rigere, (14) crescere, (15) spargere (Dressler, 1999)

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In table (5) we can see that, while in the French conjugation we have 17 inflectional classes, the Italian inflection has only 15. Although the French conjugation seems to be more complex in this aspect, a difference of two extra inflectional classes is actually very small. An inflectional class is called a microclass, which is defined as "…the set of paradigms which share exactly the same morphological generalisations, but may differ via the application of phonological processes (in the sense of Natural Phonology)" (Aguirre & Dressler 2006:75f). Let us now compare these results with the Spanish inflectional classes.

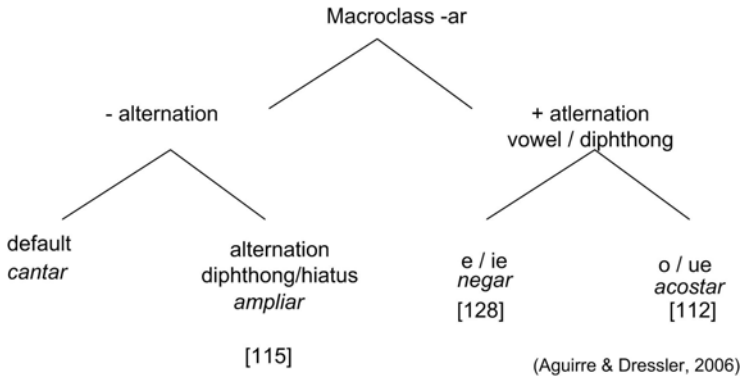

Figure 1. Macroclass with the theme vowel *–a–*.

The Spanish verbal inflection has three macroclasses. A macroclass is defined as "the highest, most general type of class, which comprises several (sub)classes or, at least, microclasses" (Aguirre & Dressler 2006:76). The only high productive macroclass in Spanish is characterized by the theme vowel *–**a***. In this class we have four microclasses (= inflectional classes). The second macroclass has two big subclasses, which are characterized with the theme vowels *–**e*** and *–i*.

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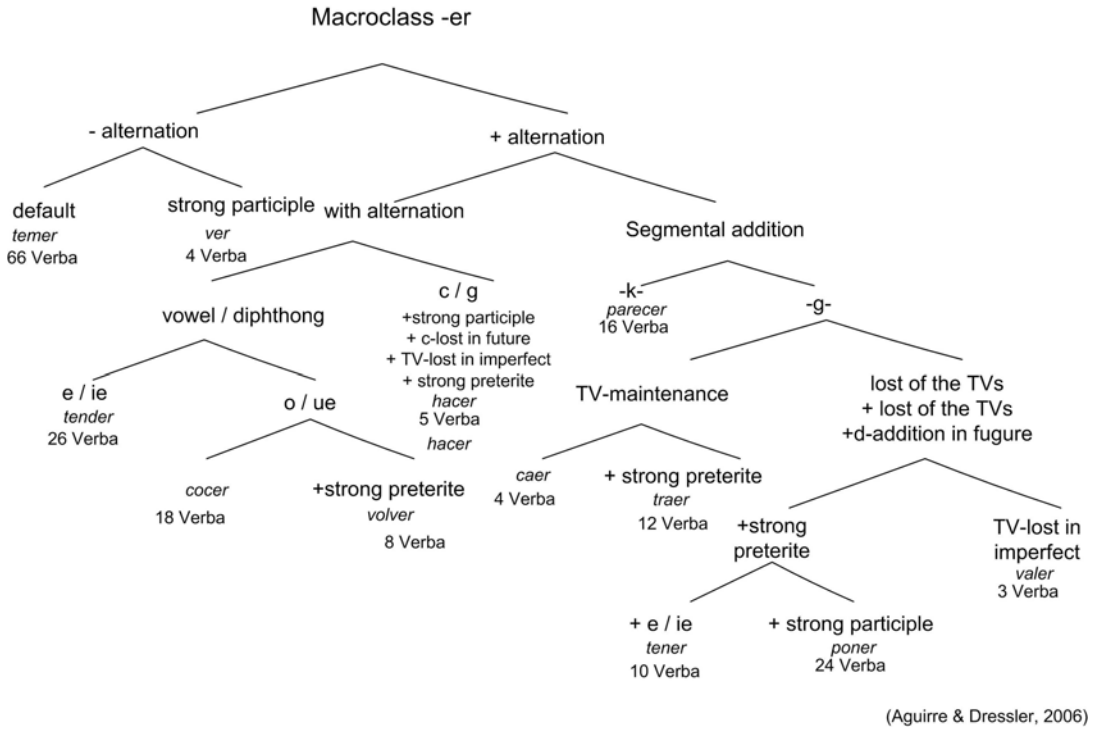

Figure 2. The first (slightly productive) subclass of the second macroclass.

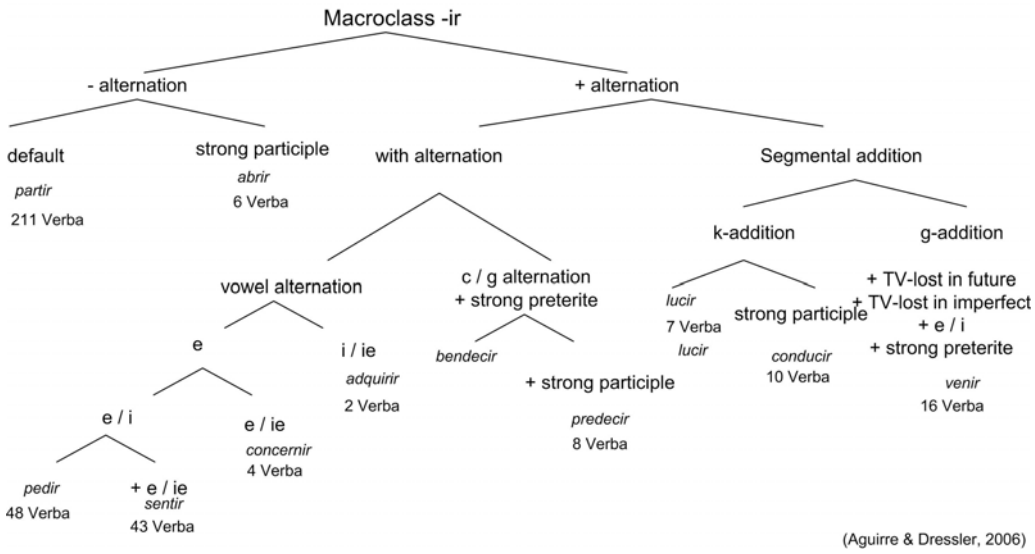

Figure 3. The unproductive second subclass of the second macroclass.

In the subclass with the theme vowel –*e*– we find a slightly productive microclass, which is *parecer* 'to seem', cf. Figure (2). This microclass is weakly productive because it only adopts indigenous neologisms. From the models *florecer* 'to flower' (*flor* 'flower'), *palidecer* 'to turn pale' (*pálido* 'pale') we can

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derive the verb *aguadecer* 'to turn watery' from *aguado* 'watery'. Taking both macroclasses of the Spanish conjugation (*-ar* & *-er, -ir*) we have 27 microclasses. This means that the complexity of the verbal inflection is much higher in Spanish than in Italian and French.

2.4. Modification of the notion of complexity

Dressler's concept of complexity entails all productive and unproductive patterns included in a morphological subsystem.

> "[l]l concetto della complessità di un sottosistema morfologico deve riferirsi alla conoscenza totale di questo sottosistema, quindi anche alle cateogorie, regole e microclassi non-produttive, ai paradigmi flessivi isolati (p.es. suppletivi o difettivi)." (Dressler 1999:589)

When talking about complexity we need to pay attention to the organization of the lexicon in the brain. Taking into consideration Dressler's differentiation between static and dynamic morphology we should reconsider the definition of complexity. Dressler makes emphasis on the lexical storage involved in the static morphological component of a language, cf. Kilani-Schoch & Dressler (2005:218). We can assume here that the memorization of words is a very complex process for language learners and users.

The phenomenon of overgeneralization – which is omnipresent in small children throughout the language acquisition process and in adults during the language learning course of action – shows us that productive patterns are quickly mastered. Overgeneralization occurs because unproductive patterns become assimilated following a productive pattern. Here we can present some typical errors of language learners that show the special difficulty that productive patters involve: Who has not heard English learners saying *eated* or *broked*? Likewise, German learners come up with errors like *geschreibt* 'wrote', *gerennt* 'ran' instead of the standard forms *geschrieben* und *gerannt*. In Austrian German we can often find people saying *gewest* 'was' or *gedenkt* 'thought' instead of the standard forms *gewesen*, *gedacht*. The most common overgeneralizations are adaptations of some unproductive patterns into a productive one. This is a crosslinguistic

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phenomenon.In view of this it is reasonable to include the static morphological component into the concept of complexity. This would be in accordance with Dressler, when he emphasizes that a great part of the morphological complexity is stored in the lexicon:

> "[G]ran parte della complessità mofologica viene immagarrinata nel lessico e non nel modulo morfologico, il quale – e questa è la mia ipotesi di lavoro – contiene solo regole produttive." (Dressler, 1999:589)

Another argument for this modification of the concept of complexity is the economy principle, which Dressler indirectly acknowledges. He points out that only productive patterns can fulfill the function of morphology, which he describes as the morphotactic and morphosemantic motivation. "[P]erché solo un meccanismo produttivo può produrre l'economia risultante dalla motivazione" (Dressler, 1999:594). This author adds that the function of inflectional morphology is to prepare inflected forms for syntax.

By considering the organization of the lexicon with its subpart of stored lexical entries and the disfunctionality of unproductive morphological patterns we believe that complexity and unproductive morphology are strongly related. Following this we propose a modification of the notion of Dressler's morphological complexity by equating complexity with the unproductive morphology. In this sense, morphological complexity and static morphology would be the same.

3. Conclusions

Firstly, by defining complexity into linguistic terms we can notice that stereotypes, such as 'German is a difficult language' are untenable. A language is a system that is composed of many subsystems, subsubsystems, etc. These (sub)systems are often called (sub)modules. Each particular (sub)module should be measured according to its own level of complexity.

Secondly, after presenting Dressler's concept of morphological complexity we come to the conclusion that it is necessary to make a modification of this notion. We are proposing to measure productivity according to the unproductive

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patterns of a language. The similarity between morphological complexity and unproductive morphology is supported by external evidence. In the areas of language acquisition and language learners we find that language users show special difficulties to learn the unproductive pattern of the given language. From a very early stage of the acquisition process on they start generalizing the productive forms. Generalization of unproductive patterns does occur as well, but this occurs very rarely.

Thirdly, if the function of morphology is the morphotactic and morphosemantic motivation of words and word forms then we can understand why the unproductive patterns present such difficulties for language learners. Unproductive morphology presents a very high complexity level because it basically lacks this function.

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Biodata

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