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WHAT IS NATURAL MORPHOLOGY? THE STATE OF THE ART

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The article is a survey of Natural Morphology's main tenets, particularly focussing on the notions of 'parameter' and 'implicational scale'. The parameters of Natural Morphology represent the formalisation of functions and semiotic principles, which derive from the extralinguistic bases assumed by a functionalist and semiotic model of morphological theory. The specific set of morphological parameters that the author briefly illustrates was first proposed in Crocco Galeas (1998). The exemplification of the parameter of diagrammaticity mainly follows from Dressler's (1985) approach to the theory of Natural Morphology.

0. Introduction

From the middle of the seventies, a theory of Natural Morphology has been developing in Europe, inspired by David Stampe's theoretical approach to phonology[1]. Natural Phonology contributed to a novel orientation not only in phonological theory but also in the areas of morphology, textlinguistics, and syntax. Today we can speak of naturalism in linguistic thought[2] where the concept of naturalness can be applied within and across the different components of grammar.

The first comprehensive publication on Natural Morphology is Dressier, Mayerthaler, Panagl & Wurzel (1987) which offers a systematic presentation of the three distinctive approaches to the theory of Natural Morphology:

1. Since its inception the theory of Natural Phonology has been closely connected with the name of David Stampe. The first, mostly unpublished, studies by him were given at conferences in the late 60's. See also Stampe (1969, 1979). The first major work done by someone other than Stampe is Patricia Donegan's dissertation on vowel systems. The most comprehensive and accessible presentation of the theory is Donegan & Stampe (1979). See also Donegan & Stampe (1978).
2. Cf. Luschützky'1991 extensive bibliography.

Dressler's semiotic functionalism, Mayerthaler's use of markedness, and Wurzel's naturalness and congruity. This article contains a survey of most basic concepts of Natural Morphology from the angle of Dressler's model. It is not my intention here to deliver a complete introduction to the theory of Natural Morphology. I will only provide a brief sketch in order to clarify some main issues - among these, the notion of parameter, which I have particularly dealt with.

1. Naturalness

Natural Morphology is the morphological theory of Natural Linguistics[3]. The concept of naturalness is the fundamental feature of Natural Linguistics. Naturalness must not be equated with frequency, concreteness, simplicity, or intuitive plausibility. Instead, it is a basic principle of a linguistic approach that relies strictly on empirical evidence. The notion of 'naturalness' remains vague and pretheoretical until we connect it to that of 'markedness'. In order to explain the interrelation between naturalness and markedness let us start with five observations (cf. Mayerthaler 1981: 2).

1) Not all morphological processes and structures are equally distributed in natural languages. For instance, as far as affixation is concerned, suffixes are cross-linguistically more frequent than prefixes (cf. Cutler et al. 1985). A language may lack prefixes altogether (as is the case of Turkish) but if it has just one kind of affix then it is the suffix.

2) Not all morphological structures are acquired by children at the same time. High-frequency suppletive paradigms, for instance, are acquired later then regular ones in first language acquisition (cf. Slobin 1971, Chini & Crocco Galeas 1995). Children first use irregular forms by rote-learning (cf. Mac-Whinney 1978); later, as their analytical capacities increase and regular paradigms are progressively organised, they drop those early irregular forms and substitute them with 'regularised' morphological structures e.g. Eng. *goed* instead of *went* (e.g. Berko 1958, Ervin 1964). Finally, they abandon the regularised structures *(goed)* and acquire the adults' suppletive forms *(went).*

3) Not all morphological structures are equally affected by language change. Suppletion is a relatively rare and unproductive morphological operation (Dressier 1985c, 1986), e.g. Eng. *be, am, is, was,* etc., Eng. *father-* paternal.*

3. Among the most significant illustrations of Natural Morphology see Mayerthaler (1981). Wurzel (1984), Dressier (1985a), Dressier et al. (1987), Kilani-Schoch (1988), Wurzel (1994a, b), Crocco Galèas (1995, 1997, 1998), LuschUtzky (forthcoming).

Fr. *œil* 'eye' → *oculaire* 'ocular', It. *occhio* 'eye' → *oculare* 'ocular'. One would therefore expect language change to suppress suppletive forms. However language change does not always move in the direction of greater efficiency - it is typologically dependent. In fact, since inflecting languages show more suppletion than agglutinating languages, a language which changes from one type to the other increases or decreases its amount of suppletion accordingly. Estonian has become an inflecting language in contrast to cognate Finnish and Hungarian, and it has more suppletion. On the other hand. Tokharian has become an agglutinating language in contrast to cognate Latin, Greek. Russian, German and it has less suppletion.

4) Not all morphological processes and structures are equally impaired by language disorders. Aphasics handle more transparent complex words better than less transparent ones (Dressier & Denes 1988). For example, *reader* in the sense of 'someone who reads' is more transparent/compositional/descriptive than *reader as* 'a position in a British university'. Indeed, the degree of morphosemantic transparency of a compound or derivative equals the degree to which the meanings of the parts (i.e. *read, -er)* yield the meaning of the whole. We can thus predict that in aphasia the opaque (i.e. non-compositional) meaning of the complex word *reader* should be hard to process whether in production or perception.

5) Not all morphological structures are equally easy to decode. Non-biunique or ambiguous complex words, that is to say words not complying with the principle 'one meaning - one form' require much more effort in morphological processing. For instance, Italian has at least three suffixes to express agent nouns e.g. -fore : *importare* 'to import' → *importa-tore* 'importer', *-nte : militare* 'to militate' → *milita-nte* "militant', *-ino: imbiancare* 'to whitewash' → *imbianch-ino* 'whitewasher'. However each of these suffixes represents other meanings. For example, all of them can express instrument nouns. In particular, the suffix *-ino* also derives relational adjectives, nouns/adjectives denoting ethnic groups, and diminutives. Thus, Natural Morphology predicts that an ambiguous suffix like *-ino* should be decoded with much more difficulty than a biunique suffix like, for instance, It. *-ificio* (cf. *calzature* 'footwear' → *calzatur-ificio* 'shoe factory', *zucchero* 'sugar' → *zuccher-ificio* 'sugar refinery'), which only has the meaning 'factory'.

Given this situation, naturalists make the following hypothesis: a morphological process or a morphological structure is natural if it is (a) widely distributed and/or (b) acquired relatively early and/or (c) relatively resistant to language change or develops frequently by language change and/or (d) is relatively less likely to be impaired by language disorders and/or (e) is relatively easy to decode. The degree of naturalness assigned to processes and structures is in

inverse proportion to the degree of markedness: a morphological phenomenon is more natural the less marked it is, and vice versa.

2. Extralinguistic foundations of Natural Morphology

Naturalists explain the complementary notions of 'naturalness' and 'markedness' in relation to extralinguistic bases of language. Extralinguistic foundations (= *causa materialis)* are best divided into two types (Dressier 1985a: 286): 1) neurobiological (including psychological) bases and 2) socio-communicative (including socio-psychological) bases. Extralinguistic factors either determine/prohibit or favour/disfavour conceivable properties of linguistic structure. Such extralinguistic constraints are relative, not absolute. They do not exclude marked (or unnatural) phenomena but predispose language users to avoid them. For instance, the highly unnatural morphological operation of suppletion is very limited in the languages of the world. It is relatively more frequent only in inflecting languages though restricted to very few morpholexical domains (e.g. few basic verbs, ethnical nouns, numerals from one to ten, etc.).

The first set of extralinguistic bases includes psychological limitations of perception and receptive processing, limitations of memory, restrictions on storage or on retrieval of information, on selective attention while producing and perceiving, etc. The second set has to do with the communicative function of language. For instance the relation between optimal perceptual contrast (or processing ease for the hearer) and articulatory effort presupposes the speaker's empathy with the hearer's receptive role (cf. Clark 1996).

The role of extralinguistic factors must be regarded from the perspective of the prototypical speaker. Indeed, the specific and universal properties of language users impose a certain number of constraints on the linguistic means that are available. This is tantamount to saying that extralinguistic factors delimit the range of possible morphological techniques and operations by enhancing some of them and inhibiting others. Given these premises, human capacities determine which operations are more or less natural according to a universal hierarchy. In this sense, what is easier for the potential language user is what is called natural. Naturalness is therefore a universal notion assumed by a universal linguistic theory based on the concept of markedness. In fact, morphological phenomena are natural if they are minimally marked or not marked at all. On the other hand, unnatural phenomena are morphologically marked. Nevertheless the theory of markedness is only a part of the theory of Natural Morphology.

3. The theory of Natural Morphology: The quintuple

Natural morphologists agree on positing five levels of linguistic analysis (Dressier et al. 1987: 8-12): 1) The level of linguistic universals or the human language faculty; 2) the level of language types; 3) the level of language-specific competence; 4) the level of norm, and 5) that of performance. Natural Morphology particularly deals with the first three levels of analysis.

3.1. First level: The universals

The level of universals is modelled on markedness theory or a special case of preference theory (cf. Vennemann 1983). It comprises functions, operations, and principles, which can be assigned to parameters of naturalness. These parameters can be given the form of implicational scales from most to least natural. Since extralinguistic factors do not underdetermine linguistic structure, but limit the choice of linguistic (i.e. morphological) techniques open to languages, a linguistic preference theory must refer to extralinguistic facts. I will describe the level of universals in greater detail in § 6.

3.2. Second level: The morphological types

The level of language types is modelled by typological theory (cf. Skalicka 1979 for the notion of language type as an ideal construct) and it filters the level of universals. In fact, universal properties are the basis of typological properties, i.e. they are restricted by the constellation of choices of a linguistic type. Language types (e.g. isolating, agglutinating, inflecting, introflecting, and polysynthetic) cannot always select the best morphological procedures of each naturalness scale due to the dialectical conflicts that characterise language systems. Thus, a language type is constituted by specific choices from the naturalness scales. Each language type 'sacrifices', as it were, naturalness in some parameters for the sake of greater naturalness in other parameters. For instance, agglutinating languages choose the most natural options from the parameters of diagrammaticity, morphotactic transparency, and morphosemantic transparency, but they 'sacrifice' the parameters of indexicality and that of size of signans. On the other hand, inflecting and introflecting languages often achieve optimal indexicality because of their fusionality, and the size of their complex words / word-forms is natural, i.e. non-marked. Yet, because of several typical phenomena - allomorphy, empty morphs, redundancy of exponence, etc., these languages do not normally select the first thresholds from the parameters of diagrammaticity, morphotactic trans-

parency, and morphosemantic transparency.

3.3. Third level: System-adequacy

The level of language-specific competence is modelled in a theory of system congruity (Wurzel 1984). Within any given language, a language type is realised according to the system-structural defining properties of each language. A morphological phenomenon (inflectional class, paradigm, a morphological form, marker, or rule) may be rather unnatural in terms of universal markedness theory, but at the same time it may be very 'normal' within the language-specific system in terms of system-adequacy. So, for instance, it is more 'normal' for German that a monosyllabic masculine is inflected according to the e-plural class (e.g. *der Hund* 'the dog' → *die Hund-e)* and not the n-plural class (e.g. *der Bär* 'the bear' → *die Bär-en),* and a monosyllabic feminine according to the η-plural (e.g. *die Bahn* 'the train' → *die Bahn-en)* and not the e-plural class (e.g. *die Maus* 'the mouse' → *die Mäus-e)* and not vice versa. Diachronic transitions, in fact, are from the π-plural class to e-plural class for the masculines (cf. *der Hahn* 'the cockerel' : *die Hähn-e)* and from the e-plural class to the n-plural class for the feminines (e.g. *die Burg* 'the castle : *die Burg-en).* In general, it is possible to claim that universal morphological naturalness favours the development and retention of inflectional systems which - according to their typological properties - follow the principles and parameters of diagrammaticity, morphotactic transparency, biuniqueness. etc. In comparison, morphological normalcy always seems to favour language specific traits of inflectional systems, irrespective of the universal properties of such systems.

4. The semiotic metalevel

Besides the universal, the typological, and the systemic level, Natural Morphology regards semiotics as a superordinate framework or metalevel. Language is a system of verbal signs serving two main functions: 1) It enables man to communicate better than with non-verbal signs, 2) it supports and guides cognition better than with non-verbal signs. Thus, because of the communicative and cognitive functions, man's verbal and non-verbal systems nay be compared. Since semiotics is the theoretical and practical study of iigns (both verbal and non-verbal), it represents a good candidate to supply a neta-theory of Natural Phonology, Natural Morphology, etc. Semiotics, herefore, serves as the basic framework underlying the notion of naturalness

itself and the functionalist approach of naturalism (see below § 5.).

Naturalists draw particularly on the semiotic theory of Charles S. Peirce. According to Peirce, a sign consists of something (= signans) which stands to somebody (= interpreter) for something (= signatum) in some respect or capacity (= interpretant). Thus we have four aspects of a sign:

1) the interpreter is the user of the sign when inventing, producing, perceiving, processing, evaluating or storing it;

2) the signatum is what is expressed in the sign;

3) the signans is what expresses the signatum;

4) the interpretant is 'the idea to which a sign gives rise'.

When we use a complex word (e.g. *(he) rewrites)* the phones or allophones [riraits] are signantia of the phonemes /riraits/ and these, in turn, are the related signata. The phonemes and their respective (allo)phones are signs on the signs of morphemes whose morphs (e.g. re-, *write, -s)* are signantia and whose signata are lexical meaning /WRITE/, derivational meaning /REPETITION/, and inflectional meaning /3rd PERSON SINGULAR PRESENT/. Morphemes are again signs on the signs of words. In our example, the signans of the complex word is *rewrites* and its signatum is the meaning of *(he) rewrites.*

Peircean semiotics particularly focuses on the opposition 'natural / conventional'. This same opposition is also the crux of the theory of naturalness. Ferdinand de Saussure claimed that the relation between the two constitutive parts of the sign is arbitrary. Peirce, on the other hand, distinguished between various types of signs according to the relation that connects signans and signatum. Among the several classifications introduced by Peirce, the one that plays a crucial role in Natural Morphology is the triad of symbol, index, and icon.

According to Peirce, a symbol is a sign that refers to its object through a conventional or habitual link. The link or rule that connects a symbol to its referent must be known by the interpreter of the sign in order to be able to use and understand it. A linguistic symbol consists of a signans representing a signatum determined by convention. All linguistic signs are symbols. Nevertheless Peirce stresses at least two other semiotic aspects that are also identifiable in a number of linguistic signs. Indeed, besides the definition of symbol, Peirce also gives a semiotic definition of index and icon.

An index is a sign that directly points to its object without describing it. From an index, an interpreter can infer the existence of a given object. A linguistic index is therefore any sign whose primary function is to signal another

sign. Demonstratives, pronouns, proper nouns, and grammatical morphemes are typical indices in language.

There is a third type of sign important for the theory of Natural Morphology: it is the icon. According to Peirce an icon is a sign exhibiting a resemblance with the object it denotes. An iconic sign in language is one whose signans shows a relation of similarity or analogy with its signatum. Icons are the most natural signs. As Peirce (1965.II: 158) states, 'the only way of directly communicating an idea is by means of an icon' because in icons there is an intrinsic connection between signans and signatum. In relation to the degree of similarity between signans and signatum, Peirce distinguishes three subtypes of icons: images, diagrams, and metaphors. Images are the most natural icons. Metaphors are the least 'iconic' icons.

An image is an icon representing directly the features of an object. A photograph is a typical image of what it represents. In language, images are mainly onomatopoeic words (e.g. *to twitter),* i.e. words imitating by the structure of their signans the sound of bird cries, objects, etc.

Diagrams are icons 'which represent the relations, mainly dyadic, or so regarded, of the parts of one thing by analogous relations in their own parts' (Peirce 1965 II: 157). For example, a paper pattern reproduces the parts of a suit or other article of clothing. The person who makes a suit, therefore, follows the scheme or model given by the paper pattern. He/she pays particularly attention to the relations among the paper pieces, in order to cut the cloth and sew it. Thus, a paper pattern is a good example of a diagram, since it reproduces by analogy the parts of an object, i.e. a suit that can be regarded as the referent of the diagrammatic icon. Similarly, a verbal diagram is an icon showing analogy of structure between signans and signatum. Its degree of iconicity lies between that of images and metaphors. Nevertheless diagrams are most important for Natural Morphology. Although their degree of iconicity is intermediate, it seems that all components of language share some fundamental traits of diagrammaticity. The general notion of structural isomorphism in language is substantially referable to the concept of diagrammatic relation between signans and signatum. In morphology, the role of iconicity is relevant (cf. Jakobson 1971). Starting from the observation that many morphological signs exhibit a relation of equivalence between signans and signatum, it is easy to find numerous examples in this respect. For instance, Indo-European languages express the three degrees of adjectives, i.e. positive, comparative, and superlative, by a gradual increase in the number of phonemes, e.g. Lat. *clar-us* 'famous' - *clar-ior* 'more famous' - *clar-issimus* 'most famous'. In this way the shape of the signantia reflects the intensity of the gradation conveyed by the signata.

A metaphor is an iconic sign characterised by similarity to its object. For instance, a tarot card showing sticks is a metaphor of a forest. In an analogous manner, a verbal metaphor is an iconic sign exhibiting some parallelism or partial similarity between signans and signatum. All types of morphological conversion (e.g. Eng. *bottle* → *to bottle, to run* → a *run)* are metaphors insofar as they show parallel signantia mapped onto different although morphologically related signata.

From each type and subtype of sign an adequate semiotic principle is deducible, expressing all the features that characterise the corresponding sign. Thus, the principle of symbolisation derives from symbol, the principle of indexicality derives from index, the principle of iconicity derives from icon, etc. Natural Morphology derives its morphological parameters from a number of semiotic principles which mostly originate from the types of signs Peirce distinguishes. For instance, the morphological parameter of diagrammaticity derives from the semiotic principle of constructional iconicity, which in turn is elaborated according to Peirce's definition of diagram.

5. **The functionalist approach of Natural Morphology**

The emphasis on a semiotic metalevel is closely related to the functionalist/teleological approach of naturalism. The theory of Natural Morphology is functionalist insofar as it explicitly distinguishes functions and operations serving these functions. In this respect the functionalist model of Natural Morphology diverges from that of André Martinet and is much more similar to the approach proposed by Hans-Jakob Seiler and his group in Cologne. In fact, analogously to Seller's UNITYP model, Natural Morphology regards language as a problem-solving system and refers to the three levels of universals, typology, and language-specific system (cf. Seiler 1978a, 1978b, 1979).

According to the functionalist postulate, language is a tool for communication and cognition. Since communication is goal-oriented, linguistic theory must provide functional explanation of language aspects. In this regard, unlike Martinet's functionalist means-ends model, Natural Morphology takes into due account the phenomenon of multicausality. Therefore, in adopting functional explanation, adherents of naturalism recognise that one function can be served by several operations (multiple strategies) and one operation may serve several functions simultaneously (multifunctionality). For instance, the main function of word-formation is lexical enrichment. This is achieved through some morphological techniques such as derivation, compounding, conversion. We can therefore say that the function of lexical enrichment is

served by numerous techniques and operations (e.g. the technique of derivation can be realised via a number of operations such as suffixation, prefixation, etc.). On the other hand, one operation like suffixation can fulfil not only the function of lexical enrichment but also that of deriving inflectional word-forms.

Language change is crucial in functional explanation. If one assumes that individuals use a determinate operation for communicative functions, then the speech community as a whole will try to improve the type of operation serving these functions. Thus, language change can be regarded as the inevitable result of such a tendency towards increased efficiency. Yet, not every diachronic change enhances communicative efficiency: in other words, languages, as whole, do not become more and more efficient throughout their diachronic development. Therefore, the type of functional explanation invoked by Natural Morphology presupposes the existence of goal conflict. What is more efficient, i.e. more natural for some reasons, is less natural for other reasons. For instance, phonological naturalness comes into conflict with morphological naturalness and this in turn with lexical naturalness. Consequently, language change does not necessarily imply better serving of functions. After the change some functions are served better, some worse. Functional optimisation is in fact local, not global.

5.1. The functions of the morphological component

There are four main functions that characterise the morphological component.

1) The first function of word-formation is lexical enrichment via morphologically derived words.

2) The first function of inflectional morphology is to express syntactic categories via morphologically derived word-forms.

3, 4) The second function of both word-formation and inflection is to motivate derived words / word-forms both morphotactically and morphosemantically.

Consequently, all morphological phenomena must be related, directly or indirectly, to at least one of these functions as well as to semiotic principles. These four functions and a small number of interconnected semiotic principles are the basis of the universal parameters of naturalness / markedness, i.e. constitute the universals of the first level of the Natural Morphology model.

6. The universals of the theory of Natural Morphology

The universals comprise main functions (i.e. communicative and cognitive functions respectively), subordinate subfunctions specific to each language component (e.g. morphotactic and morphosemantic motivation of complex words), and some semiotic principles (e.g. the principle of diagrammaticity) largely deduced from the Peircean triad of legisigns: symbols, icons, and indices. The level of universals also corresponds to the operations realising the different functions (e.g. suffixation).

Functions are determined by the neurobiological and sociocommunicative constitutive traits of human beings. This means that universals have undeniable extralinguistic bases. Consequently, functional explanations of the type admitted by Natural Morphology consist of relating a given morphological phenomenon to either neurobiological (including psychological) or sociocommunicational factors or indeed to both.

As we have seen, each level of the quintuple (see § 3.) is formalised through a specific subtheory. The level of universals is formalised in universal markedness theory. According to this universal theory, any linguistic phenomenon is said to be natural when it is unmarked or relatively less marked. More or less natural, as well as more or less unmarked, means more or less easy for the human brain. Therefore, naturalness is not a binary classificatory predicate (the opposite value being unnaturalness) but a gradient predicate. 'Natural' in the sense of Natural Morphology is not a value but a relation. We speak of naturalness and/or markedness relations. Similarly, (un)marked in the sense of Natural Morphology is an evaluative order relation, not a descriptive predicate of an idealised grammar.

Due to the gradient character of naturalness, universals of morphological naturalness are expressed in historical languages through preferences. This entails that some morphological forms, techniques, operations, and rules are preferred because they are natural. In this respect, I will give an example, which is often cited by naturalists. Assuming that the category of plurality is encoded morphologically in a given language, morphological naturalness predicts that it should be encoded by means of an overt marker or morpheme. This is a preference largely attested cross-linguistically. It is due to the relevant tendency to reflect iconically the addition of intensional meaning by the addition of phonological material. Therefore, if and only if plurality is indexed by a sign, the encoding will correspond to the naturalness preferences predicted by Natural Morphology. In other words, the encoding can be called natural or unmarked. On the contrary, if the requirement of overt sign is not fulfilled, then the type of encoding will be called unnatural or marked. A plural

form like Eng. *sheep is* unnatural or marked because, unlike most plural forms in English, it is 'featureless' (= Germ, *merkmallos).* The regular plural, in fact, is always 'featured' (= Germ, *merkmalhaft),* e.g. *ships,* and for this reason it is natural or unmarked. From this example, it is also evident that 'marked' is not necessarily synonymous with 'featured'.

As I have pointed out, morphological universals are formalised in a theory of naturalness / markedness. The relationality or gradiency of the concept of naturalness is motivated by the existence of varying degrees of ease for human brain, namely that some things are easier to handle than others (e.g. suffixation is more natural than circumfixation, namely discontinuous morphs). Therefore, the theory of naturalness entails a theory of preference, which, in turn, forms the basis of a system of predictions. For instance, since according to morphological naturalness universals, featureless nominative forms are unmarked, we can predict (a) that featured nominatives will be acquired later, (b) that they will be cross-linguistically infrequent, (c) that there should be languages with featureless nominatives but without featured nominatives, (d) that in languages having featured nominatives their type and token frequency should be limited.

7. The parameters of universal naturalness

The level of universals is modelled by the theory of naturalness/markedness in a number of parameters. Thus, the parameters of Natural Morphology represent the formalisation of functions and semiotic principles, which derive from the extralinguistic bases assumed by a functionalist and semiotic model of morphological theory.

The parameters of morphological naturalness/markedness express the preferences or tendencies of historical languages in the choice of morphological techniques, operations, and rules. Since the range of options within a single parameter goes from a maximum to a minimum of naturalness, the resulting gradient is a scale which has a most natural threshold and a least natural pole. In this sense, each parameter can be viewed as a scalarised factor of the morphological component.

A factor is, by definition, a morphological universal, whether deduced from a function or a semiotic principle or an operation. A factor is not only a universal but, at the same time, is also an essential point in the description and explanation of morphology. Any factor of morphological analysis is rooted in the morphological component, and this, in turn, due to the functionalist approach of Natural Morphology, is shaped in accordance with the system of

features that characterise human beings. Hence, a parameterised factor constitutes both an object of reality and a tool of interpretation.

Parameterisation consists mainly of the elaboration of semiotic principles in the format of superordinate hermeneutic means of linguistic behaviour. The semiotic principles, which are among the most relevant parameterised factors, derive from Peircean semiotic theory.

Parameters are scalarised factors, i.e. gradually distributed sequences of options. Thus, scalarity instead of binarity is the direct consequence of the gradual and relational character of universal naturalness / markedness. In effect, a parameter arranges in a scalar dimension all the universal possibilities conceivable between two opposite poles. Thus, a parameter is an ordered series of morphological realisations elaborated in the format of an implicational scale of naturalness/markedness.

As I have already emphasised, languages do not always select the most natural realisations on every scale. This depends upon the language type to which a specific language conforms. Indeed, a type mediates between universal naturalness and system-adequacy. However, in every language type, the unnatural selections on some scales are balanced by the very natural options on other scales.

The parameters of morphological naturalness which are represented in the format of an implicational scale are eleven in number (cf. Crocco Galeas 1998).

1) *Diagrammaticity.* The parameter of diagrammaticity (or constructional iconicity) derives from the semiotic principle of diagrammaticity. Therefore it is a typical instantiation of the principle of iconicity. Diagrammaticity entails a relation of biuniqueness between segmentability of signans and compositionality of signatum. (For the relevant examples see below § 8.).

2) *Morphotactic transparency.* This parameter derives from the principle of semiotic transparency, which, in other terms, is the principle favouring the ease of both production and perception in the realisation of complex words. By morphotactic transparency naturalists mean the factor of boundary recognisability which relates with the morphemic segmentation of a complex word. For instance, Turk, *çocuk* 'child' → *çocuk-lar* 'children', It. *prendere* 'to take' -> *ri-prendere* 'to take again' are transparent complex words, as one can easily segment the affix from the base. On the other hand, Eng. *public* → *public-ity* is a less transparent derivative because the base *public* is blurred by the intervention of an allomorphic rule of palatalisation. Even less transparent, i.e. relatively opaque is Eng. *to delude* → *delus-ion* with fusion at the morphemic boundary. Most opaque is suppletion, e.g. Eng. *to be, am, is, are,* etc.

3) *Morphosemantic transparency.* The semiotic principle underlying the parameter of morphosemantic transparency is the so-called Fregean principle of compositionality of meaning. On the basis of this principle, we assume that the meaning of a complex word is a function of the meaning of its constitutive parts. For instance, compound nouns like Eng. *teacup,* Germ. *Hausarbeit* 'housework', etc. are totally compositional, namely morphosemantically transparent. On the other hand, compound nouns like Eng. *telephone box,* Germ. *Rosenkranz* 'rosary' (literally 'rose crown') are morphosemantically opaque because they are Iexicalised items.

4) *Uniformity.* This parameter (like (5) and (6) below) can be deduced from the semiotic principle of relational invariance, i.e. the relation between the two complementary faces of a complex sign. In particular, the parameter of uniformity regards the structure of sign from the point of view of signatum. A uniform sign is a sign whose signatum is expressed by a single signans. In English, for instance, the progressive aspect is encoded only by the gerund suffix *-ing,* which is therefore a uniform encoding from signatum to signans. On the other hand, in English the superlative degree of adjectives is not only expressed by the suffix *-est* (e.g. *dear* → *dear-est)* but also by suppletive forms (e.g. *bad* → *worst)* and analytical encoding (e.g. *famous* → *most famous).* Thus, the signatum 'superlative' is not realised in a uniform manner.

5) *Transparency of encoding.* This parameter also derives from the semiotic principle of relational invariance. It is the inverse of the parameter of uniformity. Transparency of encoding implies that the semiotic perspective be the signans of a sign. There is transparent encoding if a given signans represents one and only one signatum. Instead, opaque encoding entails more than one signatum for one signans. In Italian, the inflectional suffix -ss- ([s:]) for the Imperfect subjunctive of all three conjugations (e.g. *am-a-ss-i, ten-e-ss-i, dorm-i-ss-i)* is a good example of transparent encoding - one signans represents one and only one signatum. On the other hand, in German the suffix *-icht* which is used to form neuter collective denominal (e.g. *Rohr* 'reed' → *Rohr-icht* 'bed of reeds') or deverbal (e.g. *spülen* 'to wash up' → *Spü-icht* 'dishwater') nouns, is not a transparent signatum, since the derivational semantic meaning of 'collectiveness' is also conveyed by the suffixes and suffixoids *-heit* (e.g. *Mensch-heit* 'humanity'), *-schaft* (e.g. *Kollegen-schaft* 'people from the office'), *-turn* (e.g. *Bürger-tum* 'citizens'), *-werk* (e.g. *Laub-werk* 'foliage'), and *-wesen* (e.g. *Schul-wesen* 'school-system').

6) *Biuniqueness.* Biuniqueness is the third parameter of relational invariance between signans and signatum. In the case of biuniqueness the viewpoint from which the relation is regarded is double or complementary. In fact, the semiotic relation of invariance is simultaneously evaluated form both signans

and signatum. This implies that a complex sign is biunique if and only if each part of its signans expresses always and only its corresponding signatum. For instance, in Modern Greek the prefix *is-* conveys just one semantic matrix i.e. 'movement toward or in a place', vice versa, this semantic matrix is only rendered derivationally by the prefix *is-* (e.g. *pnoí* "breath' → *is-pnoí* 'inhalation'). On the contrary, there is lack of biuniqueness in the case of the English suffix *-en* which can derive de-adjectival verbs (e.g. *short* → *short-en)* but is also the past participle suffix of many strong verbs (e.g. *to write* → *writt-en).*

7) *Indexicality.* The parameter of indexicality derives from that type of sign that Peirce calls index. The primary function of a verbal index is to signal another sign. According to Natural Morphology, an index is a less natural sign than an icon because of the lack of analogy between signans and signatum. In fact, we can observe that an indexical relation is mainly based upon a certain link of contiguity between the index and the indexed element, while on the contrary an iconic relation exhibits similarity or parallelism between signans and signatum. For instance, let us assume that in the word *explorations* the lexical morpheme *explore* is the indexed element while the derivational suffix *-ation* and the inflectional suffix -5 are both indices whose function is to signal the semantic content of the base *explore.* Given this situation, we are allowed to view the relation between the elements of a complex word as a relation of contiguity, i.e. a semiotic connection that lies upon a temporal-spatial dimension. The parameter of indexicality is a scalarised morphological factor that measures the capacity of a sign to refer itself to another sign. The most natural indices are the derivational morphemes, followed by the grammatical bound morphemes, which are less natural indices insofar as their content is more peripheral to that of the lexical morpheme. Even less natural types of index are free and semi-free morphemes, which constitute a wide range of third-degree indices in relation to the lexical morpheme they signal: adjectives and adverbs (= lexical indices), quantifiers and determiners (= less prototypical lexical indices), pre-/postpositions (= syntactic indices), classifiers and auxiliaries (= syntactic indices), pronouns and clitics with anaphoric/cataphoric function (= textual indices). The last and least natural degree of indexicality is represented by the syntagmatic context or phrasal collocation (see for instance all types of morphological metaphors, like conversions or zero-derivations)[4].

8) *Metaphoricity.* The semiotic principle of metaphoricity derives from that subtype of icon that Peirce calls metaphor. The parameter of metaphoricity (or morphometaphoricjty) allows the evaluation of complex signs (i.e. mor-

4. For more details on the parameter and the scale of indexicality see Crocco Galeas (2000 a).

phological metaphors) characterised by a partial similarity between signans and signatum. As a matter of fact, a morphological metaphor can be defined as semantically complex but morphotactically unanalysable. Therefore, there is no diagrammatic relation between a signatum resulting from an intensional addition or a modification of meaning and a signans that cannot be segmented. In other words, a morphological metaphor does not show analogy of structure between signans and signatum. In English, de-adjectival abstract nouns such as *young* → *the young, absurd* → *the absurd,* etc. are good examples of morphometaphorical nouns. On the other hand, English abstract nouns denoting feelings can either be sources of metaphoric verbalisations (e.g. *hate* → *to hate)* or targets of nominalisations (e.g. *to hate* → *hate).* Therefore, lack of a good criterion of directionality renders these nouns less typical instances of morphometaphoricity.

9) *Size of the signans.* On the basis of the semiotic principle of distinctiveness and salience of signs, complex words can be analysed through the parameter of the natural size (i.e. length) of the signans. The parameter allows complex signs to be distinguished according to the number of syllables. Since there are three types of signantia (i.e. lexical, derivational, and inflectional morphemes) co-occurring in the structure of complex words, we need to identify three different implicational scales for this parameter. For instance, on the basis of the scale of the lexical morpheme, we can predict that monosyllabic lexical morphemes are more natural hence more frequent than polysyllabic ones. These, in turn, are more natural than lexemes shorter than a syllable. Bound lexemes whose length is less than one syllable are cross-linguistically rare, but the roots of introflecting languages are typical non-syllabic bound lexemes (e.g. Arabic /ktb/ "to write", /f'l/ "to do"). They represent an unnatural morphological choice, since there is no mapping between the morphological unit (i.e. the lexeme) and the phonological unit (i.e. the syllable). In adopting consonantal roots as their morphological bases, Semitic language prefer introflection besides mere inflection. This preference is a consequence of a radical differentiation of functions between consonants and vowels in shaping lexical and grammatical morphemes. The scalarization of the parameter of size of signans is complex (see Crocco Galeas 1998, 2000b) and cannot be explained here. However it is very interesting and suggests further empirical research.

10) *Morphological base.* The semiotic principle underlying the parameter of the morphological base is that of lexical priority over morphology. In other words, lexical morphemes, whether free or bound, are primary signs because they are stored in the lexicon. Signs that constitute the semantic bulk of the lexicon are the best bases for morphological rules. The parameter of the

optimal base allows different types of morphological bases to be distinguished according to criteria of universal naturalness. Free or bound lexemes are most natural as morphological bases (e.g. It. *bar* 'coffee-bar' → *bar-ista* 'barman'. Lat. *equ-us* 'horse' → *equ-in-us* 'equine'). Complex words (e.g. Eng. *function-al* → *functional-ist)* are less natural bases for morphological rules. Syntagmata (or phrases) are even more unnatural (e.g. It. *pressappoco* 'approximately, roughly' lit. 'almost close to little' → *pressappoch-ist-a* 'careless, inaccurate person'). Non-lexical bound morphemes (i.e. affixes) represent the most unnatural type of morphological base (e.g. Germ, *miss-* [derivational prefix indicating disdain / contempt] + *-lich* [(in synchronic terms) derivational suffix for relational adjectives, cf. Eng. *-ly]* → *miß-lich* 'most regrettable'.

11) *Symbolicity.* The parameter of symbolicity derives from the semiotic principle of symbolicity. From a morphological perspective, we can regard as symbol any word which is semantically complex but morphotactically unanalysable. A symbol is a sign truly acting as a label. It is unmotivated because it is not morphemically segmentable and its signans is not articulated into a base and one or more affixes. In general, a symbolic sign is bereft of internal structure, and therefore, its signatum is not diagrammatically reflected by its signans. Prototypical symbols are (inflectional or derivational) suppletive words.

8. An example of parameterisation: diagrammaticity

The parameter of diagrammaticity (or constructional iconicity) is most important for the organization of the morphological component. It derives from the semiotic principle of diagrammaticity. Therefore, it is a typical instantiation of the principle of iconicity. In particular, diagrammaticity entails a relation of biuniqueness between segmentability of signans and compositionality of signatum. A diagrammatic word is perfectly segmentable and semantically motivated. In other terms, the transparency of its complex signans reflects the compositionality of its signatum.

For instance, *singer* is a diagrammatic derivative. It is an agent noun consisting of the lexical morpheme *sing,* which is properly a verbal base, and the derivational suffix - er. denoting an agent. The addition of signans, i.e. the suffix *-er* to the verbal base *sing* parallels the addition of meaning, i.e. the notion of agentivity to the action expressed by the verb *to sing.* Therefore, the morphological rule of affixation combines two levels. On the one hand, the derivational process adds intensional meaning (e.g. agency) to the

meaning of the base (e.g. *to sing).* By this combination, the global meaning of the complex word is perfectly motivated. On the other hand, the addition of expression (e.g. the suffix -er) reflects the semantic composition of the word. Thus, we can say that morphotactic transparency diagrams (i.e. reflects analogically) semantic compositionality.

Let us denote the semantic operation of addition with (A+B) and the corresponding morphotactic operation with (a+b). Then we can say that A (= the meaning of "sing") is conveyed symbolically / conventionally by a (= the morph *sing),* whereas B (= the meaning of "agency") is conveyed in an analogous way by b (= the suffix -er). By and large, the word *singer* is a symbol. Nevertheless, since it is semantically and morphotactically motivated by its verbal base and the agentive suffix, it is an iconic sign or, more specifically, a diagram.

Similarly, Turk, *kanunlarimizda* 'in our laws' is an inflected form characterised by a biunique structure. The word is analysable in the following manner:

1) a lexical base, *kanun* 'law';

2) the Plural suffix *-lar-*\

3) the Possessive suffix *-imiz* lst PI. Pers. Our' (which can be further segmented into *-im-,* lst Sg. Pers. 'my' and *-iz-* Plural suffix for Possessive endings);

4) the Locative case ending *-da.*

The sequence of morphs corresponds to the semantic composition. Thus, there is a biunique link connecting each morph to its meaning. The agglutinating morphological structure of this Turkish word fully exhibits analogy of signans and signatum. Turk, *kanunlarimizda* is therefore a good example of a diagrammatic word.

On the contrary, the degree of diagrammaticity is lower if a derivative and / or an inflected form show mere modification of the lexical base. i.e. without addition of signans. In this case, the addition of phonological sequence does not parallel the intensional addition of meaning in the morphological process of derivation or inflection. In fact, it is only a modification in the shape of the base morpheme, which realises the morphotactic aspect of the operation. For instance, denominal English verbs voicing the fricative consonant of the base are relatively less diagrammatic derivatives than affixed complex words, e.g. *advice → to advise.*

8.1. The scale of diagrammaticity

The scale of diagrammaticity comprises six degrees and some sub-degrees.

i. Agglutinative affixation

e.g. Eng. *pig* → *pig-let*
Eng. *sing* → *sing-er*

ii. Affixation + modification

e.g. a) Eng. *shelf* → *shelv-es*
b) It. *Vicenza* → *Vicent-ino* (ethnical noun)
c) It. *Chieti* → *Teat-ino* (ethnical noun)

iii. Modification

e.g. Germ. *Vater* 'father' → Väter 'fathers'

iv. Metaphoricity

e.g. Eng. *bottle*$_N$ → *to bottie*$_N$

v. Total suppletion

e.g. Eng. *go* → *went*

vi. Subtraction

e.g. Russ. *logika* 'logics' → logik 'logician'

8.1.1. First degree: Agglutinative affixation

The most natural degree of the scale of diagrammaticity is represented by agglutinative affixation, i.e. direct suffixation or prefixation onto the lexical base. Examples of this process are some Eng. suffixed action nouns, e.g. *to annul* → *annulment, to conceal* → *concealment,* etc. or some prefixed deverbal verbs, e.g. *to define* → *to predefine, to judge* → *to prejudge,* etc. These words are morphotactically transparent and semantically motivated, hence they are diagrammatic complex words.

8.1.2. Second degree: Affixation + modification

Both a process of affixation and a modification of the lexical morpheme realise the words of the second degree of the scale. Cases of apophony, metaphony, umlaut, consonant changes, and any kind of introflective phe-

nomenon exemplify modification, whether in inflection or derivation. In Eng. *shelf* → *shelv-es* there is a consonant modification, i.e. a morphonological rule affecting the final consonant of the lexeme. Moreover, the inflected word shows suffixation for plural formation. Therefore, diagrammaticity is still preserved by the operation of suffixation whereas morphotactic transparency is disturbed by the modification of the base signans. As diagrammaticity is the result of a parallelism of transparency between the sequence of morphs and the composition of meanings, complex words like *shelves* belong to a lower degree of diagrammaticity.

Weak suppletion (see ex. lib in § 8.1) constitutes a subtype of this degree. Suppletive weak forms that are also affixed belong to this level of the scale. For instance, a number of ethnical nouns in Italian are both characterised by weak suppletion of the lexeme and transparent suffixation, e.g. *Vicenza* → *Vicent-ino, Arezzo* → *Aret-ino* (vs. *Agnadello* → *Agnadell-ino).*

Another subtype of the second degree of diagrammaticity is given by suppletive strong alternations (see ex. lie in § 8.1) which, nevertheless, are combined with direct affixation. Again, Italian ethnical nouns can provide several examples of strong lexical suppletion and parallel transparent suffixation, e.g. *Chieti* → *Teat-ino.* In addition, verbal inflection in Italian also presents some significant cases of strong suppletive suffixed forms. For instance, *andare* 'to go' → *vad-o* 'I go', *va-i* 'you go' (2nd Sg.) beside non-suppletive forms *parlare* 'to speak' → *parl-o* 'I speak', *parl-i* 'you speak' (2nd Sg.).

8.1.3. Third degree: Modification

The third degree of the scale is less natural than the previous degrees (including all subtypes) because the quantity of diagrammaticity is minor. Words of the third degree are only formed via modification without affixation. For example, German has some plural forms characterised by umlaut, e.g. *Water* 'father' → *Water* PL, *Mutter* 'mother' → *Mutter* PI. On the other hand. German also has plural nouns derived by both umlaut and suffixation, e.g. *Stadt* 'town' → *Stadt-e* PI., *Baum* 'tree' -> *Baum-e* PI. (cf. *Tiir* 'door' → *Tiir-e* 'doors', etc.). These suffixed forms are more diagrammatic and, therefore, represent typical instances of the second degree of the scale.

8.1.4. Fourth degree: Metaphoricity

All words derived by the morphological technique of metaphoricity are referable to the semiotic principle of metaphoricity, i.e. a different instantiation of iconicity (see Crocco Galeas 1997, 1998). Diagrammaticity (or constructional

iconicity) requires a relation of biuniqueness between signans and signatum. Metaphoricity, on the other hand, entails the absence of any operation of affixation or modification. The inalterability of the base is a constant of all morphometaphorical rules. The output of a morphological metaphor has the same signans as the input. There is no intervention of any change with respect to the lexical base. Thus, the morphotactic level does not reflect the semantic modification. The numerous cases of denominal converted verbs in English represent a typical operation of morphometaphoricity, e.g. *bottle → to bottle, carpet → to carpet.* Conversion in English is not an aniconic operation. It is rather a metaphorical iconic operation deriving from the technique of morphometaphoricity.

8.1.5. Fifth degree: Total suppletion

Total suppletion[5], i.e. morphological irregular alternation without affixation is an aniconic operation subsumable under the technique of modification. Being aniconic it shows no diagrammaticity. This is a consequence of the lack of both morphemic segmentation and semantic compositionality. Total suppletion is altogether a rare and unproductive phenomenon, whose occurrence is cross-linguistically very restricted and limited to a few morpholexical domains only. Strong verbs in English are not quite good examples of total suppletion. Although they do not show segmentation into morphs (e.g. *to buy → bought),* they are adequately classifiable into types or schemes of weak suppletion (see Crocco Galeas 1991a). The verb *to be,* however, can be regarded as a genuine case of total suppletion, e.g. *to be → was, were.*

8.1.6. Sixth degree: Subtraction

The last degree of the scale is the least natural because it is represented by an anti-iconic operation, i.e. subtraction. Subtraction is a peculiar operation of the technique of modification. It consists in a modification of the lexical base via deletion of phonological material (Dressier 1984). The derivative or the

5. Within the framework of natural Morphology scholars have frequently tackled the topic of suppletion. Dressier (1985c, 1986) has dealt with both derivational and inflectional suppletion; Crocco Galèas (1991: 106-109) has proposed a scalar classification of suppletion based on a number of criteria, e.g. the concept of scheme and that of submorpheme; other naturalists who have treated this morphologically unnatural phenomenon are Wurzel (1985, 1990), Bittner (1988, 1990), Ronneberger-Sibold (1988). See also Melčuk (1976, 1994).

inflected form resulting through subtraction shows a reduction of the phonological shape of the base. The countericonicity of subtraction is decisive for its morphological unnaturalness. Subtracted word-forms contravene the principle of biuniqueness of form and meaning since the semantic addition is paralleled by a reduction in the phonological shape. Due to its intrinsic antidiagrammaticity, this operation of modification is rarely used in languages and is unproductive too. Besides the denominal nouns of Russian, belonging to a restricted domain (i.e. animate nouns denoting people engaged in scientific disciplines, e.g. *logika* 'logic' → *logik* 'logician', *mathematika* 'mathematics' → *mathematik* 'mathematician'), subtraction is also exemplified by some geographical nouns, e.g. It. *Sardegna* → *Sardo. Liguria* → *Ligure.* Also the so-called singulative formations in Welsh can be viewed synchronically as cases of subtraction, e.g. *ader-yn* 'a bird' → *adar* 'birds*. However, these subtracted plurals, which in diachronic perspective constitute the morphological bases of their singular forms, represent a closed and unproductive class of nouns in Modern Welsh. On the other hand, "normal" (or system-congruent) plural patterns in Welsh are diagrammatic, namely derived via addition of phonological material, e.g. *trên* "train" → *tren-au. llestr* "dish" → l*lestr-i, afon* "river" → *afonydd,* etc.

9. Scalarity and predictiveness

Each parameter represents a constitutive factor, that is a selected criterion of analysis of the morphological component. In other words, the parameters of Natural Morphology are factors which are used in the morphological analysis of complex words and word-forms, i.e. words having structure. On the basis of a number of factors, rooted in a semiotic superordinate level, morphological rules (i.e. language-specific realisations of typologically definable operations subsumable under a few universal techniques)[6] and complex words (i.e. objects upon which morphological rules operate)[7] are evaluated. Indeed, each factor can be expressed by a scale, along which different rules together with their corresponding complex words are located in a delimited range of degrees. According to a determined selected factor, a morphological phenomenon is 'measured' on a scale. A parameter is therefore a scalarised factor, and, as a factor, is a criterion for morphological analysis; the parameterisation of factors is nothing else but the elaboration of morphological scales of natu-

6. For this definition of rule and the related definitions of operation and technique see also Crocco Galèas (1997: 14-15).
7. For this interpretation of linguistic rule I refer to Lieb (1992).

ralness. The threshold of any morphological scale always represents the most highly preferred, that is to say the most natural solution for language users. Such a solution is better realised by natural morphological rules i.e. rules that are formally and semantically relatively less or not marked at all. Therefore, Natural Morphology claims that the most natural degrees of all morphological scales refer to those rules, i.e. those formalised processes, expressing in a higher 'quantity' a given morphological factor. For instance, agglutinative affixation, which is the first-degree-operation of the scale of diagrammaticity, gives rise to the most natural type of morphological rules according to the universal principle of diagrammaticity.

Summarising, the following two points are most interesting for the theoretical framework within which Natural Morphology makes morphological analysis possible.

1) The concept of naturalness is neither vague nor pretheoretical within the theory of Natural Morphology[8]. This means that, although having on the one hand extralinguistic bases depending on the psychophysical structure of human beings[9], morphological naturalness is, on the other hand, an entirely linguistic notion defined by the synergy of a semiotic level and three filters of analysis (i.e. the levels of universals, language type, and language-specific-competence respectively). This synergy gives rise to a selection of constitutive factors. Moreover, the notion of naturalness is not only rooted in the biological, psychological, and gnosiological nature of language users and linguistically defined as well, but it is also constantly verified by the analyst on the background of both internal and external evidence. Thus, the relation between extralinguistic factors, theoretical assumptions and data develops triadically by a process of continuous feedback from the most different domains of language.

2) Since parameters are scalarised factors, Natural Morphology makes scalarity the fundamental feature of its theoretical model. In this sense naturalists can reasonably claim that the relation between data and theory is neither naive nor preconceived. In other words, the model of scalarity neither excludes the many-sided variety of phenomena nor leaves the analyst dumbfounded by a welter of features. On the other hand, this very important advantage of perspective is not achieved by negation of reality which is independent

8. Cf. Mayerthaler (1981: 1), Dressler et al. (1987: 3-4).
9. Several types of linguistic evidence, such as cross-linguistic frequency, simplicity, salience, ease of processing and learning, diachronic persistence, etc. derive from extralinguistic bases of Natural Morphology.

of human classification, nor is it the result of superimposing an arbitrary yes-or-no categorial membership attribution.

3) As a consequence of 2) all morphological phenomena that are reducible to formalised processes[10], that is to say rules

a) are described by each and every scale of naturalness,

b) show in a computable, hence predictable way (Dressier 1985b) the incidence of a determined factor.

What a) implies is the possibility of linguistic and, in the case in point, morphological analysis. What b) implies is the possibility of functional explanation which is a necessary part of scientific and, in the case in point, morphological theory (cf. Dressier 1985a: 262-279).

4) The implicational scales of Natural Morphology allow probabilistic predictions (cf. Dressier 1985b) on distribution, frequency, and implications of morphological phenomena cross-linguistically. Because Natural Morphology takes psychological reality into account, we can claim that predictiveness is a constitutive part of morphological analysis. In fact, morphological analysis supported by empirical testing cannot be restricted to mere description. Analysis implies explanation and this, in turn, requires the possibility of making predictions. However, since no total or complete explanation is possible in science, both explanations and predictions must be partial and probabilistic.

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10. For an exhaustive discussion on rules and processes see Crocco Galeas (1991a: 128-36)

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