# Feature hierarchy and nominal inflection: Evidence from ancient Greek

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## 1. Introduction

In many morphological theories and especially in those which consider morphology as an autonomous component of the grammar, features play a crucial role. They are considered to be linguistic primitives manipulated by the rules of word formation. However, despite their importance in both the description of language and the derivation of words, no serious attempts have been made so far with regard to their internal organization, namely the description of the internal structure of feature bundles. Previous works on the field such as Noyer's leading study (1992), the approaches of Harley (1994) and Harley and Ritter (2002) confine themselves to the study of the hierarchy of verbal features. Nominal features, although equally central in the description of the inflectional paradigm and the derivation of inflectional forms, have not been examined with regard to their interrelations under a general perspective.

In this paper we aim at the establishment of a nominal feature hierarchy for Ancient Greek on the basis of well-defined criteria and also at the examination of the possible relationship of this hierarchy to aspects of the Ancient Greek nominal inflection. More specifically, our proposal is first that the feature hierarchy is a language specific phenomenon founded on empirical facts and theoretical criteria and second that it is parallel to the role that individual features play in inflectional derivation and the distribution of the inflectional forms to a strictly defined number of inflectional patterns. Such an approach opens the way for a total reformation of our views on the derivation of the inflectional forms, the notion of the paradigm and the definition of features, like inflectional class. The theoretical framework of our approach is the Feature theory (Halle and Maranz 1994 and Ralli 1999, 2000, 2005 for Modern Greek) whereas a central point of the analysis is the view that morphology functions as an independent grammatical component whose principal role is the interpretation of syntactic information in its own terms; therefore it holds a post-syntactic position (Halle and Maranz 1993, 1994, Beard 1995, Stump 2006, Steward and Stump 2007, Sigurðsson 2009).

The term Ancient Greek concerns the Attic dialect of the classical period ($5^{th}$ – $4^{th}$ centuries BC) whereas the linguistic data presented are all drawn from the grammatical descriptions of the dialect found in the literature (cf. Kühner and Blass 1890, Goodwin 1900 and especially Smyth 1976[10]).

The paper is organized as follows. Section 2 and its sub-sections express some general assumptions on Feature theory with a special focus on the type of nominal features and

their distribution with regard to the internal structure of nominal forms. Section 3 is a general introduction to the form of the nominal features of the Attic Greek. Section 4 deals with the definition of the theoretical criteria for the establishment of the hierarchy of nominal features for Attic Greek and also provides empirical evidence in support of this hierarchy. Section 5 examines the impact of the proposed feature hierarchy in the nominal inflection of the language, particularly in the structure of the operations involved in inflectional derivation and the organization of the inflectional patterns of the language, whereas section 6 presents some conclusive remarks.

## 2. Remarks on feature theory

Feature theory in Morphology has been developed on the model of feature organization in Phonology. According to this theory, morphological features are considered to be linguistic primitives with internal structure, exhibited in their organization into feature bundles. Each feature constitutes an abstract category which acquires a particular realization in certain linguistic environments. To capture this Feature theory organizes morphological features internally on an attribute – pair basis. Thus abstract features such as number, gender and case are the attributes while their particular realizations in certain environments like singular, plural, masculine, feminine, nominative, genitive etc are the values.

The definition of the morphological features of a particular language is a matter of parametric variation which allows for each language to select its own features from a large feature inventory in accordance to its internal morphological structure and organization. In morphologically rich languages feature selection as well as feature interrelation is realized through inflection. Each inflectional form corresponds to a number of features which codify the set of the grammatical information expressed by it. Therefore morphological features form the internal constitution of inflectional forms and trigger the morphological spelling operations which are responsible for inflectional derivation. The variety in feature selection attested cross-linguistically corroborates the differences of particular languages in their inflectional structure and their feature hierarchies. This remark is crucial for the definition of both the role and function of each feature in nominal inflection as it will be shown in the sections to follow.

### 2.1. The organization of the nominal features

In this section we put forward a number of general assumptions with regard to the organization of nominal features and the relation between this organization and the morphological processes involved in the derivation of inflectional forms. For many morphological theories (Halle and Vaux 1998, Ralli 2000, 2005), the internal constitution of each nominal form in terms of its abstract features is illustrated by the bipartite scheme given below in figure 1.

Nominal Form

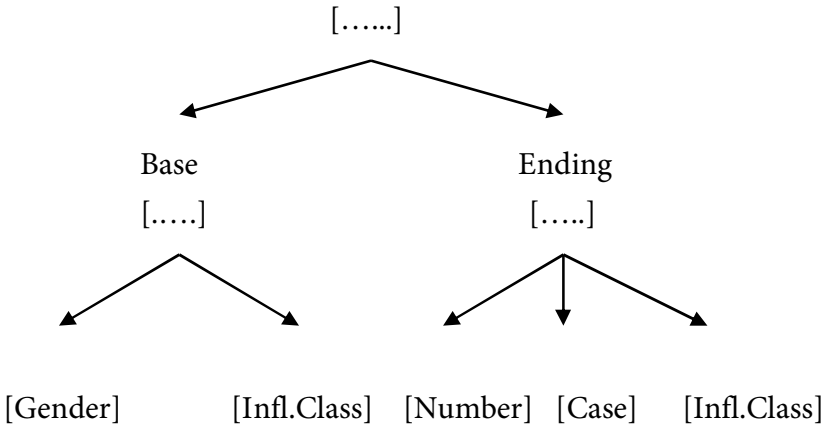


Figure 1

According to this scheme, each nominal form consists of a base and an ending. The base contains information about the grammatical category, the gender and the Inflectional Class (IC) of the form, while the ending carries information about the features of number and case. In some approaches (Ralli 1999, 2005) the feature of IC is also taken to be part of the ending in an attempt to secure its relation to a particular base or bases, a view which is also adopted here. In general terms, base features express information which contributes to the semantic identity of a form, whereas ending features are responsible for the morphological interpretation of abstract syntactic information.

However, this clear distinction of nominal features into semantic (lexical) and syntactic (functional) is often challenged by their type and behavior in both inflection and syntax. More specifically, the feature of gender, which generally expresses inherent semantic information and, for that reason, is considered as part of the base, participates also in agreement relations expressing syntactic relations as well (Ralli 1999, 2005). Quite similarly, the feature of number which is accommodated to the ending expresses also semantic information (Ralli 2005). Finally, the feature of IC which expresses no semantic or functional meaning and consequently belongs to both the base and the ending contradicts the binary distinction of the nominal features proposed (Ralli 2005, Sigurðsson 2009).

In view of these inconsistencies, we adopt a different model of analysis which is founded on the following assumptions:

(a) Morphology is an autonomous component of the grammar of language whose principal role is to express syntactic information in its own terms. As such, it holds a position after syntax and its role is to interpret syntactic information (Halle and Maranz 1993, 1994, Beard 1995, Sigurðsson 2009).

(b) Traditional morphemes are considered to be morphological spelling operations rather than formative elements. As such they have a functional load which is expressed in terms of features. Their function is to modify the phonological structure of the lexical bases over which they operate (Beard 1995).

(c) The derivation of any inflectional form is a purely morphological process which is carried out by a set of morphological spelling operations in accordance to the information of the terminal node it fills which is defined by syntax and expressed in terms of syntactic features.

(d) The strict relationship between syntax and morphology is to be understood on condition that there are two distinct feature sets, one syntactic and one morphological, which contain the same type of features and correspond to each other in a not always symmetric type of correspondence (Sigursson 2009).

Given this basis, we now proceed to a feature based analysis of the Attic Greek nominal inflection. Our aim is first to define the criteria for the establishment of a hierarchy for the nominal features of Attic Greek and second to investigate its impact (if any) to the inflectional derivation and the organization of inflection in general. Such an approach will possibly reform our view about the derivation of the inflectional forms as well as about the notions of the IC and the paradigm. However, before this, a short account of the nominal features of Attic Greek will precede.

## 3. The feature-based analysis of the Attic Greek inflection

The Attic Greek nominal inflection contains a set of four features each of which acquires a number of potential values as illustrated in (1):

(1) Gender : Masculine (M), Feminine (F), Neuter (N)
Number : Singular (Sg), Plural (Pl), Dual (Du)
Case : Nominative (N), Genitive (G), Dative (D), Accusative (A), Vocative (V)
Inflectional Class : 1 – 10 (IC)

From the abstract features gender, number and case are defined as arbitrary grammatical categories expressing lexical and/or syntactic information. IC on the other hand is generally considered as a conventional category which carries no lexical or functional load. Its role therefore is purely morphological, since it functions as a connective element defining the relationship between morphemes to their lexical bases (Ralli 2005, Sigurðsson 2009). For that reason it is always defined on the basis of specific criteria, which are either dictated by the theoretical model of analysis adopted or are imposed by the peculiarities of the morphological structure of the language under consideration. The criteria which have been proposed so far for the definition of the IC of standard Modern Greek and Ancient Greek are (i) the base allomorphy (Ralli 2000, 2005), (ii) the set of the endings attached to the various bases (Ralli 2000, 2005) and (iii) (especially for Ancient Greek) the stress pattern (Kakarikos 2009a, 2010). These criteria lead to the definition of a set of 10 values for the IC of Attic Greek which is presented in detail in the Appendix.

## 4. The hierarchy of nominal features: general assumptions

In general terms, the establishment of any feature hierarchy, in order to be methodologically well-organized, should be built on the basis of certain principles and conditions. First it should be defined as a language specific property (Stump 2006), second it should be able to accommodate both the abstract features as well as their special values and third it should be organized on the basis of theoretical criteria, having certain correspondences to the empirical facts of the language.

In our account, the first condition is satisfied by the fact that the proposed hierarchy of the nominal features refers exclusively to the Attic Greek dialect and therefore precludes generalizations of any sort; the second is satisfied by the setting of a general ranking for the abstract nominal features, like gender, number and case and also by the enrichment of this ranking with the addition of their special values, like masculine, feminine and neuter (for gender), singular, plural and dual (for number) and nominative, genitive, dative and accusative (for case)[10]. Finally, the third condition is satisfied first by the support of theoretical criteria, such as markedness, logical entailment and the like, which have been widely discussed in the literature on various occasions (cf. Noyer 1992 and Hurley 1994 among others) and second by the analogy to the typological and empirical facts of the dialect.

An important aspect of the analysis which should be stressed is that the proposed hierarchy does not include the feature of IC. This is due to its conventional character and the lack of any particular semantic or functional load related with it.

### 4.1. The hierarchy of the abstract features

A typical indicator of the relationship between the abstract nominal features, which have been pointed out in many approaches to inflection, is syncretism (cf. Baerman, Brown and Corbett 2005 and Stump 2006 among others). Syncretism is the morphological identification of forms which exhibit neutralization in some of their features. Both typological and empirical facts in many different languages show that in all cases of syncretism there is a fixed relation between the features neutralized and the features defining the context of neutralization. This sort of relationship is theoretically defined either as the *Dominance Hierarchy* (Hjelmslev 1935 cited by Carstairs 1987) or as the *Feature Ranking Principle* (Stump 2006) and states that the neutralized or dominated features are always ranked lower than the dominant features, namely the features defining the context of this neutralization.

This situation is compatible with the linguistic data of Attic Greek as illustrated in table 1.

Table 1: Types of syncretism in Attic Greek

| Features Neutralized | | | | Morphosyntactic Context | | | Affixes Involved | Indicative Examples |
|---|---|---|---|---|---|---|---|---|
| | Gender | Number | Case | Gender | Number | Case | | |
| 1 | - | - | N, A, V | N | Sg | - | /n/ | *δῶρο-ν* |

[10] Vocative is a special case with a different behaviour from other cases. As such it will not be discussed here.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | - | - | N, A, V | N | Pl | - | /a/ | *δῶρ-α* |
| 3 | - | - | N, A, V | M | Du | - | /e/ | *βότρυ-ε* |
| 4 | - | - | G, D | F | Du | - | /in/ | *σκια-ὶν* |
| 5 | - | Sg, Pl | D, N, V | M | - | - | /i/ | *λύκω-ι, λύκο-ι* |
| 6 | - | Sg, Pl | G, A | F | - | - | /s/ | *σκιᾶ-ς* |

More specifically, in examples 1 – 4 the neutralized feature is case, whereas gender and number are the features determining the context of neutralization. Thus, according to the dominance hierarchy, gender and number dominate over case and therefore they are ranked higher as it is shown in (2).

(2) GENDER, NUMBER > CASE

Similarly, in examples 5 – 6, the neutralized features are number and case, whereas the feature conditioning the neutralization is gender. Again, the dominance hierarchy ranks gender higher than number and case as it is shown in (3).

(3) GENDER > NUMBER > CASE

The Feature hierarchy proposed in (3) finds further theoretical support by similar notions such as the *Relevance Hierarchy* (Bybee 1985, cited by Carstairs 1987) which classifies the nominal features according to their position with respect to the nominal base and their meaning. According to this, the more relevant features which are part of the base like gender are ordered higher than the less relevant features, like number and case, which are located on the right of the base. This sort of classification has certain correspondences to figure 1 above.

**4.2. The hierarchy of the special feature values**

Abstract feature ranking can be further analyzed and enriched with the addition of the special values which correspond to each of them. Special feature values are organized in feature sub-trees and are all subject to the control of their abstract counterparts. Their internal ranking is founded on three criteria:

(a) The criterion of *markedness* which states that marked features are ranked lower than the unmarked ones.

(b) The criterion of *logical entailment* (Noyer 1992, cited by Hurley 1994) which holds that features logically implied by other features of the same kind are ranked lower than them.

(c) The criterion of *argument encoding* (Blake 2001) which refers particularly to the feature of case and states that case values encoding peripheral grammatical relations are ranked lower than case values encoding core relations.

All three criteria have certain applications to the hierarchy of the special feature values of Attic Greek.

More specifically, the criterion of *markedness* predicts the dominance of the animate (i.e. masculine and feminine) over the inanimate (i.e. neuter) gender[11], the dominance of the masculine over the feminine gender, the dominance of the singular number (considered as a means expressing individuality) over the plural and dual numbers (considered as means expressing aggregation), and finally the dominance of the direct over the indirect cases.

The criterion of *logical entailment* specifies the relationship of the plural and dual by predicting the predominance of the plural in the sense that duality is a notion already existing in the expression of aggregation.

Finally, the criterion of *argument encoding* sheds light to the internal organization of the special values of the case feature in a way reflecting the distinction of the grammatical relations into core (i.e. subject < direct object < indirect object) and peripheral (i.e. oblique meanings, such as locative, instrumental etc).

The discussion on the hierarchy of the special feature values leads to a more elaborated version of (3) which is given in figure 2.

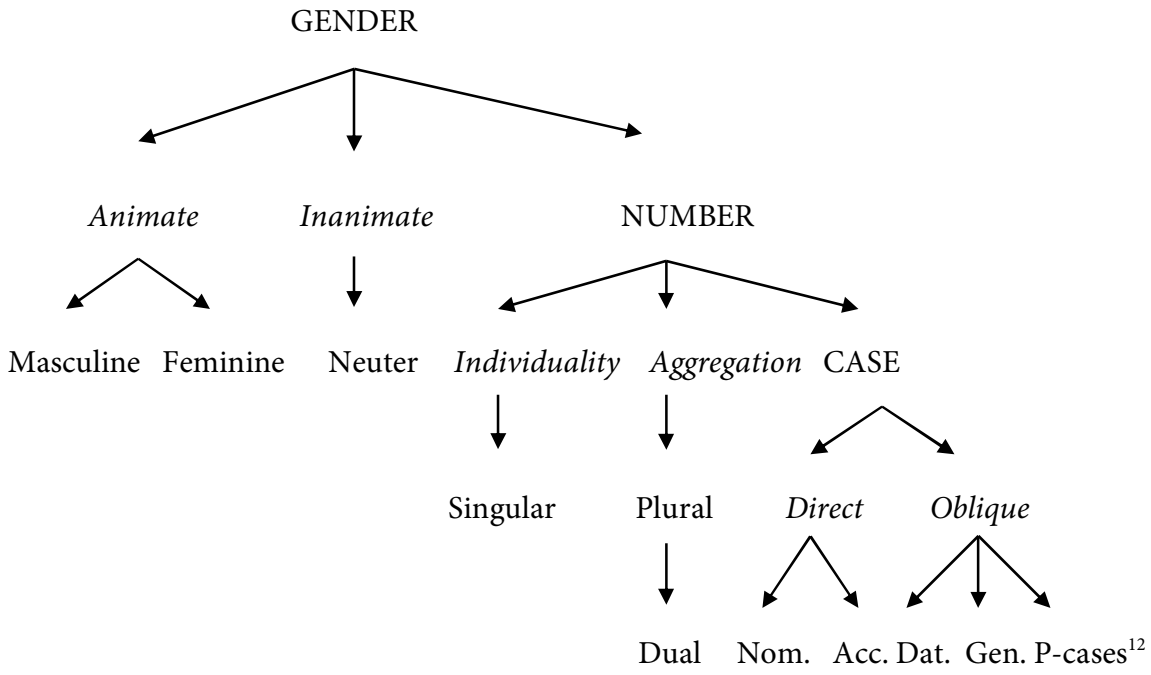


Figure 2

The hierarchy proposed in figure 2 finds empirical support in the linguistic data of Attic Greek. Thus, the internal hierarchy of gender values is reflected in agreement

[11] The ranking of animate > inanimate is founded on typological evidence from many languages (Corbett 1999).

[12] P-cases concern structures with a preposition and a noun and are not to be discussed here.

constructions defined according to the scheme: human entities > non-human entities > inanimate entities (cf. Chila-Markopoulou 2003). Similarly, the internal relation of the plural and dual is reflected in cases of verbal agreement where the verb in the plural agrees with the subject in the dual and vice versa. Consider the examples in (4) and (5) below.

(4) *Ξενοφώντι προσέτρεχον* $_{(PL)}$ *δύω*$_{DU)}$ *νεανίσκω*$_{(DU)}$ (*Xen. Anab.4.3.19*)
"Two youths ran up to Xenophon"

(5) *Δύο ἄνδρες*$_{(PL)}$ *προσελθόντε*$_{(DU)}$ *Ἄγιδι διελεγέσθην*$_{(DU)}$ *μή ποιεῖν μάχην* (*Thuc.5.59.5*)
"Two men coming to Agis urged him not to fight"

Finally, the hierarchy of the case feature values is reflected in the numerous instances of syntactic conflict which are exemplified by case attraction phenomena and resolved on the basis of case feature hierarchies (Grosu 1994, Vogel 2001, 2003 and Kakarikos 2009b). Consider the examples in (6), (7), (8) and (9) (Kakarikos 2009b).

*Accusative vs. Nominative → Accusative*
(6) *τοῦ ναυτικοῦ αὐτῶν* ***τό πλῆθος ὅ*** *πρίν οὐχ ὑπῆρχε* (*Thuc.1.90*) (instead of *ὅ πρίν*)
"the greatness of their navy, which there was not before"

*Dative vs. Accusative → Dative*
(7) τοῖς γάρ **ἀγαθοῖς οἷς** ἔχομεν ἐν τῇ ψυχῇ (*Isocr.8.32*) (instead of *ἀγαθοῖς ἅ*)
"with the goodness which we have in our soul"

*Genitive vs. Dative → Genitive*
(8) τινές ***ὀλίγοι ὧν*** *ἐγώ ἐντετύχηκα* (*Pl.Res.531e*) (instead of *ὀλίγοι οἷς*)
"a few of those whom I have met with"

*P-case vs. Dative → P-case*
(9) *σύν ταῖς δώδεκα* ***ναυσίν αἷς*** *εἶχεν* (*Xen.Hell.4.8.23*) (instead of *ναυσίν ἅς*)
"with the twelve ships which he had"

### 4.3. Interim summary: remarks on feature hierarchy

A close examination of the feature hierarchy proposed in figure 2 is rather informative as regards the definition of the principles underlying the interrelations of the various nominal features inside the sphere of the hierarchy. These are:

(a) the *Dominance Principle*: higher ranked features dominate all lower ranked features.

(b) the *Dependency Principle*: higher ranked features have less dependents than lower ranked features.

(c) the *Complexity Principle*: higher ranked features are less complex than lower ranked features, since they are dominated by fewer feature nodes.

Thus, according to the *dominance principle* the feature of gender dominates over the features of number and case on the basis of its higher ranking. In the same vein, the feature of number dominates over the case feature. According to the *dependency principle*, gender and number as higher ranked features, have three dependents (i.e. masculine, feminine, neuter and singular, plural, dual, respectively) whereas case, as a lower ranked feature, has five (i.e. nominative, genitive, dative, accusative and the p-cases). Finally, according to the *complexity principle*, case as the feature filling the lowest position in the hierarchy and therefore dominated by two nodes (i.e. gender and number) is more complex than number which is dominated by only one node (i.e. gender) and gender which has no dependence on any other feature node.

The establishment of a well-defined hierarchy for the nominal features of Attic Greek leads to the second aim of our analysis which concerns its impact to both the role of nominal features in inflectional derivation processes and the definition of the inflectional patterns allowed in that dialect. More specifically, the discussions concern first the possible analogy between the ranking of each nominal feature proposed in figure 2 and its role in triggering the morphological spelling operations for the formation of the inflectional forms and second the possible connection of the feature hierarchy with the (fixed) number of the inflectional patterns of Attic Greek. This second issue reforms our view for both the notion and role of the inflectional paradigm in the sense it is considered as an entity not existing in advance as a well-defined and fixed set of inflectional forms but rather as an entity arising from the derivational mechanism of morphology.

## 5. Feature hierarchy and nominal inflection

In a theoretical model which accepts a post-syntactic position for morphology, inflectional derivation is carried out by morphological operations which are triggered by syntax. Given this, the main aim of morphology is to derive lexical forms for the terminal positions of a syntactic structure. A necessary condition for this is the existence of a correspondence between the information underlying the terminal positions which is syntactic and the information expressed by the inflectional forms, which is morphological. Such an approach presupposes the existence of two feature sets, one syntactic and one morphological. The correspondences between the two feature sets are not always symmetric and this may explain the possible asymmetries often existing between syntax and morphology (cf. Ralli 2005). On the other hand, it reforms the view which classifies nominal features into lexical and syntactic, by considering them all as morphological entities which realize abstract syntactic information in their own terms (Sigurðsson 2009; for a similar view cf. also. Booij 1995 and Ralli 2005). In such a context, morphological features take different roles which are reflected both in the

inflectional derivation processes and the definition of the inflectional patterns of a language. These roles will be further analyzed and described in the following sections. A crucial point of the discussion is that it supports the autonomy of morphology from a different point of view which does not dismiss its interface with syntax.

### 5.1. Feature hierarchy and inflectional derivation processes

The importance of the role of morphological features and their hierarchical ranking in inflectional derivation may be found in connection with the morphological spelling operations which are involved in the derivation of the inflectional forms of Attic Greek and presented in table 2 along with their feature specifications.

Table 2. The morphological spelling operations of Attic Greek

| MORPHOLOGICAL SPELLING OPERATIONS | | NOMINAL FEATURE SPECIFICATIONS | | | |
|---|---|---|---|---|---|
| | | GENDER | NUMBER | CASE | IC |
| 1 | /s/ | {M, F} | {Sg, Pl} | {Nom, Gen, Acc, Voc} | {1 – 6, 8, 10} |
| 2 | /o/ | {M, F, N} | Sg | Gen | {1 – 4} |
| 3 | /i/ | {M, F, N} | {Sg, Pl} | {Nom, Dat, Voc} | {1 – 10} |
| 4 | /n/ | {M, F, N} | Sg | {Nom, Acc, Voc} | {1 – 6} |
| 5 | /ø/ | {M, F, N} | Sg | {Nom, Acc, Voc} | {1 – 10} |
| 6 | /ɔ:n/ | {M, F, N} | Pl | Gen | {1 – 10} |
| 7 | /is/ | {M, F, N} | Pl | Dat | {1 – 4} |
| 8 | /si/ | {M, F, N} | Pl | Dat | {5 – 10} |
| 9 | /e/ | {M, F, N} | Du | {Nom, Acc, Voc} | {1 – 10} |
| 10 | /in/ | {M, F, N} | Du | {Gen, Dat} | {1 – 4} |
| 11 | /oin/ | {M, F, N} | Du | {Gen, Dat} | {5 – 10} |
| 12 | /os/ | {M, F, N} | Sg | Gen | {5 – 10} |
| 13 | /es/ | {M, F} | Pl | {Nom, Voc} | {5 – 10} |
| 14 | /as/ | {M, F} | Pl | Acc | {7 – 10} |
| 15 | /a/ | {M, F, N} | {Sg, Pl} | {Nom, Acc, Voc} | {2 – 10} |

The first point which emerges from table 2 is that all morphological operations are always triggered by a combination of features; therefore no feature has the complete control over an inflectional derivation process. However, such a view does not preclude the existence of an internal scale in the role of particular features inside the general frame of the feature specifications for each operation. The main reason for this is that some features are more flexible than others in distinguishing morphological operations by specifying them more precisely. This flexibility is consistent with the number of their special values as well as their position in feature hierarchy. Thus, complex features with many special values have a greater control to the inflectional derivation processes than less complex features. This is because they are able to define the maximum number of morphological operations which could apply to the lexical bases of a language and accordingly the maximum number of the correct inflectional formations possible in it.

For instance, according to table 2 the possible feature combinations for the morphological spelling operation suffixing /s/ can theoretically lead to the derivation of 16 inflectional forms ending in /s/ (i.e. 2 x 2 x 4 = 16). Since this is not true for the Attic Greek inflection, the blocking of the ungrammatical formations is related to the role that each morphological feature plays in any inflectional derivation process. More concretely, the specification of the morphological operations suffixing /s/ by the morphological feature of gender alone is quite general and vague. This situation is improved with the addition of the feature of number. The combination of the features of gender and number make more clear predictions as to the functional load of the derived forms and also increases their number from 2 to 4 (i.e. 2 x 2 = 4: 1. [M, Sg], 2. [M, Pl], 3. [F, Sg], 4. [F, Pl]). All forms are taken to be grammatical. The whole situation becomes even more precise with the addition of the feature of case.

Case has the greatest number of special values and as a result it increases the number of possible formations from 4 to 16 (i.e. 4 x 4 = 16: 1. [M, Sg, N], 2. [M, Sg, G], 3. [M, Sg, A], 4. [M, Sg, V], 5. [M, Pl, N], 6. [M, Pl, G], 7. [M, Pl, A], 8. [M, Pl, V], 9. [F, Sg, N], 10. [F, Sg, G], 11. [F, Sg, A], 12. [F, Sg, V], 13. [F, Pl, N], 14. [F, Pl G], 15. [F, Pl A], 16. [F, Pl, V]). However from this set of candidate forms, only 9 are grammatical. The blocking of the ungrammatical formations is controlled to some extend by the feature of case as well as by the feature of IC.

To understand how this is possible, we focus on the formation of a subset of the forms ending in /s/, namely the forms derived by operations specified as [M, Pl] and [F, Pl]. Both operations, although quite general as far as their specification is concerned, are theoretically considered to lead to grammatical formations. This situation radically changes with the addition of the feature of case. Case feature has the greatest set of feature values (i.e. Nominative, Genitive, Accusative, Vocative) and therefore may define morphological operations in a more precise way. According to this, from the possible 8 candidate forms which come out from the combination of the features of gender (M, F), number (Sg, Pl) and case (N, G, A and V), (i.e. 1. [M, Pl, N], 2. [M, Pl, G], 3. [M, Pl, Acc], 4. [M, Pl, V], 5. [F, Pl, N], 6. [F, Pl, G], 7. [F, Pl, A], 8. [F, Pl, V]) only two are grammatical (i.e. the combinations: [M, Pl, A] and [F, Pl, A]). All other forms are blocked as ungrammatical. This blocking is the combined result of the coordination between the features of case and IC. The role of case concerns the precise and analytic definition of the candidate forms bearing the suffix /s/ which may be theoretically derived. The role of the IC concerns the filtering of their feature specifications leading to the emergence of the correct formations.

The example is very illustrative since it gives an idea about the number of forms which are finally derived and take their place in inflection. Moreover it explains why from a large number of possible combinations grammar allows the derivation of a small set of forms. In this context it supports the role of the feature of case as the leading feature in the hierarchy of features compared to both gender and number. On the other hand, it does not dismiss the role of IC as an equally central feature in inflectional derivation despite its absence from the hierarchy of nominal features and highlights its character as

a purely morphological element serving formative aims with no reference to syntax and semantics.

Summing up all three features of gender, number and case contribute to the derivation of the right inflectional form; however their contribution varies depending on the number of their special values. As a result, the number of the grammatical inflectional forms in a language is gradually limited as the analytic definition of the morphological spelling operations with the addition of more features is increased. And the role of features in this procedure is attuned to the feature hierarchy proposed in figure 2.

### 5.2. Feature hierarchy and the inflectional patterns of language

The administration of the inflectional formation processes in the way described above plays also a decisive role in the organization of the derived inflectional forms into inflectional patterns. More specifically, a common feature of the fusional languages is the organization of the inflectional forms into larger groups, traditionally known as paradigms. Each paradigm exhibits its own combination of endings and represents a special and unique pattern of inflection. The definition of the inflectional patterns of a language depends on its morphological structure and is carried out with the most economical way possible for that language. Therefore, the number of the inflectional patterns of a language is always fixed in a way which does not allow for changes of any sort. In Attic Greek of the classical period (5th – 4th centuries BC) the number of the inflectional patterns is equal to 8, as it is shown in table 3, below.

Table 3. The inflectional patterns of Attic Greek (Kakarikos 2007, 2010)

| **PATTERN** | **I** | **II** | **III** | **IV** | **V** | **VI** | **VII** | **VIII** |
|---|---|---|---|---|---|---|---|---|
| **IC** | **1, 3 – 4** | **1 – 3** | **5 – 6** | **8** | **10** | **7, 9** | **3 – 4** | **5 – 9** |
| **GENDER** | M / F | F | M / F | M / F | M | M / F | N | N |
| **SINGULAR** | | | | | | | | |
| **NOM.** | -s | -ø | -s | -s | -s | -ø | -n | -ø |
| **GEN.** | -o | -s | -os | -os | -os | -os | -o | -os |
| **DAT.** | -i | -i | -i | -i | -i | -i | -i | -i |
| **ACC.** | -n | -n | -n | -a | -a | -a | -n | -ø |
| **VOC.** | -ø | -ø | -ø | -s | -ø | -ø | -n | -ø |
| **PLURAL** | | | | | | | | |
| **NOM.** | -i | -i | -es | -es | -es | -es | -a | -a |
| **GEN.** | -ɔ:n | -ɔ:n | -ɔ:n | -ɔ:n | -ɔ:n | -ɔ:n | -ɔ:n | -ɔ:n |
| **DAT.** | -is | -is | -si | -si | -si | -si | -is | -si |
| **ACC.** | -s | -s | -s | -as | -as | -as | -a | a |
| **VOC.** | -i | -i | -es | -es | -es | -es | -a | a |
| **DUAL** | | | | | | | | |
| **NOM.** | -e | -e | -e | -e | -e | -e | -e | -e |
| **GEN.** | -in | -in | -oin | -oin | -oin | -oin | -in | -oin |
| **DAT.** | -in | -in | -oin | -oin | -oin | -oin | -in | -oin |
| **ACC.** | -e | -e | -e | -e | -e | -e | -e | -e |
| **VOC.** | -e | -e | -e | -e | -e | -e | -e | -e |

This situation raises questions regarding the factors conditioning the formation of the inflectional patterns in a way which allows for the emergence of the right combinations and blocks the wrong ones. The possible answer to these questions is related with the role of features in controlling both the systematic differences and similarities of each

pattern, a function which once more is strictly connected to their special position in the feature hierarchy.

The starting point of the discussion is that the formation of the inflectional patterns of a language depends on the inflectional derivation processes. As a result, inflectional patterns may be better understood as units which emerge via a number of morphological operations and therefore do not exist *a priori*. Such a view is against the traditional notion of paradigm, but is consistent with our view of morphology as an autonomous post-syntactic grammatical component which derives forms on the basis of syntactically driven information.

On the other hand, as it comes out from the empirical facts of Attic Greek, the idea for the *a priori* existence of the paradigm gives only a partial explanation both to its internal organization as well as to the number of paradigms which are possible in that dialect. This is because the treatment of nominal features outside the derivational processes which give rise to the inflectional forms puts limits to their role as factors conditioning inflection.

In such a context, gender seems to capture the systematic differences across different patterns but only in the range of certain sub-systems. is the case with the differences in the nominative and genitive singular of the inflectional patterns I and II which is controlled by the distinctions between the masculine and feminine genders (e.g. (M) *neaniaː-s* (*νεανίας*) vs. (F) *moːsa-∅* (*μοῦσα*), (M) **neanio-o → neanioː-∅* (*νεανίου*) vs. (F) *moːsɛː-s* (*μούσης*)) or the difference between the inflectional patterns I, III, IV, V and the inflectional pattern VII as well as that between the inflectional patterns I, III, V and VIII in the nominative and vocative singular respectively, which is controlled by the distinction between the masculine and feminine genders from the neuter (e.g. (M/F): *lyko-s*/*nɛːso-s* (*λύκος*/ *νῆσος*) vs. (N): *dɔːro-n* (*δῶρον*), (M/F): *botry-s*/*ophry-s* (*βότρυς*/ *οφρῦς*) vs. (N): *dakry-∅* (*δάκρυ*) (M/F): *peleky-s*/ *poli-s* (*πέλεκυς*/ *πόλις*) vs. (N): *asty-∅* (*ἄστυ*) (M/F): *korak-s*/*lamba-s* (*κόραξ*/ *λαμπάς*) vs. (N): *sɔːma-∅* (*σῶμα*) etc).

Quite similarly, the feature of number captures the differences across all inflectional patterns but again in the range of its immediate control, namely the five cases of each number, while it is unable to capture both differences and similarities across different numbers and paradigms (e.g. (Sg): *lykos* (*λύκος*), **lyko-o → lykoː* (*λύκου*), *lykɔː-i* (*λύκῳ*) etc vs. (Pl): *lyko-i* (*λύκοι*), **lyko-ɔːn → lyk-ɔːn* (*λύκων*), *lyko-is* (*λύκοις*) etc).

In contrast to both number and gender, case seems to be more flexible. However it lacks the basis which could define it as the feature connecting the various forms inside a paradigm and also distinguishing them from the forms of other paradigms.

A different and more thorough approach could come through the examination of the inflectional patterns as units emerging through a number of derivational processes which, apart from conditioning the derivation of the right inflectional formations, are also responsible for their classification into the patterns of inflection.

This sort of classification is envisaged on the basis of a vertical and a horizontal axis. The vertical axis defines the role of features in controlling the cohesion of forms belonging to the same inflectional pattern. The horizontal axis concerns the role of

features in defining the relations between forms belonging to different inflectional patterns. In the first case what matters is the control over the similarities in the feature specification of each inflectional form. In the second case the interest focuses on the control over the differences in the feature specification of each inflectional form.

A necessary prerequisite for the first task is the variation in the range of the special values of the controlling feature. The more special values a feature has, the most powerful as a factor conditioning similarities (that is to say grouping similar forms) it is. For instance, the feature of gender fails to control the similarity of forms such as *anthrɔ:po-s*, **anthrɔ:po-o* → *anthrɔ:po:* … etc of the Inflectional Pattern I, since it is the only variable available in this pattern. On the other hand, the feature of number which has a greater range of variables is able to control more similarities. Consider the forms *anthrɔ:po-s*, **anthrɔ:po-o* → *anthrɔ:po:* etc. (which are marked as Masculine, Singular) vs. the forms *anthrɔ:po-i*, *anthrɔ:p-ɔ:n* etc (which are all marked as Masculine, Plural) and the forms **anthrɔ:po-e* → *anthrɔ:po:*, *anthrɔ:po-in* etc (which are marked as Masculine, Dual). However each value of the number feature fails to control the similarities of forms inside its range of control (cf. the forms *anthrɔ:po-s*, **anthrɔ:po-o* → *anthrɔ:po:* etc) which are specified as Masculine, Singular). Therefore its controlling power is greater than genders but it is still limited compared with that of case. This is because case has an even greater number of values than both gender and number and therefore a greater range of control over the features of the same inflectional pattern. Thus the similarities of the forms *anthrɔ:po-s*, **anthrɔ:po-o* → *anthrɔ:po:*, *anthrɔ:pɔ:-i*, *anthrɔ:po-n*, *anthrɔ:pe-∅* are controlled by the feature of case which again is the only varying feature in the feature specification of all five forms (cf. M, Sg, **N** vs. M, Sg, **G** vs. M, Sg, **D** vs. M, Sg, **A** vs. M, Sg, **V**, respectively) (for a similar view cf. Blevins 2006).

Summing up, features with a great number of special values, such as case, play a more decisive role in controlling the cohesion inside the same pattern of inflection as opposed to features with less special values, such as number. This distinction is consistent with the proposed feature hierarchy.

The second task, namely the control over the differences of forms belonging to different patterns of inflection, is a consequence of the first. It depends on the number of the different forms which may be grouped under the heading of a single feature in the most precise way possible. This possibility is however related to the power of different features in controlling the cohesion inside the same pattern. Thus features with few special values and small power in controlling the cohesion of an inflectional pattern, allow for large groupings which are vague and unclear. In contrast, features with more special values, have a wider range of choices and therefore are more powerful in controlling the cohesion of the forms inside the same pattern. As a result they allow for more concrete and precise classifications by managing a more strict and solid organization of inflection in general.

In this context the grouping of the inflectional endings of Attic Greek according to the feature of gender alone, gives 15 possible inflectional patterns (on the basis of the feature with the greatest number of endings). Similarly, a grouping on the basis of gender

reveals a number of 9 possible inflectional patterns. In contrast to both gender and number, the feature of case allows for a number of 7 patterns of inflection. Consider table 4 below.

Table 4. Possible definitions of the inflectional patterns of Attic Greek

(a) Definition according to gender alone

| **Allomorphs** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Masculine | s | o | i | n | ∅ | ɔ:n | is | e | in | os | es | si | as | oin | a |
| Feminine | ∅ | s | o | i | n | ɔ:n | is | e | in | os | es | si | oin | a | as |
| Neuter | n | o | i | a | ɔ:n | is | e | in | ∅ | os | si | oin | - | - | - |

(b) Definition according to number alone

| **Allomorphs** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|
| Singular | s | ∅ | n | o | os | i | a | - | - |
| Plural | i | es | a | ɔ:n | is | si | s | as | a |
| Dual | e | in | oin | - | - | - | - | - | - |

(c) Definition according to case alone

| **Allomorphs** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
|---|---|---|---|---|---|---|---|
| Nom | s | ∅ | n | i | es | a | e |
| Gen | o | s | os | ɔ:n | in | oin | - |
| Dat | i | is | si | in | oin | - | - |
| Acc | n | a | ∅ | s | as | in | oin |
| Voc | ∅ | s | n | i | es | a | e |

As we see in the table 4, there is again an internal scale as regards the role of each feature in the organization of the inflectional patterns which is in absolute accord with the feature hierarchy proposed in figure 2. More specifically, complex features, like case, allow for more precise classifications as opposed to less complex features, like gender and number. This hierarchical difference may be better seen in the way that all inflectional features coordinate for the formation of an inflectional pattern. For instance, in a possible formation of the inflectional patterns of, say, the Masculine Singular, the 15 allomorphs defined by the gender feature alone (cf. table 4a) are reduced to 7 with the addition of the feature of number (cf. table 4b). This number of 7 allomorphs is increased to 15 with the addition of the feature of case (cf. table 4c). However, this is an occasional increase since this number (except from the endings which are defined as plural or dual, e.g. -es, -is, -si, -in etc) includes also ill-formations (i.e. the definition of /*i/, /*n/, /*a/ as [M, Sg, N], the definition of /*s/ as [M, Sg, G] and [M, Sg, A] and finally the definition of /*i/, /*a/, /*s/ and /*n/ as [M, Sg, V]) which are blocked as ungrammatical. Therefore the final number is fixed to 7 endings (i.e. /s/, /Ø/,

/o/, /os/, /i/, /n/, /a/). Interestingly, this number of 7 endings does not point to 7 inflectional patterns, since their distribution is controlled (apart from the case feature) by other factors, such as the feature of IC and the influence of the rules of syncretism. IC distributes similar endings into different inflectional patterns (e.g. /s/: IC 1, 3 – 6, 8, 10, /os/: IC 5 – 10 etc. Cf. table 3) while syncretism is responsible for the distribution of similar endings into the same inflectional pattern (e.g. /s/: inflectional pattern 1 – 4, /os/: inflectional pattern 2 – 4 etc. Cf. table 3).

This example corroborates the hierarchical role of each nominal feature in inflection. However it cannot predict the exact organization of forms to the vertical axis. This means that, although case may secure the internal cohesion of the inflectional form inside an inflectional pattern, the formation of this pattern, namely the exact combinations of forms in a certain way and not in another is again a matter strictly related to the feature of IC. This is a further indication which stresses its importance as a purely morphological formative element, despite the lack of any semantic or functional load. Thus, according to table 3, the 7 endings of our example will be distributed in a fixed set of 5 patterns defined by the feature of IC.

A final remark from this discussion which should be pointed is the reformation of our view about the type, organization and function of the traditional paradigm. This is no more defined as a well-organized set of forms which exist in advance and to which all inflectional derivation processes refer, but rather as a dynamic grammatical entity which emerges through morphology as a result of the coordination of nominal features in the general framework of inflectional derivation.

## 6. Conclusions

Summing up, in this paper we argued that nominal features may be organized into language specific hierarchies. These hierarchies are organized on the basis of empirical (i.e. syncretism) and theoretical well-defined criteria (i.e. markedness, logical entailment and argument encoding) and also have certain implications to the role of individual features in both the inflectional derivation processes and the organization of the inflectional patterns of a language.

More specifically, less complex features, such as gender and number, have a limited control over inflection whereas more complex features, such as case, have a more complicated and decisive role. In practical terms, this hierarchy is expressed by the dominance of case over the other features and the use of the information provided by them first to the formation of the inflectional forms of the language by triggering the relevant morphological spelling operations and second to the distribution of the derived forms into a fixed set of inflectional patterns.

However, it should be stressed that this hierarchical ranking is built on the assumption that nominal inflection is the combined result of a set of features and therefore it does not prove in any way the absolute dominance of particular feature over it. On the other hand, features, such as the IC, although excluded from the feature hierarchy because of their conventional character, have still a crucial role as formative elements, purely

morphological in nature, which form the reference point of all derivational processes and support the role of the other features.

Practically speaking, the establishment of a feature hierarchy in inflection reveals many aspects of the function of both the operations involved in the derivation of the inflectional forms of a language and their organization into patterns of inflection. Moreover it improves our view on the notion of the inflectional paradigm by defining it as a derived, rather than as a pre-existing set of forms which emerges by means of the deductive logic via morphological operations built on morphological features and reflecting their hierarchical status.

## Appendix

The inflectional classes of Attic Greek (Kakarikos 2007, 2009a)

| IC | GENDER | STEM ALLOMORPHY | EXAMPLES | | |
|---|---|---|---|---|---|
| | | | STEM VARIABLES | GREEK FORMS | GLOSSES |
| 1 | M | -aː ~ -a | neaniaː- ~ neania- | *νεανίας* | "young man" |
| | | -ɛː ~ -a | poiɛːtɛː- ~ poiɛːta- | *ποιητὴς* | "poet" |
| | F | -aː ~ -a | skiaː- ~ skia- | *σκιὰ* | "shadow" |
| | | -ɛː ~ -a | korɛː- ~ kora- | *κόρη* | "girl" |
| 2 | F | -a ~ -aː | alɛːthejja- ~ alɛːthejjaː- | *ἀλήθεια* | "truth" |
| | | | muːsa- ~ muːsaː- | *μοῦσα* | "muse" |
| 3 | M | -a | bo̯rea- | *Βορρᾶς* | "North" |
| | | | hermea- | *῾Ερμῆς* | "Hermes" |
| | | -o | ploo- | *πλοῦς* | "sailing" |
| | F | -a | mnaa- | *μνᾶ* | "mna" |
| | | -a | sykea- | *συκῆ* | "fig tree" |
| | N | -o | osteo- | *ὀστοῦν* | "bone" |
| 4 | M / F | -o | lyko-, nɛːso- | *λύκος, νῆσος* | "wolf", "island" |
| | | -ɔː | leɔː-, halɔː- | *λεὼς, ἅλως* | "people", "thrashing floor" |
| | N | -o | dɔːro- | *δῶρον* | "present" |
| | | -ɔː | anɔːgeɔː- | *ἀνώγεων* | "upper floor" |
| 5 | M / F | -iː | kiː- | *κίς* | "worm" |
| | | -y | botry- | *βότρυς* | "grapes" |
| | N | -y | dakry- | *δάκρυ* | "tear" |
| 6 | M / F | -yː ~ -y | ophryː- ~ ophry- | *ὀφρῦς* | "eyebrow" |
| | | -i ~ -e | poli- ~ pole- | *πόλις* | "city" |
| | | -y ~ -e | peleky- ~ peleke- | *πέλεκυς* | "axe" |
| | | -ɔːw ~ -ow | bɔːw- ~ bow- | *βούς* | "ox" |
| | | -aːw ~ -aw | graːw ~ -graw, naːw ~ -naw | *γραῦς, ναῦς* | "old woman", "ship" |
| | N | -y ~ -e | asty- ~ aste- | *ἄστυ* | "city" |
| | | -es | Sɔːkrates-, Periklees-, triɛːres- | *Σωκράτης, Περικλῆς, τριήρης* | "Sokrates", "Perikles", "trireme" |
| | | -Vnt | geront- | *γέρων* | "old man" |

| | | | | | |
|---|---|---|---|---|---|
| **7** | M / F | -Vn | daimon- | *δαίμων* | "god" |
| | | -Vr | r̥ɛ:tor | *ῥήτωρ* | "orator" |
| | | | pater-, mɛ:ter- | *πατὴρ, μήτηρ* | "father", "mother" |
| | | -os | aidos- | *αἰδῶς* | "shame" |
| | | -o | hekho- | *ἠχώ* | "echo" |
| | N | -es | beles-, khrees- | *βέλος, χρέος* | "arrow", "dept" |
| | | -as | kreas- | *κρέας* | "meat" |
| **8** | M / F | -C | korak-, pteryg-, phleb-, tapɛ:t-, lambad-, patrid-, akti:n- | *κόραξ, πτέρυξ, φλὲψ, τάπης, λαμπὰς, πατρὶς, ἀκτὶς* | "raven", "wing", "vein" "carpet", "torch", "country", "ray" |
| | | -Vnt | imant-, odont- | *ἱμὰς, ὀδοὺς* | "strap", "tooth" |
| | N | -t | sɔ:mat- | *σῶμα* | "body" |
| **9** | M/F | -Vn | poimen- | *ποιμὴν* | "shepherd", |
| | | -Vr | aither- | *αἰθὴρ* | "air", |
| | | -V:n | hellɛ:n-, kheimɔ:n - | *῾Ελλην, χειμὼν* | "Greek", "winter" |
| | | -V:r | klɛ:tɛ:r- | *κλητὴρ* | "usher" |
| | N | -r | nektar- | *νέκταρ* | "nectar" |
| **10** | M | -ɛ:w | basileːw- | *βασιλεὺς* | "king" |
| | | -Vnt | gigant- | *γίγας* | "giant" |

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