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*Jason Johnston  
Sydney, 19 April 1997*

**Systematic Homonymy  
and the Structure of  
Morphological Categories**

**Some Lessons from  
Paradigm Geometry**

by

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# Abstract

This thesis takes as its starting point proposals to model inflectional paradigms as geometrical structures, wherein systematic homonymies are constrained to occupy contiguous regions. It defines a precise criterion for assessing systematicity and shows, for a range of largely Indo-European and Afro-Asiatic data, that such models are observationally adequate in modelling systematic homonymies within a single inflectional dimension, and to a lesser extent, between different inflectional dimensions. This is taken to indicate that widely assumed characterizations of inflectional categories in terms of cross-classifying binary features are incorrect, inasmuch as such characterizations fail to predict the linearizability of natural classes of properties belonging to those categories. The same inadequacy besets attempts to account for systematic homonymies by means of rules that convert or ‘refer’ one morpho-syntactic representation to another.

Rather it is argued that the linearizability of natural classes of properties suggests that inflectional categories are structured as a sub-classification of those properties, but that a phenomenon of ‘re-marking’ serves to define, under strict constraints, additional natural classes beyond those defined by the sub-classification itself. The specific sub-classifications indicated by observed patterns of homonymy are language-specific. In addition, the properties so sub-classified under a single node may in certain cases be drawn from separate morpho-syntactic categories. This is taken to indicate that the terminal nodes of a morphological sub-classification are not morpho-syntactic feature complexes but purely morphological functions performing a discontinuous mapping between morpho-syntactic and morpho-phonological representations. The systematicity of homonymy patterns, then, is shown to be evidence for a linguistic level of ‘pure morphology’.

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Sydney, April 1997

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## Chapter 1

# Outline

### 1.0 Introduction

At various times, morphology has held a central place in the attentions of scholars interested in the structure of language. As Anderson (1988) points out, this has been particularly true of the ‘mature’ phase of various theoretical frameworks. Thus the early neo-grammarians’ concern with phonological change gradually developed in the direction of an interest in morphological phenomena in the work of such scholars as de Saussure, Hjelmslev, Kuryłowicz and Benveniste.

In like manner the American structuralist school, which was at first almost exclusively concerned with sharpening the notion of a ‘phoneme’, turned its attention, when this was considered substantially achieved, to the corresponding morphological notion of a ‘morpheme’, culminating in important contributions such as Harris (1942), Hockett (1947, 1954) and Nida (1948).

One consequence of this emergence of serious morphological study in the later period of a theoretical framework is that it has tended to be put aside in favour of starting from fresh principles when the framework itself has been superseded by new interests. And in no ‘paradigm shift’ was this clearer than in the emergence of generative grammar with Chomsky (1957). Chomsky effectively eliminated morphology as an independent domain of inquiry by subsuming the principles by which word elements are combined under more general principles designed to account for the formation of sentences.

The earliest phase of generative grammar was concerned primarily with syntax, and so dealt in a rather cavalier fashion with the ultimate phonological realization of the strings of ‘formatives’ defined by the syntactic portion of the grammar. In time, however, there

developed a theory of generative phonology, epitomized in Chomsky & Halle (1968). The combination of ideas in this work and the statement of the ‘standard theory’ of syntax in Chomsky (1965) inclined to the view that everything interesting about morphology was contained in the syntactic and phonological components. Whatever was regular about the combinations of morphemes in words, or morpho-tactics, was handled as part of the syntax, while whatever was regular about the phonological realization of morphemes in different contexts, or morpho-phonemics, was handled as part of the phonology. A set of ‘re-adjustment’ rules mediated between these two components, changing syntactic representations as required for input to the phonology. This is as close as the grammar got to having a specifically morphological component.

Developments subsequent to Chomsky (1970) have seen an enormous rise in the importance attributed to the lexicon, including the rise of self-consciously ‘lexicalist’ theories of syntax (Bresnan 1982, Gazdar *et al.* 1985) and of phonology (Kiparsky 1982a, 1982b; Mohanan 1986). These developments have sometimes been hailed as the harbingers of a renewed interest in morphological questions (e.g. Hammond & Noonan 1988) but it is fair to say that the focus of researchers pursuing these directions is in the statement of *syntactic* and *phonological* regularities respectively ‘in the lexicon’. Insofar as these syntactic and phonological concerns impinge on the structure of words, we have morpho-syntax and morpho-phonology respectively, but still no unhyphenated morphology to any great extent.

It is worth inquiring why this should be the case. Generative linguists are interested in unearthing linguistic patterns which are both deep and broad, in the sense that they are unobvious and widely found in the world’s languages. They hope from such findings to gain insight into the workings of the human language faculty, frequently thought of in terms of a biologically innate Universal Grammar. The problem with morphology from this point of view, then, is that all too frequently it looks both chaotic and parochial, the worst combination imaginable from the generative linguist’s point of view.

Some light can begin to be shed on this apparent chaos by taxonomizing it. Accordingly, Carstairs (1987) shows that all the deviations from an imagined ideal of one-to-one correspondence between content and form fall into four types, cross-classified with respect to the syntagmatic or paradigmatic character of the deviation, and the direction of mismatch. Accordingly he groups morphological idiosyncrasies under four Deviations. In the characterization of these Deviations, expressions such as ‘one-to-many’ etc. are

understood to be referring to a mapping from syntax to phonology:

[1]

Deviation I:	one-to-many syntagmatic	multiple exponence
Deviation II:	one-to-many paradigmatic	allomorphy
Deviation III:	many-to-one syntagmatic	cumulative exponence
Deviation IV:	many-to-one paradigmatic	homonymy

Deviation I, then, occurs when a single inflectional property is realized several times in a single word form, as in Latin *am-āv-ī* ‘I (have) loved’ where the perfect tense is expressed by both of the suffixes *-āv-* and *-ī*, each of which occurs only in perfect forms. This is known as multiple exponence, or, following Matthews (1972, 1974), ‘extended exponence’. (The deviation is ‘syntagmatic’ because the several exponents occur simultaneously.)

Deviation II occurs when an inflectional property has more than one exponent, but these are associated with different word-forms. It is the traditional problem of allomorphy, exemplified by comparing the exponents of the perfect tense in *am-āv-imus* ‘we loved’, *mon-u-imus* ‘we warned’, *dīx-imus* (i.e. *dīk-s-imus*) ‘we said’ and *vīd-∅-imus* ‘we saw’. (The deviation is ‘paradigmatic’ because the several exponents do not occur simultaneously but are rather in competition.)

Deviation III occurs when several inflectional properties are realized by a single exponent, as when the suffix in Latin *insul-ās* ‘islands, accusative’ simultaneously expresses the plurality and the accusative case of the noun, and cannot be segmented into a plural part and an accusative part (cf. accusative singular *insul-am* and nominative plural *insul-ae*). This deviation is also known as ‘cumulative exponence’. (It is ‘syntagmatic’ because several simultaneously present inflectional properties are involved.)

Deviation IV occurs when several alternative inflectional properties are realized by the same exponent, as when the Latin *insul-īs* ‘islands’ is either ablative or dative in case. This is the problem of homonymy. (It is ‘paradigmatic’ because the inflectional properties involved do not occur simultaneously at the syntactic level but are rather in competition.)

Since these four deviations comprise the logically possible gamut of mismatches between content and form, it is highly desirable for linguistics in general, and for the future of

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morphology in particular, that some constraints on their operation be found. Indeed, Carstairs (1987) suggests that the discovery of such constraints is the fundamental question for inflectional theorists.

Carstairs' (and Carstairs-McCarthy's) own work (1987, 1988, 1991, 1994) has been mainly concerned in elucidating the constraints on Deviation II, allomorphy. At the same time, the nature and extent of constraints, if any, on Deviation I is part of the subject matter of the ongoing polemic between proponents of A-Morphous Morphology (Anderson 1992) and related frameworks on the one hand, and on the other hand frameworks that assume a greater degree of localization of inflectional properties, including most others (e.g. Lieber 1983, 1992; Halle & Marantz 1993).

This thesis, by contrast, is concerned with Deviation IV, the homonymous realization of paradigmatically related inflectional properties. I take as my point of departure the quite radical proposal of McCreight & Chvany (1991) to account for constraints on homonymy in terms of geometric organization. Although I advance an alternative explanation to theirs, it is important to understand their proposal, primarily because to a very surprising extent *it works*, observationally speaking.

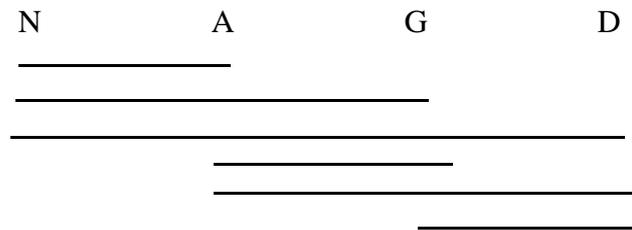
McCreight & Chvany propose to model inflectional information as an  $n$ -dimensional geometric object, where  $n$  is the number of dimensions of inflectional information, or 'morpho-syntactic categories', represented within a single word form. For instance, a word form that expresses only the number of its base would be modelled as a one-dimensional object, viz. a line segment. A word form that expresses both number and case would be modelled as a two-dimensional object, viz. a plane. A word form that expresses number, case and gender would be modelled as a three-dimensional object, viz. a cube. And so on, with extra dimensions for extra morpho-syntactic categories.

Within a single dimension, the properties belonging to that dimension are assumed to be arrayed in a fixed linear order. So a system that distinguishes four cases of nominals would entail a linear ordering of those cases, say as nominative-accusative-genitive-dative or as genitive-accusative-nominative-dative. Similarly a system that distinguishes three numbers would entail an ordering of those numbers, say as singular-dual-plural or as dual-singular-plural.

McCreight & Chvany propose that systematic homonymies within a single dimension

occur only between linearly adjacent terms. So a system with ordering nominative-accusative-genitive-dative would allow for homonymies between the nominative and accusative cases, or between the accusative, genitive and dative cases, but would not allow for a homonymy between the nominative and genitive cases unless it also involved the accusative case. The possible homonymies within a four-case system ordered as indicated are shown by the horizontal lines in [2].

[2]



The empirical burden is quite severe, since it is not *prima facie* obvious that the confluences between properties belonging to a given morpho-syntactic category in a given language should in fact be distributed in such a way that they always involve properties and sets of properties that are contiguous within a fixed linear ordering.

McCreight & Chvany go further, however, by proposing that homonymies can also occur between properties represented on different dimensions — i.e. properties belonging to different categories — provided that the confluences can be represented by a contiguous space within the *n*-dimensional object that models all the categories. Speaking in terms of a theory of lexical storage of fully inflected word forms, McCreight & Chvany state (p.104):

We propose that lexical entries in the geometric account are governed by a contiguity constraint: a lexical entry may be of any shape, but all its parts must be contiguous.

As an example, they propose for the Finnish word form *kirjansa*, which represents the nominative singular, genitive singular and nominative plural of the third-person possessed form of ‘book’, the following lexical entry (at 105):

[3]

Lexical entry for *kirjansa*

	-plural	+plural
nominative		
genitive		

This sort of representation can be extended to any number of dimensions as required, purely graphical difficulties notwithstanding.

The idea that terms of a category, in particular case and gender, should be displayed in some fixed linear order has ancient antecedents in the Western tradition. The Greek cases were ordered, for unstated reasons, by Dionysius Thrax as nominative — genitive — dative — accusative — vocative. The Latin grammarians simply took over this order and added their ‘ablative’ case at the end. This ordering was, with few exceptions, essentially unchallenged in European scholarship and pedagogy until the issue became an obsession for Rasmus Rask in the early 1800s. Despite his advocacy for a different ordering, the traditional ordering maintained its place at least in pedagogical works well into the twentieth century, particularly in Germany (Allen & Brink 1980:95-6).

One problem with this traditional ordering, as Rask noticed, is that it is extremely unsuitable for bringing homonymies into adjacency. Rask set out to remedy this, but he made his job needlessly difficult by mixing philosophical, rational criteria with formal ones, and by insisting that the ordering so obtained be universal. This project caused him continual vexation (cf. Plank 1991c). Rask’s fellow Dane Madvig did considerably better by keeping semantic and formal criteria firmly distinct, and by giving priority to the latter. The ordering of Latin cases so established, viz. nominative — vocative — accusative — genitive — dative — ablative, has itself become a rival tradition, particularly in British pedagogy. Even so, it is, as I show in Chapter 2, Rask’s and not Madvig’s ordering which most effectively captures the homonymies in the Latin case system in geometric terms.

No such confusions assailed the ancient Hindu grammarians. They were quite clear that the cases should be ordered in such a way as to bring the most frequent conflation into adjacency. And so the cases were arranged, and even named (as ‘first’ to ‘seventh’),

and homonymies were referred to ‘natural classes’ consisting of segments of this ordering: thus, in the dual number,  $-\bar{a}u$  or  $-\bar{i}$  is the suffix for cases 1–2,  $-bhy\bar{a}m$  for cases 3–5, and  $-os$  for cases 6–7 (Whitney 1879:95). This device is used very extensively in Panini’s *Astadhyayi*, and not only in morphology. For instance, the introductory *Shivasutras* (traditionally attributed to the god Shiva rather than to Panini himself) are concerned to lay out a linear ordering of phonological segments in such a way that the ‘natural classes’ that need to be referred to in the rest of the grammar come out as discrete segments of this ordering.

McCreight & Chvany (1991) is an admittedly programmatic paper, and so the burden of testing the predictions of their hypothesis (which I refer to throughout as the ‘geometric hypothesis’) remains to be discharged. I make an effort towards fulfilling this task in Chapter 2, showing that for a range of data their predictions are substantially correct. It is usually or always possible to find one or more arrangements of the properties constituting an inflectional category that bring all the undoubtedly systematic homonymies into contiguity.

This result poses a serious problem for widely assumed theories of classification by means of ‘distinctive features’. As far as the modelling of inflectional categories is concerned, distinctive features have generally been used in one of two ‘modes’. Either the inflectional category is modelled by monadic values of a category-feature, such as CASE:NOM, CASE:ACC, etc. (e.g. in most work in GPSG and LFG), or the category is modelled by means of cross-classifying binary features, such as  $[\pm oblique]$ ,  $[\pm quantifying]$ , etc. (e.g. in the work of Jakobson 1935, 1958 and Neidle 1982).

Each of these approaches has grave limitations when it comes to accounting for homonymies within inflectional categories. Monadic features clearly cannot characterize homonymies directly as anything other than accidents, since the various values of the category-feature have nothing in common beyond belonging to the relevant category. This means that if undoubtedly systematic homonymies are to be captured at all, there must be some mechanism to change feature values into other feature values. This is the purpose of ‘rules of referral’ of the type associated particularly with Zwicky (1985a, 1985b, 1990, 1991) and Stump (1993).

The use of cross-classifying binary features would seem better equipped to deal with systematic homonymies, not least because its applications to morphology have made a

great fanfare about precisely this ability. But it turns out that cross-classifying features predict precisely the wrong patterns of homonymy, and in addition are frequently undermotivated at the syntactic level.

Accordingly, in Chapter 3 I explore the idea that the linearizability of homonymy patterns suggests that what is at work is sub-classification rather than cross-classification. This is because the natural classes defined by a sub-classification are invariably linearizable, while the natural classes defined by a cross-classification are invariably non-linearizable. However, mere linearizability is insufficient, because the homonymy patterns that can be modelled geometrically include overlapping sets of terms which cannot be captured as natural classes under a sub-classification. I take this to indicate a need to augment the natural-class-defining power of a sub-classification by making use of some of the redundant information it contains. The class of schemes which augments a sub-classification in this way I call ‘re-marking’ schemes, and after exploring several such schemes I tentatively settle on one as providing the most exact fit to the homonymy patterns observed in the data of Chapter 2.

In Chapter 4 I deal with several remaining issues. One concerns those patterns of homonymy that suggest that what is in syntactic and semantic terms a cross-classification by two distinct inflectional categories may be in morphological terms a single dimension of sub-classification. This in turn brings to the fore an issue that had remained largely latent in Chapter 3, the issue of ‘mapping’ between morpho-syntactic and purely morphological representations.

I argue that the need for some form of non-trivial mapping between syntax and morphology, which is a consequence of the types of morphological representations I advocate in order to account for systematic homonymies, has been independently established in any event. Aronoff (1994) shows that at least some morphology consists of purely morphological functions, or ‘morphemes’, which are not related in a one-to-one fashion to any plausibly motivated syntactic objects. Aronoff sees morphemes as a link between syntax and phonology, but I interpret the sub-classificatory representations I have argued for as an additional layer of structure, in fact as a structuring of morphemes.

Finally, I deal somewhat briefly and inconclusively with the issues raised by McCreight & Chvany’s multi-dimensional geometric representations. The evidence for these is less convincing than it is for linear representations, and there are clear counter-examples.

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There is also a clear alternative in the use of disjunctive ordering, i.e. some form of ‘elsewhere principle’. I do note, however, that the substantial conformance of homonymy patterns across inflectional dimensions to the constraints of the geometric hypothesis argues for some tightening up of this potentially very broad idea.

In this thesis, I largely follow the terminology of Matthews (1972:160-2) in describing morphological and morpho-syntactic entities. In particular, it should be noted that a ‘category’ is understood to mean an inflectional dimension, i.e. a set of paradigmatically related inflectional features, such as features of case. When it is necessary to speak of syntactic categories such as nouns and verbs, I call them ‘syntactic categories’ or ‘parts of speech’. The terms that comprise a category are called ‘properties’: thus ‘nominative’ is a property belonging to the category ‘case’. Actual word-forms, whether whole words or parts of words such as stems and affixes, are said to ‘realize’ or ‘expound’ the properties that they are associated with. Thus a feminine singular nominative noun like Latin *insula* ‘island’ realizes the properties feminine (gender), singular (number) and nominative (case). This terminology should not be taken as a commitment as to the place of inflection before or after syntax, or as to the question of whether all word elements which are associated with a particular property actually expound or discharge (Noyer 1992) that property, principally (Carstairs 1987) or otherwise.

## Chapter 2

# Evidence for Geometric Representations

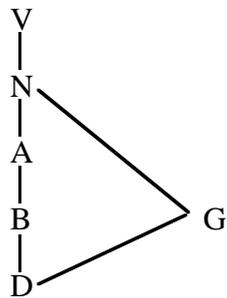
### 2.1.0 Introduction

It would obviously be pointless to inquire into the lessons to be learned from paradigm geometry if the geometric hypothesis itself were either empirically vacuous or simply observationally wrong in an uninteresting way. As it happens, the hypothesis is far from vacuous, indeed it is readily falsifiable, and so it is necessary to demonstrate its adequacy, as a hypothesis about the predicted distribution of various data if nothing else.

Demonstrating adequacy is a far more open-ended task than demonstrating inadequacy, and in this case would involve seeking counter-examples in the inflectional system of every language that has or ever had one. Before undertaking such an enterprise, it would be wise to ensure that there is some hope of success, by testing the hypothesis against a smaller, but significant, set of data. The data examined here is drawn almost exclusively from Indo-European and Afro-Asiatic languages, largely because these languages have well-documented inflectional systems which abound in the deviations (1.0) of which extensive homonymy is one.

Even in this domain the burden is quite severe. Though McCreight & Chvany's (1991) few examples tend to show the hypothesis in a good light, Plank's (1991c) more extensive but mostly schematic survey looks discouraging indeed. Plank reviews the case systems of fourteen Indo-European languages, amongst a few others, from just this point of view. Of the languages surveyed, Plank finds that only Sanskrit and Arabic are perfectly well-behaved in terms of linearizability. All the rest show varying degrees of non-conformity with strictly linear ordering, by requiring the addition of 'loops' to make additional connections beyond those given by strict linear contiguity. For instance, Latin appears to require an arrangement along the following lines, including a loop to connect the genitive case with both the dative and nominative cases (p.185):

[1]



[B = ablative]

This makes it clear that a strict version of the geometric hypothesis is falsifiable, and indeed apparently false. It is worth inquiring, though, whether it is fundamentally misguided or only trivially false. It may be that it correctly characterizes a strong tendency rather than an absolute constraint. Or it may be that the counter-examples that Plank identifies are themselves trivial in some way. Indeed, Plank suggests so (p.185):

For the languages slightly less well-behaved than Arabic and Sanskrit it would have to be shown now that the homonymy patterns responsible for minimal or near-minimal deviations from linear order (or, equivalently, neighbourhood or invariance) are systematically marginal. In many instances it is as transparent as it was in Old English that crucially non-conformist patterns are isolated, superficial, and local. Most commonly offences are brought about by inconsistencies between the homonymy patterns of different subparadigms, declensions, or classes of Case-marked words, which individually are all consistent with a single invariant linear order.

In fact the situation is better than Plank suggests, and the hypothesis survives without as much weakening as he would apparently countenance, in admitting different geometries for different inflection classes. This is as well, because the co-incidence of different patterns of homonymy in different inflection classes is one of the best indicators that geometric organization is a matter of content rather than mere form.

What is required to save a strong version of the geometric hypothesis is therefore some way to excuse or mitigate the surface exceptions. If the counter-examples can be shown to be merely trivially non-conformant, or non-conformant in tightly circumscribed ways, the hope remains that the hypothesis is after all correctly modelling at least one aspect of the organization of inflectional systems, and that the circumstances that provoke deviations should be further investigated in their own right. At the same time, one can impose

stricter criteria for non-conformance than being “isolated, superficial, local” in some undefined way. I therefore proceed as outlined in the following sections.

### 2.1.1 Counter-Examples

A fair evaluation of the observational adequacy of the geometric hypothesis requires at least the following. For any given set of morpho-syntactic properties that are realized inflectionally in a particular language, we need to look, as far as possible, at the entire range of their exponence, i.e. every inflection class of each syntactic category which is inflected for these properties. Contrary to Plank, I take this to be a minimal requirement if the hypothesis is to hold any interest.

Where there is an apparent counter-example to the hypothesis, we need to ask whether the deviating homonymy can reasonably be regarded as accidental. If not, and it is associated with a specific syntactic category, we need to ask whether there is some alternative ordering of inflectional properties which is able to model all the systematic homonymies in *that* syntactic category. If so, we need to ask if the alternative ordering for that syntactic category is not itself without some plausible justification, for instance in the differing pragmatic status of various inflectional properties as manifested in different syntactic categories, or in the fact that the inventory of inflectionally realized properties is somewhat different.

As a straightforward example of the former effect, it may be tolerable to assume that in pro-drop languages such as Latin or Italian, the nominative case of pronouns has a different status vis-à-vis the other cases than does the nominative case of nouns. This stems from its special functional role — supplying something like contrastive emphasis — and might be responsible for a different ordering of cases in the pronoun paradigm. Of course one would need to investigate further the nexus between this particular condition and the observed deviations, and if possible try to *explain* it.

The latter effect — where the actual cardinality of realized properties is different — arguably occurs in some pronoun paradigms which lack a true genitive form, most or all of its functions being supplied by categorially distinct possessive determiners. If the absence of the genitive case from the pronoun paradigm is associated with a homonymy between properties that are non-adjacent in the corresponding noun paradigm because of

the intervening genitive, and if a corresponding homonymy does not occur in nouns, then the apparent violation of geometric consistency can be seen as a prediction of the hypothesis rather than a counter-example to it.

As well as functional differences between syntactic categories, there can be functional differences between different properties of a single morpho-syntactic category, for instance between cases generally used to mark adnominal dependants (e.g. the genitive) and those used adverbally, or between cases used to mark grammatical functions of some kind and those that do not (e.g. the vocative). These could be responsible for the non-conformance, and in fact Plank notes (pp.189-90) that the genitive and vocative cases are peculiarly likely to offend (though the accusative case is also).

If deviations from geometric consistency are correlated to a high extent with factors such as these, it would appear that the geometric hypothesis is in need of further research and fine-tuning rather than abandonment.

### 2.1.2 Systematic and Accidental Homonymies

Finally, there is the question of which homonymies are to be regarded as systematic and which as accidental. Plank regards most of the counter-examples to the geometric hypothesis that he finds as “isolated, superficial, local”, but does not exclude them on that ground. Invoking a distinction between accidental and systematic counter-examples to a hypothesis runs a serious risk of rendering that hypothesis unfalsifiable, in the absence of some independent characterization of that distinction. Zwicky (1991), while not defining the distinction directly, suggests a test that reveals the systematic status of some homonymies. The test revolves around the ability of homonymies to salvage syntactic feature conflicts in certain environments such as factorable co-ordination, where the same expression must satisfy two or more conflicting syntactic requirements. In some instances the result is grammatical when the form involved is, through homonymy, ‘neutral’ as between those requirements. For example, the following sentence is acceptable with *come* and *run* which are neutral as between the infinitive and the past participle, but unacceptable<sup>1</sup> with either *see* or *seen*:

[2] There before me sat one of the ugliest creatures I ever have or ever will

$$\left\{ \begin{array}{l} \text{come upon} \\ \text{run across} \\ \text{*see(n)} \end{array} \right\} \text{ in the whole of my life.}$$

On the other hand, Zwicky claims, mere identity of form does not necessarily salvage sentences involving syntactic feature conflicts. Judgments differ as to the acceptability of the following, involving identity between the present and past finite tenses:

[3] %At present the project managers, but in the past the executive directors, set the research priorities.

There is greater consensus about acceptability with the following, involving identity between forms showing agreement with a second-person subject and with a third-person plural subject:

[4] Either they or you are going to have to go.

Zwicky concludes that two factors come into play in determining the circumstances in which a syntactic feature conflict is resolved by formal identity: whether the formal identity is accidental or systematic, and whether the conflicting syntactic features are syntactically imposed (e.g. under government or agreement), or syntactically ‘free’ (as in the choice of tense in a finite clause). These factors interact as follows: formal identity will resolve a syntactic feature conflict *unless* (1) the identity is accidental, and (2) the relevant features are free.

In principle this formulation, if correct, could be used to help identify accidental homonymies. That is, a homonymy will be judged accidental if (1) the properties it expounds are syntactically imposed, and (2) it fails to resolve a syntactic conflict involving those properties. Unfortunately this does not help in separating systematic from accidental homonymies in most of the instances that are considered in this chapter, since they are largely concerned with case systems and case is, one presumes, a syntactically imposed property. Therefore Zwicky predicts that homonymies amongst cases should resolve syntactic feature conflicts regardless of whether they are systematic or accidental<sup>2</sup>.

Even when the relevant features are free, the acceptability judgments cited by Zwicky

indicate (if his formulation is correct) that the same homonymies are considered accidental by some speakers and systematic by others. This at least is his interpretation of the different judgments passed on sentences like [3], as compared with the uniform acceptability of [4]: all speakers judge the homonymy of second-person and third-person plural verb forms as systematically identical, whereas only some people judge the homonymy of past and simple present forms as systematically identical. Presumably this implies different underlying representations or rule systems relating the two forms in the two different groups of speakers.

Rather than use such syntactic tests, however, I propose to rely primarily on the criterion of co-extension of the homonymy under allomorphy and under different conditions of cumulation in assessing systematicity. The reasoning is this. If we find that a suffix  $x$  in a certain context realizes properties  $a$  and  $b$ , it is entirely possible that the homonymy is accidental and of no more account than the two senses of *bank* in English. But if we find that in another context a suffix  $y$  also realizes properties  $a$  and  $b$ , then it becomes more likely that the homonymy is systematic. The difference of context may be allomorphic (a different inflection class) or it may involve a different cumulation of categories (say, the same properties in the plural). Naturally one's confidence in systematicity rises as the number of co-extensive homonymies does. In practice there can be no doubt in some cases. For example, in Latin the suffix *-um* realizes both the nominative and accusative cases of the singular of neuter Class 2 nouns. This in itself could be accidental, were it not for the fact that all other realizations of the neuter nominative are also realizations of neuter accusative, both the competing realizations in different inflection classes (*-e*, *-s*,  $-\emptyset$ , *-ū*) as well as in the context of cumulation with the plural instead of the singular (*-a*, *-ia*, *-ua*). There can be no doubt, then, that this particular homonymy is systematic.

At the other extreme, a homonymy associated with just a single pair of realisations gives no evidence in itself for or against systematicity. Given Zwicky's data suggesting that some speakers are more permissive than others in allowing systematicity to homonymies, I will in this chapter opt to give the geometric hypothesis the benefit of the doubt in such cases, being prepared to regard the homonymy as accidental, systematic or indeterminate depending on its effect on the geometric consistency of the whole paradigm. That is, I will make the presumption that homonymies are possibly systematic, but be prepared to regard a particular homonymy as accidental just in case (1) it violates geometric consistency, and (2) the same homonymy does not re-appear in other contexts.

### 2.1.3 Wastage

Evidence of compatibility with the geometric hypothesis comes in different strengths. The evidence is more compelling the more it converges on a single, or at least a small number, of arrangements, since this indicates that the potential of the geometry for defining pairwise homonymies (at least) is being heavily used. A system showing no homonymies whatever is compatible with the geometric hypothesis, but trivially so: any arrangement at all of the relevant properties would suffice<sup>3</sup>. At the other extreme, a system such as that of the Russian or Modern Greek cases, which converges on a single ordering, is strong evidence that the geometric hypothesis is modelling something significant about the organization of that system.

The reasoning here is that a particular geometric arrangement of inflectional properties defines the equivalent of a certain set of ‘natural classes’ of those properties<sup>4</sup>, viz. each set of such properties which constitutes a contiguous region within that geometric arrangement. For instance, a linear representation of  $n$  terms defines  $(n - 1)$  pairs of neighbours (i.e. natural classes of two members), and more generally  $n - (m - 1)$   $m$ -tuples of neighbours (i.e. natural classes of  $m$  members) (Plank 1991c). Those defined natural classes that are not implicated in homonymies can be said to be ‘wasted’.

Compatibility with different arrangements implies wastage, because all the neighbourhood relations that do not occur in each such arrangement define unaddressed, i.e. wasted, natural classes. Consider for instance a four-case system, the cases being N, A, G, D, in which there are homonymies between N and A and between G and D, but not between any other pair of cases. This system could be modelled by any of the following orderings:

[5]

- (a) N A G D
- (b) A N G D
- (c) N A D G
- (d) A N D G

Each of these arrangements exhibits the same ‘wastage’, viz. one wasted pair (respectively AG, NG, AD, ND), two wasted triples and one wasted 4-tuple. But if the same system contains a systematic homonymy of A and G, then the ordering is fixed as [5a], all pairwise neighbours define addressed natural classes, and the wastage is reduced to the triples and the 4-tuple.

The point here is that any formal model that seeks to characterize possible homonymies should be judged on its ability not only to characterize those homonymies that do occur, but also to exclude those that do not. That is, it should be judged on its weak generative capacity<sup>5</sup>, and penalized to the extent that this is either insufficiently or excessively powerful. It is on these two grounds that the geometric hypothesis will be compared with other models in the following chapters, so it is important to stress this point now and to allude to it repeatedly in the course of the exposition.

#### 2.1.4 Whole Words and Part Words

McCreight & Chvany (1991) make it clear that they envisage their geometric hypothesis as providing a model of entire paradigms of whole word-forms, and their examples suggest that whole-word homonymies are the focus of their interest. Various remarks in the paper, as well as its publication in a volume devoted to paradigms, suggest that they view their effort as part of the on-going research programme into effects attributable only to the structure of paradigms as a whole, as opposed to effects which can be attributed to properties of individual stems, affixes, morpho-syntactic property bundles, and so forth. They thus situate themselves in a broad tradition which includes Carstairs' (1987) Paradigm Economy Principle, Wurzel's (1984) 'system-defining structural properties', and Plank's (1986) proposed limit of about 30 or so distinct exponents of nominal inflection. What these proposed principles, properties and limits have in common is that they could not in principle be associated with individual rules or lexical items<sup>6</sup>. This contrasts sharply with the position represented by, for example, Lieber (1983, 1992) that paradigms are a mere taxonomic artefact and that all properties of paradigms can be so reduced.

This thesis, however, is concerned with the geometric hypothesis not so much as a theory of paradigms but rather as a theory about the organization of inflectional categories. The contrast I seek to draw, implicit at all times and sometimes made explicit, is with alternative theories of such organization, e.g. as a set of cross-classifying or sub-classifying distinctive features, or as a set of monadic entities related amongst themselves by means of 'rules of referral'. In the following two chapters I examine these alternatives more closely and compare the predictions that they make about the possible extent and the likely patterns of systematic homonymy, but in this chapter I focus on geometric representations alone, and I am willing to adduce as evidence homonymies at the sub-word level, e.g. as between affixes, stems, and even prosodic contours.

This strategy increases the range of phenomena amenable to geometric modelling quite dramatically. An example of this concerns the nominative and accusative plurals of certain non-neuter nouns of the Sanskrit consonantal declension. In most instances the nominative and accusative are not homonymous and are therefore not subject to geometric modelling as whole word-forms, e.g. *bhāvantas* [N], *bhāvatas* [A] ‘being pl.’. However, the relevant suffixes are homonymous, and can therefore supply evidence towards an ordering of the Sanskrit cases in which nominative and accusative are adjacent. And in addition, the relevant stems which distinguish whole word-forms in these two cases each participate in a complex pattern of homonymy encompassing the categories of case and number. This too can be modelled geometrically, and in an arrangement which is consistent with that indicated for the suffix homonymies (details at 2.3.3).

A further example of how this approach brings some rather complex data under the purview of the geometric hypothesis is furnished by the Classical Arabic imperfect conjugation (see 2.3.7). There is only one whole-word homonymy. But when the prefixes and suffixes that realize inflectional properties in this conjugation are considered separately, they participate in an extensive pattern of homonymies which can be modelled within a tightly constrained three-dimensional space, admitting of alternative orderings only of two properties in one dimension. In other words, the pattern of homonymies can be modelled geometrically with very little wastage.

On the other hand the localized approach does occasionally throw out data that seems relevant to the geometric hypothesis. This happens when a whole-word homonymy occurs but as a phonological ‘accident’ due to the interaction of exponents at separate (but adjacent) positions. McCreight & Chvany’s own example of a homonymy involving Finnish case and number, for instance, falls victim to such an analysis (2.3.1). For my purposes, I show that this homonymy is accidental in the sense that it is the by-product of quite general phonological rules. But it is systematic in that it will occur in any configuration where certain case forms are followed by possessive suffixes. It may well be that McCreight & Chvany would consider such an adventitious but ‘systematic’ homonymy at the whole-word level quite relevant to their enterprise; but such issues are not my focus here.

It is important to note in this regard that in this chapter I sidestep as far as possible important issues relating to the localization of the exponence of inflectional properties.

Rather, I merely assume it. I consider some aspects of current controversies in this field in Chapter 4, but for the purposes of this chapter it usually suffices to see if some particular stem, affix, or prosodic contour consistently correlates with some range of inflectional properties, and whether this range forms a contiguous region in a consistent geometric arrangement of those properties. This should not be construed as a claim that the particular item concerned is or is not an exponent, or the principal exponent, of that range of properties, as opposed to a conditioned allomorph which is selected because it subcategorizes an adjacent item, or something else altogether. All that is necessary for present purposes is that the item occurs in word-forms which realize the inflectional properties concerned.

This chapter is, however, faced with the pressing practical problem of segmentation, i.e. of identifying these ‘items’ that enter into homonymies in the first place. An obvious example of where this might be an issue is the division, or lack of it, of suffixes into theme vowels and desinences. Choices made in this regard have a direct effect on the precise homonymies that might be found. For instance, a division of the Latin declensional suffixes into theme vowels and desinences will expose an identity in the exponence of the non-neuter accusative singular in all inflection classes (i.e. as *-m*), while a lack of such division will expose an identity between only two inflection classes (i.e. *-um* versus *-am, -em, -im*)<sup>7</sup>. Other such questions relate to the boundary between stems and affixes, and to the abstraction or otherwise of the phonological representations of the items concerned. Clearly all these considerations have repercussions on what counts as ‘the same’ item.

### 2.1.5 Modus Procedendi

All these considerations add up to the need for a rather detailed treatment of most of the data examined. This is the inevitable result of the novelty of the geometric hypothesis itself, the need to account for the distributions of exponents within all inflection classes of the syntactic categories associated with particular sets of inflectional properties, the need to weigh carefully the systematicity of homonymies, the need to justify the particular segmentations assumed in controversial cases or to consider alternative segmentations, and the need to make decisions about how to divide the labour of explication between the morphology and the phonology.

This threatens to produce the “baroque maelstrom” that Aronoff (1976:47n1) identified

as the peculiar danger of expositions of detailed morphological data. I try to avoid this as much as possible by the use of several devices. One of course is simply to defer till later discussion of the important issues I have already identified as such. Another simplifying expository device is suggested by the geometric hypothesis itself: in many cases a ‘homonymy diagram’, which patently demonstrates how homonymies are distributed in a geometric space, is able to do the work of many words. Where homonymous forms are grouped in contiguous regions in such a diagram, no more need be said. For this reason homonymy diagrams are employed very extensively, leaving to verbal argumentation such tasks as justifying segmentations and assessing systematicity.

In addition the geometric hypothesis itself also suggests a numerically based approach to exposition, based on the number of dimensions in the representation and the number of terms in each dimension. Accordingly I proceed as follows. I first deal with homonymies along a single dimension of classification, for instance number, gender, person or case. I begin with three-term systems, this being the minimum number necessary to furnish evidence either for or against the approach. I then steadily increase the number of terms, up to eight.

I then examine the adequacy of the geometric approach in modelling cross-categorical homonymies, i.e. homonymies along more than one dimension of classification. Typically these will involve two-dimensional representations of case and number, or of number and gender, or of tense and mood, etc. I will also look at a few possible instances of homonymies across more than two dimensions.

I must make it clear that I do not consider multi-dimensional representations where one dimension represents not a morpho-syntactic category but an inflection class, so that the paradigmatic relations between the items represented are ones of form rather than content. This is not homonymy but mere lack of allomorphy.

## **Three-term Systems**

### **2.2.1 Gender in Indo-European**

The oldest Indo-European languages and many modern ones feature a system of three grammatical genders, masculine, feminine and neuter. A pervasive feature of the realization of gender in these languages is the presence of extensive homonymies between the

masculine and neuter genders, and to a lesser extent the masculine and feminine genders. There is little or no homonymy between realizations of the feminine and neuter genders, except in contexts where the gender distinction is entirely neutralized.

The situation we find in Latin may be taken as typical. In one declension of Latin adjectives, in both singular and plural, the masculine and neuter genders differ only in the nominative, vocative, and accusative cases. In the remaining ‘oblique’ cases, the masculine and neuter genders are identical. The feminine gender has a distinct set of forms throughout. So the adjective *bonus* ‘good’ is declined as follows in the singular (Gildersleeve & Lodge 1948:37):

[6]

	<b>Neuter</b>	<b>Masculine</b>	<b>Feminine</b>
<b>Nom</b>	bonum	bonus	bona
<b>Voc</b>	bonum	bone	bona
<b>Acc</b>	bonum		bonam
<b>Gen</b>	bonī		bonae
<b>Dat</b>	bonō		bonae
<b>Abl</b>	bonō		bonā

In the plural there is one form *bonīs* for dative/ablative of all genders, but the genitive has one form *bonōrum* for masculine and neuter, and another form *bonārum* for feminine.

This is typical not only of adjectives of this class, but also of nouns of the second declension (which decline like the neuter or the masculine of *bonus* as appropriate) and of all pronouns which distinguish gender.

In other circumstances, however, the masculine and feminine genders line up against the neuter. This is to be observed in third-declension adjectives like *facilis* ‘easy’ (Gildersleeve & Lodge 1948:40):

[7]

	Singular		Plural	
	Masc/Fem	Neuter	Masc/Fem	Neuter
<b>Nom/Voc</b>	facil-is	facil-e	facil-ēs	facil-ia
<b>Acc</b>	facil-em	facil-e	facil-ēs/īs	facil-ia
<b>Gen</b>		facil-is		facil-ium
<b>Dat/Abl</b>		facil-ī		facil-ibus

There are no situations in which the neuter is formed like the feminine but unlike the masculine<sup>8</sup>, apart from the similarity of one marker of the feminine *singular* with the universal marker of the neuter *plural* *-a*. The possibilities for gender syncretism are therefore exhaustively accounted for by the ordering neuter-masculine-feminine or the reverse, [8].

[8]

Neuter	Masculine	Feminine
bonum	bonus	bona
bonī		bonae
facile	facilem	
faciī		

Apart from correctly predicting the gender syncretisms in three-gender Indo-European languages, this arrangement is also the appropriate starting point for the historical reduction of gender distinctions, where it has occurred: either the neuter and masculine came together in a ‘masculine’ gender, as in Romance, or the masculine and feminine came together in a ‘common’ gender, as in Dutch and Scandinavian, or all three genders came together, so neutralizing the category entirely, as in English and Farsi. Nowhere has a gender contrasting with masculine been formed out of the feminine and neuter genders<sup>9</sup>.

(As a historical aside, it is worth mentioning that establishing and defending this ordering

of the genders for Icelandic was Rasmus Rask’s first foray into questioning some conventionally accepted linear orderings of gender and case. The conventional arrangement had always been masculine—feminine—neuter. See Allen & Brink (1980) for discussion.)

**Wastage:** zero.

### 2.2.2 Case in Arabic

Classical Arabic has a system of three morphological cases: nominative, accusative and genitive. There is also a distinction of ‘state’ — absolute or construct — which correlates in part with the presence of the definite article or with a modifying noun in the genitive (the precise syntactic conditions are not relevant here). (Data are from Thatcher 1976.)

Nouns are classed as ‘nunating’ or ‘non-nunating’ according as they take a final *-n* in their absolute form (this can be considered an arbitrary lexical property). Examples of declension are given in [9] (p. 40).

[9] Declension of *sāriq-* ‘thief’ and *makkat-* ‘city’, ‘Mecca’

	<b>Nunating</b>		<b>Non-Nunating</b>	
	<b>Absolute</b>	<b>Construct</b>	<b>Absolute</b>	<b>Construct</b>
<b>N</b>	sāriq-u-n	sāriq-u	makkat-u	makkat-u
<b>G</b>	sāriq-i-n	sāriq-i		makkat-i
<b>A</b>	sāriq-a-n	sāriq-a	makkat-a	makkat-a

It can be seen that in the absolute state of non-nunating nouns, the accusative and genitive are the same, and in fact in the form one can otherwise identify as accusative.

There are two distinct plural formations. ‘Broken’ plurals rely on a (somewhat idiosyncratic) change in the ‘pattern’ — i.e. the skeleton and vocalization — which produces a noun form which is otherwise declined like a singular. Broken plurals, like singulars, are either nunating or non-nunating and decline accordingly, exhibiting in the latter case a homonymy between the genitive and the accusative in their absolute state.

There is also an affixational plural called the ‘sound’ plural. The forms for *malik-un* ‘king’ and its feminine derivative *malik-at-un* are given in [10] (pp. 43-4). The element *-na* in the plural forms of ‘king’ is dropped before a following genitive case.

[10] Sound plurals

	<i>malik-un</i>		<i>malik-at-un</i>	
	Absolute	Construct	Absolute	Construct
N	malik-ū (-na)		malik-āt-u-n	malik-āt-u
G	malik-ī (-na)		malik-āt-i-n	malik-āt-i
A				

It is apparent that in sound plurals too, the difference between accusative and genitive is neutralized, but this time apparently in favour of the genitive (insofar as wherever there is a three-case distinction, *i* is the mark of the genitive)<sup>10</sup>.

The same situation obtains in the dual, [11]. Again, *-ni* is omitted before a following genitive case.

[11] Duals

	<i>malik-un</i>	<i>malik-at-un</i>
N	malik-ā (-ni)	malik-at-ā (-ni)
G	malik-ai (-ni)	malik-at-ai (-ni)
A		

These homonymies are consistent with an ordering N—G—A or N—A—G and their inverses. To choose between these orderings we would need to find a homonymy between N and G or between N and A.

In fact a common N—G homonymy can be found, but its source is fairly clearly accidental. The surface paradigm is illustrated with *qāḍiy-* ‘judge’ in [12a] in its indefinite form. However the homonymy can be analysed as arising from underlying forms as in [12b] by a rule of contraction which is stated in [12c] (in fact the rule is somewhat more general: p. 41).

[12]

	(a) Surface	(b) Underlying
N	qāḍīn	qāḍīyun
G	qāḍīyan	qāḍīyin
A	qāḍīyan	qāḍīyan

$$(c) \quad y \quad V \Rightarrow \emptyset / i\_ \\ [+high]$$

Superficially, then, Arabic is consistent only with the ordering NGA or its inverse.

But when we take into account the fact that the NG homonymies are produced by a rule of contraction from underlyingly distinct forms, Arabic becomes consistent with any ordering that makes neighbours of G and A. The wastage, then, is 50% of pairwise neighbours under any compatible ordering.

### 2.2.3 Person in German

German verbs are conjugated for the person and number of their subjects, amongst other distinctions. There are certain systematic homonymies, all of which can be captured by assuming an ordering of persons 1—3—2 or the reverse. (References are to pages of Borgert & Nyhan 1976.)

Most striking is the homonymy between the first and third persons of the plural. This occurs in both morphological tenses and both moods, and across all verbs without exception, including the pathologically irregular *sein* ‘to be’.

[13]

		(a)		(b)
		<i>sein</i> ‘be’ (p.191)		<i>kaufen</i> ‘buy’ (p.184)
		present indicative		
<b>sg</b>	<b>1</b>	bin		kaufe
	<b>3</b>	ist		kauft
	<b>2</b>	bist		kaufst
<b>pl</b>	<b>1</b>	<b>sind</b>		<b>kaufen</b>
	<b>3</b>			
	<b>2</b>	seid		kauft <sup>11</sup>

In the past of the indicative [14a] and [14b], both tenses of the subjunctive [14c] and [14d], and the present indicative of ‘modal’ verbs [14e] and [14f], the first and third

persons are identical in the singular also.

[14]

		(a) <i>sein</i> 'be' preterit indicative (p.191)	(b) <i>kaufen</i> 'run' preterit indicative (p.184)	(c) <i>kaufen</i> 'run' present subjunctive (p.184)	(d) <i>haben</i> 'have' preterit subjunctive (p.192)
<b>sg</b>	<b>1</b>	<b>war</b>	<b>kaufte</b>	<b>kaufe</b>	<b>hätte</b>
	<b>3</b>				
	<b>2</b>	warst	kauftest	kaufest	hättest
<b>pl</b>	<b>1</b>	<b>waren</b>	<b>kauften</b>	<b>kaufen</b>	<b>hätten</b>
	<b>3</b>				
	<b>2</b>	wart	kauftet	kaufet	hättet
		(e) <i>können</i> 'can' (p.194) present indicative		(f) <i>wollen</i> 'want' (pp.194-5) present indicative	
<b>sg</b>	<b>1</b>		<b>kann</b>	<b>will</b>	
	<b>3</b>				
	<b>2</b>		kannst	willst	
<b>pl</b>	<b>1</b>		<b>können</b>	<b>wollen</b>	
	<b>3</b>				
	<b>2</b>		könnt	wollt	

The fact that the homonymy occurs in both the singular and the plural, and that it involves at least two suffixal realizations ( $-\emptyset$ ,  $-en$ ) as well as the idiosyncratic form *sind*, is sufficient to establish that the homonymies are systematic, and that first and third persons must be adjacent in linear ordering.

On the other hand a large group of verbs<sup>12</sup> is characterized by using a modified stem in the second and third persons of the singular in the present indicative (p.130). These homonymies are consistent with the same ordering:

[15]

present indicative

		(a) <i>fallen</i> ‘fall’ ‘fall’	(b) <i>sprechen</i> ‘speak’	(c) <i>stehlen</i> ‘steal’
<b>sg</b>	<b>1</b>	fall- e	sprech- e	stehl- e
	<b>3</b>	fäll- t	sprich- t	stiehl- t
	<b>2</b>	st	st	st
<b>pl</b>	<b>1</b>	fall- en	sprech- en	stehl- en
	<b>3</b>			
	<b>2</b>	t	t	t

The question here is whether this co-extension of homonymies could be accidental. This seems unlikely. It is not phonologically conditioned (cf. *fällt* and *fallt*), nor does this particular alternation, which unlike the more common pattern of umlaut raises mid front vowels and does not affect non-low back vowels, occur with any regularity anywhere else in the language. It appears to be a systematic homonymy of stems associated peculiarly with the categories ‘second/third-person singular present indicative’.

Note that the homonymy of third-person singular *-t* and second-person plural *-t* is here being regarded as accidental. I have deferred discussion of homonymies across categories to a later part of this chapter, but this one can be disposed of directly.

The homonymy, if systematic, would pose a danger for the geometric hypothesis because it is not representable geometrically in any two-dimensional space involving the persons and numbers. Under any arrangement, the relevant cells merely touch at a corner:

[16]

	<b>sg</b>	<b>pl</b>
<b>1</b>		
<b>3</b>	-t	
<b>2</b>		-t

However, the homonymy is confined to a single pair of suffixes of the form *-t* and does

not co-extend under allomorphy or under different conditions of cumulation. In fact the second-person plural shows no allomorphy at all, apart from the suppletive *seid* (which  $\neq$  *ist*, [13a]), while the third-person *-t* corresponds to either *-t* or  $\emptyset$  in other contexts. The homonymy of the two *-t*'s can therefore be safely regarded as accidental.

The only one possible homonymy within the German system of exponence of person in verbs that is incompatible with the 1—3—2 ordering involves the similarity at the start of the *bi-* forms of *sein* 'to be' (cf. [13a]). However the identification of *bi-* as a word element is problematic, since it occurs only in these two forms, and the residue in the first-person singular is an 'affix' *-n* which is otherwise unattested in the language as an exponent of that property.

**Wastage:** Zero pairwise, 33% overall, in the absence of a complete homonymy of all three persons.

#### 2.2.4 Tense Stems in Germanic

As well as this stem alternation in the second- and third-person singular present indicative of some verbs, German, along with other Germanic languages, exhibits a more general system of stem alternations in some of its verb stems (ablaut). In the modern language, those verbs that undergo ablaut ('strong verbs') have a maximum of three different stems. One, here called BSE, is used in the infinitive and the present indicative and subjunctive. Another, here called PST, is used in the past tense. A third, here called PSP, is used in the formation of the past (passive) participle<sup>13</sup>.

There are nine major patterns of alternation, of which only two involve three different stems for BSE, PST and PSP. Otherwise, there is invariably homonymy either between PST and PSP or between BSE and PSP. There is never homonymy between BSE and PST to the exclusion of PSP. If this is considered systematic, it establishes the ordering BSE—PSP—PST or its inverse.

The main patterns are as follows (Borgert & Nyhan 1976:131):

[17]

BSE	PSP	PST	Example
ie	o		bieten
ei	i		gleichen
ei	ie		meiden
i	u	a	singen
e	o	a	helfen
e		a	lesen
a		i	fangen
a		ie	raten
a		u	graben

The same system subsists among the strong verbs of English. Some examples are given in [18]. Again the generalization is that we find the homonymies sanctioned by the ordering BSE—PSP—PST and no others.

[18]

BSE	PSP	PST
sing	sung	sang
come		came
bind	bound	

Zwicky (1991) considers that speakers differ in whether they regard the BSE-PSP homonymy as systematic or not (§2.1.2), and Carstairs-McCarthy (1992:202) apparently regards them both as “probably accidental”, at least insofar as they occur in strong verbs. Nonetheless, the persistence of this pattern in both English and German, after something like 1500 years of separation and much remodelling of the strong verb system in both languages, suggests that it is not entirely accidental.

**Wastage:** In both languages, zero pairwise. English has in addition a fair number of verbs (*put, set, hit, bid, etc.*) in which all three stems are homonymous. If accepted as systematic, these homonymies would take the total wastage for English down to zero. However it is suspicious that the verbs involved all end in alveolar stops, and that there is evidence for an alternative ‘weak’ suffix<sup>14</sup> *-t*, e.g. in *dreamt, slept, meant*. This suffix would be deleted after another alveolar stop, so that an analysis of PST and PSP

*put* as /put+t/, etc., becomes feasible. On this analysis, the wastage in English would be the same as in German, i.e. 33% overall.

## Four-term Systems

### 2.2.5 Case in Modern Greek

Modern Greek has a system of four cases, nominative, vocative, accusative and genitive (N, V, A, G). There are a number of declensional types, which correlate partly with gender, partly with the phonological characteristics of the stem. For the major classification I will adopt the system of Mackridge (1985:135-8), who divides the declensional types into Classes 1-3, corresponding to the traditional number of the Ancient Greek declension from which the corresponding modern type is historically derived. Because the data is relatively unfamiliar, I will give a fairly complete account of it<sup>15</sup>. (References are to pages of Mirambel 1969.)

Although Modern Greek has four cases and two numbers, there are no nouns which have eight distinct forms. Some homonymies are pervasive. All neuter nouns conflate N, V and A in both the singular and plural numbers. V always conflates with N in the plural, and in all but one type conflates with A (hence possibly also N) in the singular. This establishes the ordering NVA or its inverse for three of the cases. In a number of declensions, A conflates with G in the singular. This fixes the ordering as NVAG or its inverse.

Class 1 nouns are either masculine or feminine. Their declension differs only in Nsg and Gsg (the suffixes of which are effectively exchanged), with correspondingly different patterns of homonymy.

[19]

	(a)		(b)
	‘mother’ , f. (p.55)		‘father’ , m. (p.48)
N	mitér-a	mitér-es	patér-as
V			patér-a
A			
G	mitér-as	mitér-on <sup>16</sup>	patér-on

The vowel characteristic in the singular of this type need not be *-a*. It can be *-i* in both

masculines and feminines (hence feminine *psixí* ‘soul’, masculine *kléftis* ‘thief’), and also *-o* in feminines (hence *parθéno* ‘virgin’). Whatever the vowel characteristic is, it is maintained throughout the singular, while the plurals invariably show *-es*, *-on*. (This naturally raises the question whether the correct segmentation should not be *mitéra-Ø*, *patéra-s* etc. in the singular, but it is unnecessary to decide in this context.)

Many Class 1 nouns are ‘imparisyllabic’, which is to say that they employ an extended stem in *-ð-* in the plural (hence *jajá* ‘grandmother’, *papús* ‘grandfather’, plurals respectively *jajáðes/on*, *papúðes/on*). It is not in general predictable which nouns are imparisyllabic (Mackridge 1985:136), though they are generally (not always) accented on the last syllable. Imparisyllabic feminine nouns can have any characteristic vowel, and masculine can have any except *-o* (p.51-4 for masculine, p.57-60 for feminines).

In addition to the types listed by Mirambel, Joseph & Philippaki-Warburton (1987:155) list two further types that differ from the above in the plural:

[20]

	(a) ‘judgement’, f.		(b) ‘barber’, m.
N	krísi	krísis	kuréas
V			kuréa
A			
G	krísis	kriséon	kuréon

The pattern of homonymies is maintained under these variations.

Class 2 nouns are masculine or neuter. The standard masculine pattern is given in [21a]. Proper names and some common nouns of this pattern differ in having a Vsg homonymous with Asg, giving the paradigm in [21b].

[21]

	(a) ‘friend’, m. (p.50)		(b) ‘Nick’, m. (p.51)
N	fílos	fíli	Níkos
V	fíle <sup>17</sup>		Níko
A	fílo	fílus	
G	fílu	fílon	Níku

Neuters of this declension have their own characteristic forms outside of the genitive case. There are two types, depending on the stem-final vowel:

[22]

(a) 'mountain', n. (p.62)	(b) 'child', n. (p.61)
N	vunó
V	vuná
A	
G	vunón

(a)	(b)
'mountain', n. (p.62)	'child', n. (p.61)
N	peđí
V	peđjá
A	
G	peđjú

Class 3 nouns are all neuters, and differ from Class 2 neuters principally in having a Gsg in *-os* or *-us*. All the important patterns are given in [23] (p.63-4).

[23]

		(a) 'nation'	(b) 'letter'	(c) 'writing'	(d) 'meat'
<b>sg</b>	<b>NVA</b>	έθνος	γράμα	γράψιμο	κρέας
	<b>G</b>	έθνος	γράματος	γραψίματος	κρέατος
<b>pl</b>	<b>NVA</b>	έθνη	γράματα	γραψίματα	κρέατα
	<b>G</b>	εθνόν	γραμάτων	γραψιμάτων	κρέατον

Finally, there is a not inconsiderable number of indeclinable nouns, which perforce conflate all of N, V, A and G. These include various native nouns such as the letters of the alphabet (e.g. *to álfa* 'alpha'), dependent but finite verb forms preceded by the article and treated as infinitives (*to na férho* 'the fact that I bring; my bringing') as well as incompletely assimilated loanwords (e.g. *to tank* 'tank').

These exhaust the productive patterns of declension in Modern Greek<sup>18</sup>. The only compatible ordering is NVAG. The pairwise wastage is 33% (AG does not occur), but all 3-tuples and the 4-tuple are addressed:

[24]

**quadruples:**

N—V—A—G	indeclinables
---------	---------------

**triples:**

N—V—A	exx. [15a], [16a], [18a], [18b] singular and plural; exx. [15b], [16b] plural
-------	---

V—A—G	exx. [15b], [16b] singular
-------	----------------------------

**pairs:**

N—V	ex. [17a] plural
-----	------------------

V—A	ex. [17b]
-----	-----------

A—G	none
-----	------

The overall wastage, then, is 17%.

**2.2.6 Case in German**

Modern German has four cases: nominative, accusative, dative and genitive (N, A, D, G). There are three genders — neuter, masculine and feminine (n, m, f) — and two numbers — singular and plural (sg, pl). There is a fairly sharp distinction between a type of declension associated with pronouns, determiners and adjectives in certain syntactic contexts (here called ‘pronominal’ declension), and another, greatly reduced, type of declension associated with nouns (here called ‘nominal’ declension). (References are to pages of Borgert & Nyhan 1976.)

Certain homonymies are pervasive in both the pronominal and nominal declensions. As usual in Indo-European languages, neuters always conflate N and A in both numbers. Plurals of all numbers conflate N and A. In the singular, feminines conflate N and A on the one hand, and G and D on the other. These establish the grouping of (NA) and of (GD). In the following homonymy tables I will adopt the order NAGD, though as we shall see, one could argue for NADG as well.

The homonymies so far mentioned are illustrated by the declension of the definite article (p17):

[25]

	<b>m</b>	<b>n</b>	<b>f</b>	<b>pl</b>
<b>N</b>	der	das	die	die
<b>A</b>	den			
<b>G</b>	des	des	der	der
<b>D</b>	dem	dem		den

There are three different declensions of adjectives, the choice of which is governed by the presence and type of a preceding determiner. Two of these declensions ('weak' and 'mixed') show homonymy of AGD in the masculine, and homonymy of all cases in the plural, as well as the usual NA homonymies in the neuter and feminine. [26a] shows the weak declension. The mixed declension differs from the weak only in Masculine Nsg and neuter NAsg: it offers no new homonymies. The strong declension, shown in [26b], differs from the pronominal declension only in masculine and neuter Gsg, but this creates a new homonymy of AG in the masculine singular (p.89):

[26]

(a) Weak adjectival declension — 'red'

	<b>m</b>	<b>n</b>	<b>f</b>	<b>pl</b>
<b>N</b>	rote	rote	rote	roten
<b>A</b>	roten			
<b>G</b>		roten	roten	
<b>D</b>				

(b) Strong adjectival declension — 'red'

	<b>m</b>	<b>n</b>	<b>f</b>	<b>pl</b>
<b>N</b>	roter	rotes	rote	rote
<b>A</b>	roten			
<b>G</b>		roten	roter	roter
<b>D</b>	rotem	rotem		roten

The pattern of noun declension is somewhat different. In the plural there is always homonymy of NAG. Where the NAG forms end in *-n* or *-s*, there is complete homonymy of all four cases (p.34):

[27]

	‘brothers’ (p.36)	‘ladies’ (p.40)	‘mothers’ (p.36)	‘nights’ (p.37)	‘cars’ (p.42)
<b>N</b>	Brüder	Frauen	Mütter	Nächte	Autos
<b>A</b>					
<b>G</b>					
<b>D</b>	Brüdern		Müttern	Nächten	

Up to this point the data look good for the geometric hypothesis. The homonymies are all representable within the ordering NAGD, with zero wastage. Now we confront a possible problem.

In the singular there is always homonymy of all four cases in feminines. However, in the majority of masculine and neuter nouns, there is in the singular most commonly one form for NAD and another for G (p.36):

[28]

	<b>m</b> ‘brother’	<b>n</b> ‘bed’	<b>f</b> ‘mother’
<b>N</b>	<b>Bruder</b>	<b>Lager</b>	Mutter
<b>A</b>			
<b>G</b>	Bruders	Lagers	
<b>D</b>	<b>Bruder</b>	<b>Lager</b>	

A possible solution emerges from re-examining the singular masculines and neuters. The examples in [28] are disyllabic. When monosyllabic nouns are considered, there is the possibility for D to differ from NA (pp.37-8):

[29]

	<b>m</b> 'river'	<b>n</b> 'sheep'
<b>N</b>	Strom	Schaf
<b>A</b>		
<b>G</b>	Strom(e)s	Schaf(e)s
<b>D</b>	Strom(e)	Schaf(e)

The choice between forms with and without final *-e* is conditioned by a number of language-internal and language-external factors (p.38). The *-e* forms are used mainly with monosyllables. The Dsg form with *-e* is dispreferred when the following word begins with a vowel, and also when the noun in question is governed by a preposition. The *-e* forms generally have a formal flavour, and survive best in certain fixed expressions such as *zu Hause* 'at home', *auf dem Lande* 'in the country'. Nevertheless, the option is available, and may be thought to be evidence that the homonymy of Dsg with (N)Asg, when it occurs, is 'accidental', due to the apocope of final *-e*. If so, the ordering NAGD could be maintained for nouns.

The universal lack of *-e* in the Dsg of polysyllabic nouns is susceptible of an independently justified explanation, based on Wurzel (1970). Most polysyllabic but monomorphemic masculines and neuters end in one of *-er*, *-el* or *-en*. As a general rule of German noun declension, *-e* is always absent where it would otherwise be expected (i.e. it is deleted) in the context  $e[+son]_{\_\_}$ . (This is discussed further at 2.3.7, where it figures in providing a united account of German noun inflection.) Accordingly we could say that surface forms like Dsg *Vater*, *Onkel* 'uncle', *Mädchen* represent underlying /Vater-*e*/, /Onkel-*e*/, /Mädchen-*e*/ respectively. In these instances the dropping of final *-e* is obligatory. In the monosyllabic instances like *Tag(e)*, *Kind(e)* it is 'optional' (which is to say, subject to sociolinguistically conditioned variability).

If this analysis is accepted, and the homonymy of Dsg with (N)Asg in many masculine and neuter nouns is treated as superficial and not reflecting an underlying identity, it is possible to maintain a uniform ordering NAGD for nouns. Otherwise, if greater weight is given to the widespread occurrence of surface homonymies between Dsg and (N)Asg in masculine and neuter nouns, and to the fact that the homonymic pattern appears to be spreading at the expense of the distinct Dsg, then the homonymies could, it seems, be captured by an ordering such as GNAD, which includes segments comprising both of the desired sets (NAG) and (NAD). Unfortunately, however, this is not tenable. Apart

from the evidence of the pronominal declension, there is also the existence of (traditionally so-called) ‘weak’ nouns like *Graf* ‘count’, and *Herr* ‘gentleman, Mr’ which set Nsg apart from all other forms:

[30]

	‘count’ (p.40)		‘gentleman’ (p.47)	
	sg	pl	sg	pl
<b>N</b>	Graf	Grafen	Herr	Herren
<b>A</b>	Grafen		Herrn	
<b>G</b>				
<b>D</b>				

These patterns establish that N must be at one end of the ordering, even for nouns.

In the pronominal declension we have already seen that we require an ordering that groups (NA) and (GD), and that furthermore groups (AGD) as against N. The data presented so far have been compatible with an ordering NAGD. However, the paradigms for the first- and second-person plural pronouns, and the reflexive pronoun, show a homonymy between A and D, implying the ordering NADG:

[31]

	1pl (p.52)	2pl (p.52)	refl. (p.58)
<b>N</b>	wir	ihr	sich
<b>A</b>	uns	euch	
<b>D</b>			
<b>G</b>	unser	euer	

The problem here could also be reformulated in terms of G being ‘in the way’ of the AD homonymy. Interestingly, this correlates with a rather peripheral status of G in pronouns. Pronoun G is little used (p.53), its place normally being taken by a ‘possessive adjective’, i.e. a determiner (p.56). Furthermore, the G forms in all the pronoun paradigms are quite transparently borrowed from the paradigms of these determiners. In fact they look like the genitive plural (or feminine genitive singular) of the monosyllabic determiners, and a reduced form of this (by simplifying *-(e)rer* to *-er*) in the disyllabic determiners:

[32]

		<b>Pronoun G Determiner (GPI)</b>	
<b>sg</b>	<b>1</b>	meiner	mein-er
	<b>2</b>	deiner	dein-er
	<b>3m/n</b>	seiner	sein-er
	<b>3f</b>	ihrer	ihr-er
<b>pl</b>	<b>1</b>	unser	unser-er
	<b>2</b>	euer	eu(e)r-er
	<b>3</b>	ihrer	ihr-er

It seems not too farfetched to consider that the pronoun paradigm ‘really’ lacks a genitive case altogether. If this is right, then the AD homonymy in pronouns, far from being a counter-example, is exactly what one would expect in the ordering NAD, reduced from NAGD by omission of the genitive. (A similar situation obtains in Latin: §2.2.8.)

We see, then, that all the German homonymies can be captured within a linear ordering, but that some of them argue for NAGD while others argue for NADG. NAGD works for the plural of nouns, and for the singular of nouns also if we adopt the analysis of masculine and neuter Dsg forms with an underlying *-e*, whether present or not on the surface. NADG works for the pronominal declension, as does NAGD if we choose to ignore the AD homonymies in three pronouns. But there is no single ordering that allows all the surface homonymies to be characterized in terms of adjacency. All the problems lie in the genitive case, and particularly the genitive case (if there is one) of the personal pronouns.

### **Wastage:**

Either of the orderings NAGD and NADG has a wastage of zero. All homonymies made possible by both orderings are attested. The problem is, of course, that homonymies not representable in one or the other ordering are also attested.

## **Five-Term Systems**

### **2.2.7 Case in Ancient Greek**

Ancient Greek had, in addition to the four cases given above for Modern Greek, a dative case. Some of the patterns of homonymy are the same as for the modern language, modulo the presence of an extra case, but in its general outlines the system is quite different<sup>14</sup>. (References in the section are to sections of Goodwin 1959.)

Some homonymies are completely general (§33). In the neuter gender in all numbers, and in the dual number in all genders, N, V and A always conflate. In all genders and declensions, N and V conflate in the plural. This imposes an ordering NVA or VNA or their inverses.

In the dual number, G and D always conflate. This imposes the ordering GD or its inverse.

Accordingly the system consists of two sets, the first susceptible of four orderings and the second susceptible of two. The number of possible total orderings is the product of these, plus their inverses, for a total of sixteen:

[33]

$$\begin{array}{l}
 \text{NVA} \\
 \text{AVN} \\
 \text{VNA} \\
 \text{ANV}
 \end{array}
 \times
 \begin{array}{l}
 \text{GD} \\
 \text{DG}
 \end{array}
 =
 \begin{array}{l}
 \text{NVAGD, NVADG} \\
 \text{AVNGD, AVNGD} \\
 \text{VNAGD, VNADG} \\
 \text{ANVGD, ANVDG}
 \end{array}
 \text{ and inverses}$$

To narrow down the set of possible orderings, we would need to find a systematic homonymy across the ‘divide’ between (NVA) and (GD). The evidence is sparse.

One type of paradigm contained a homonymy between Vsg and Gsg. This, if systematic and not accidental, would entail the unique ordering ANVGD:

[34]

‘mind’ (m.) §43

**sg**                      **pl**

<b>A</b>	nô:n	nô:s
<b>N</b>	nô:s	noî
<b>V</b>	nô:	
<b>G</b>		nô:n
<b>D</b>	nô:i	noîs

However, this homonymy is reasonably regarded as an accident attributable to the phonology. The forms can be derived rather straightforwardly from one of the major paradigms of the language by a rule of contraction, and in the underlying forms so construed, the homonymy does not occur. The major pattern is given in [35a]; [35b]

gives the underlying forms of the paradigm of *nô:s* on this analysis.

[35]

		(a) §42 'word' (m.)	(b)
<b>sg</b>	<b>A</b>	lóg-on	nó-on
	<b>N</b>	lóg-os	nó-os
	<b>V</b>	lóg-e	nó-e
	<b>G</b>	lóg-o:	nó-o:
	<b>D</b>	lóg-ɔ:i	nó-ɔ:i
<b>pl</b>	<b>A</b>	lóg-o:s	nó-o:s
	<b>N</b>	lóg-oi	nó-oi
	<b>V</b>		
	<b>G</b>	lóg-ɔ:n	nó-ɔ:n
	<b>D</b>	lóg-ois	nó-ois

The contraction involved is quite general in the language. Some of its effects are given in the following table, after Smyth (1920:20-1). The row headers represent the first vowel, and the column headers the second vowel. The regular result is shown at the intersection of the appropriate row and column:

[36] Regular vowel contractions

	<b>a</b>	<b>e</b>	<b>e:</b>	<b>i</b>	<b>ɛ:</b>	<b>ɛ:i</b>	<b>o</b>	<b>o:</b>	<b>oi</b>	<b>ɔ:</b>	<b>ɔ:i</b>
<b>a</b>	a:	a:	a:i	ai	a:	a:i	ɔ:	ɔ:	ɔ:i	ɔ:	ɔ:i
<b>e</b>	ɛ:	e:	e:	e:	ɛ:	ɛ:i	o:	o:	oi	ɔ:	ɔ:i
<b>o</b>	ɔ:	o:	oi	oi	ɔ:	oi	o:	o:	oi	ɔ:	ɔ:i

By contraction, the underlyingly distinct sequences *o-e* and *o-o:* surface identically as *-o:*, which produces the apparent homonymy.

A very few members of another type of paradigm show homonymy between Asg and Gsg (§42). The form of Asg that conflates with Gsg is optional in all instances, except apparently in the one word *héɔ:s* 'dawn'. Apart from this word and *lagó:s* 'hare', the members of this paradigm type that optionally have Asg homonymous with Gsg are restricted to a few proper nouns such as *Mínɔ:s* '(the king) Minos' and *ʼAthɔ:s* 'Mount Athos'. This provides some — extremely weak — evidence for the ordering NVAGD.

It would appear, then, that there is little compelling evidence for any homonymies between members of (NVA) as a group and (DG) as a group, in the classical period. Subsequent phonetic developments, however, may have provided evidence for an ordering ANVDG at a later time.

The matter rests on the development of the ‘long diphthongs’ [a:i, ɛ:i, ɔ:i, ɛ:u], the first three of which were the usual markers of Dsg in the first and second declensions. Inscriptional evidence suggests that the off-glide in these diphthongs had ceased to be pronounced by about 100 BCE: there began to be fluctuation between the spellings A and AI, H and HI, Ω and ΩI, representing respectively *a:(i)*, *ɛ:(i)* and *ɔ:(i)* (Sihler 1995:59). This could indicate variability in pronunciation at this stage, or simply conservative versus innovative spelling in the face of a general loss of the off-glides<sup>19</sup>. At any rate, we have in Dionysius Thrax (late second century BCE) an explicit statement to the effect that the iota in certain verbal forms which likewise had, etymologically, a long diphthong, was written but not pronounced: “prosgraphoméno: tô: i, mē: sunekphō:no:méno: dé” (Lallot 1989:56). (For further discussion see Allen 1987:84-7.)

The simplification of the long diphthongs by loss of the off-glide would have led to homonymy in a large number of first-declension forms between Dsg and Vsg, in some cases encompassing Nsg as well. This would force the ordering ANVDG (§37):

[37]

	(a) ‘house’, f.	(b) ‘honour’, f.	(c) ‘steward’, m.
<b>A</b>	oikía:n	ti:mḗ:n	tamía:n
<b>N</b>	oikía:	ti:mḗ:	tamía:s
<b>V</b>			tamía:
<b>D</b>	(i)	(i)	(i)
<b>G</b>	oikía:s	ti:mḗ:s	tamío:

The status of this homonymy as systematic or not is a little unclear. True, the homonyms are co-extensive under the limited amount of allomorphy involved in the distinction between *-a:* and *-ɛ:*. But even this is arguably an automatic phonological alternation, since underlying *a:* generally surfaces as *ɛ:* in Ionic dialects, except that in Attic *a:* generally remains after *r*, *e* and *i* (Smyth 1920:15). The examples of [37] conform to this rule (though there are surface exceptions, attributable amongst other things to the loss of a *w* intervening between *r* and *a:*, e.g. *korwa:* > *korwɛ:* > *korɛ:* \**kora:* ‘maiden’).

In any case, the homonymy does not co-extend outside of this context. Alongside the patterns in [37a,b] there was another which shares the affixes for D and G (as well as the whole plural pattern), but has short-vowel affixes in N, V, A [38a]. And alongside the declension of *tamía:s* [37c], there was a type with a short-vowel affix in V. In both of these types, Dsg continues to show the  $-ε:(i)$  affix of [37b], but is no longer homonymous with V or N (§37):

[38]

<p>(a) 'Muse' (f.)</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="padding: 2px;">A</td><td style="padding: 2px;">mô:san</td></tr> <tr><td style="padding: 2px;">N</td><td style="padding: 2px;">mô:sa</td></tr> <tr><td style="padding: 2px;">V</td><td style="padding: 2px;"></td></tr> <tr><td style="padding: 2px;">D</td><td style="padding: 2px;">mó:se: (i)</td></tr> <tr><td style="padding: 2px;">G</td><td style="padding: 2px;">mó:se:s</td></tr> </table>	A	mô:san	N	mô:sa	V		D	mó:se: (i)	G	mó:se:s	<p>(b) 'citizen' (m.)</p> <table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td style="padding: 2px;">polí:te:n</td></tr> <tr><td style="padding: 2px;">polí:te:s</td></tr> <tr><td style="padding: 2px;">polí:ta</td></tr> <tr><td style="padding: 2px;">polí:te: (i)</td></tr> <tr><td style="padding: 2px;">polí:to:</td></tr> </table>	polí:te:n	polí:te:s	polí:ta	polí:te: (i)	polí:to:
A	mô:san															
N	mô:sa															
V																
D	mó:se: (i)															
G	mó:se:s															
polí:te:n																
polí:te:s																
polí:ta																
polí:te: (i)																
polí:to:																

If this difference in the coincidence of Dsg with Vsg in otherwise closely related form-types is taken as evidence for the accidental nature of the homonymy where it does occur, then all the systematic homonymies in Greek can be captured by any one of the eight different orderings (and their inverses) listed at [33]. Otherwise, if the Vsg-Dsg homonymy is regarded as systematic, it can still be captured within a linear ordering, but the possibilities reduce to ANVDG and its inverse.

For the period before the extra-long diphthongs were simplified, when in consequence pairs like *oikía:* and *oikía:i* were not yet homonymous, there is no solid evidence for any homonymies between (ANV) and (DG). Rather, the cases appear to group themselves into a 'direct' set and an 'oblique' set, with virtually no interaction between them.

### Wastage:

For the period when ANVDG might be justified, the wastage is 40%: the unused possibilities are ANVD, NVDG, VDG and AN. Again, though, the interaction between (ANV) and (GD) was limited to one homonymy of V and D (possibly encompassing N as well).

### Six-Term Systems

### 2.2.8 Case in Latin

Latin has (at least) six cases: nominative, vocative, accusative, genitive, dative, and ablative (N, V, A, G, D, B). There is a marginal Locative case, discussion of which is deferred to 2.2.11. (References are to sections of Gildersleeve & Lodge 1948.)

The pervasive homonymies (§26) are of (NVA) in neuters of both numbers, (NV) in the plural, and (BD) in the plural. There are five declensions. Three of these have sub-types depending on the gender of the noun concerned, and in addition the ‘third declension’ includes two different types based (historically) on the difference between stems ending in a consonant and stems ending in *-i*; there is some mixture of types in the ablative singular and the genitive plural.

The ordering that best accommodates the many homonymies that occur in the several declensions and sub-declensions is NVABDG, except that the placement of V after instead of before N is not motivated by linearity effects (so VNABDG would be just as good). This ordering will be used in the homonymy diagrams to follow. It will be noted, however, that the adjacency of A and B is motivated only by the behaviour of three personal pronouns, and that the ordering of G away from N entails that a fairly common homonymy in the third declension be treated as accidental.

The first declension contains mostly feminine nouns, though nouns denoting male beings such as *nauta* ‘sailor’ are masculine. Morphologically, there is only one pattern:

[39] First declension: *mēnsa* ‘table’ (§29)

	sg	pl
N	mēnsa	mēnsae <sup>20</sup>
V		
A	mēnsam	mēnsās
B	mēnsā	mēnsīs
D	mēnsae	
G		mēnsārum

There are homonymies between N and V in both singular and plural, between D and G in the singular and between D and B in the plural.

The second declension contains mostly masculine and neuter nouns, though some names of trees, cities and islands are feminine (§34). Morphologically, there is a masculine-feminine type and a neuter type, differing only in (NVA).

The masculine-feminine pattern is shown in [40]. Observe that, as opposed to the first declension, D conflates with B in both singular and plural. Also, this is the only type in the language that has a distinct V, in the singular.

[40] Second declension, masculine-feminine: *hortus* ‘garden’ (m.) (§33)

	sg	pl
N	hortus	horti
V	horte	
A	hortum	hortos
B	horto	hortis
D		
G	horti	hortorum

Where Nsg ends in *-ius*, Gsg often ends in *-ī* instead of expected *-īi*. Similarly, in proper names, as well as the nouns *filius* ‘son’ and *genius* ‘genius’, Vsg likewise ends in *-ī* instead of the expected *-ie*. This brings about a homonymy of V and G in the singular, but its status as a superficial result of contraction from different underlying forms is made clear by the pattern of accentuation: forms like *Vergīlī* ‘Virgil’ maintain the accentuation of the underlying V /vergīlie/, G /vergīlīi/, contrary to the general rule of accentuation which would otherwise require *\*Vérgilī* (§15).

There is a slight variant for stems ending in *-r*. It differs from [40] only in N, V singular:

[41] Second declension, masculine-feminine: *puer* ‘boy’ (m.) (§33)

	sg	pl
N	puer	puerī
V		
A	puerum	pueros
B	puerō	puerīs
D		
G	puerī	puerōrum

Neuter nouns of this declension differ from their non-neuter counterparts in NV singular and NVA plural. As with all neuters in Latin, there is complete homonymy of NVA in both numbers.

[42] Second declension, neuter: *bellum* ‘war’ (§33)

	sg	pl
N	bellum	bella
V		
A		
B	bellō	bellis
D		
G	belli	bellōrum

The fourth declension contains nouns of all three genders, and like the second declension, has slightly different paradigms for masculines-feminines on the one hand and neuters on the other. The non-neuters go as follows:

[43] Fourth declension, masculine-feminine: *fructus* ‘fruit’ (m.) (§61)

	sg	pl
N	fructus	fructūs
V		
A	fructum	
B	fructū	fructibus <sup>21</sup>
D	fructū <sup>22</sup>	
G	fructūs	fructuum

The neuters of this declension have, in the classical period, a radically reduced paradigm in the singular, conflating all cases bar G. The earlier D singular was *cornū*, in line with masculine-feminine paradigm and with the generalization that neuters differ from non-neuters of the same declension only in N, V, A.

[44] Fourth declension, neuter: *cornū* ‘horn’ (§61)

	sg	pl
N	cornū	cornua
V		
A		
B		cornibus
D		
G	cornūs	cornuum

The fifth declension contains feminine nouns, along with one masculine noun *merīdiēs* ‘midday’ and one noun *diēs* ‘day’ which is ‘common’ (i.e. either masculine or feminine) in the singular and masculine in the plural. The declension goes as follows:

[45] Fifth declension, masculine-feminine: *rēs* ‘thing’ (f.) (§63)

	sg	pl
N	rēs	rēs
V		
A	rem	
B	rē	rēbus
D	rē <sup>23</sup>	
G		rērum

The remaining declension, the third, poses difficulties of exemplification. Unlike the other declensions, it is not possible to give one canonical example which will predict all the forms of other nouns. The main difficulty is that the nominative singular exhibits various stem alternations which are only in part phonologically predictable. These prove important in assessing the weight of a common GN homonymy.

For present purposes, it suffices to illustrate two types (each with neuter and non-neuter sub-types) that may be regarded as ‘pure’ examples of an *i*-pattern and a C-pattern respectively<sup>24</sup>. In practice, there is considerable variation and mixing of types throughout the history of Latin, with a marked but not overwhelming tendency to associate the *i*-pattern with adjectives and the C-pattern with nouns. The patterns differ in A and B of the singular, and A and G of the plural.

The ‘pure’ *i*-pattern for non-neuters and neuters is shown in [46].

[46] Third declension, *i*-stems (§56)

		(a) masculine-feminine <i>turris</i> ‘tower’ (f.)		(b) neuter <i>animal</i> ‘animal’	
		sg	pl	sg	pl
<b>N</b>	turris	turrēs		animal	animālia
<b>V</b>					
<b>A</b>	turrem <sup>25</sup>	turrīs			
<b>B</b>	turri	turribus		animāli	animālibus
<b>D</b>					
<b>G</b>	turris	turrium		animālis	animālium

We see homonymy of N and V, and of B and D, in both the singular and the plural. In the neuters we see, as usual, an additional homonymy of A with N, V in both singular and plural. There was a tendency to replace the *-īs* of A plural with *-ēs*, thus merging with NV; this change was complete by the early empire according to Gildersleeve (§57), though Nyman (1988:503-4) maintains that *-īs* continued as a sociologically marked variant until much later. The NG homonymy in the singular in [46a] is discussed below.

The ‘pure’ C-pattern is as follows:

[47] Third declension, C-stems, masculine-feminine

		(a) masculine-feminine <i>pater</i> ‘father’ (m.) (§45)		(b) neuter <i>corpus</i> ‘body’ (§48)	
		sg	pl	sg	pl
<b>N</b>	pater		patrēs	corpus	corpora
<b>V</b>					
<b>A</b>	patrem				
<b>B</b>	patre		patribus	corpore	corporibus
<b>D</b>	patrī			corporī	
<b>G</b>	patris		patrum	corporis	corporum

Here we see that B and D are distinct in the singular, but that A merges with N, V in the

plural even in the non-neuters.

This completes the presentation of all the major paradigms<sup>26</sup> of Latin noun (and adjective) declension, leaving aside many details which are irrelevant to the issue of the geometric representation of homonymies. One further example, from pronoun declension, serves to illustrate a collapsing made available within this ordering, but which has not yet been used: accusative with ablative, in the singular. This pattern occurs in the first- and second-person singular pronouns, and in the reflexive pronoun *sē* (§§100-2).

[48] Declension of the first- and second-person pronouns

(a) First person

sg pl

N	ego	nōs
V		
A	mē	nōbīs
B		
D	mihi	
G	meī	nostrum, -ī

(b) Second person

tū	vōs
tē	
tibi	vōbīs
tuī	
	vestrum, -ī

There is a further ‘pronominal’ paradigm (§§103-6) with a characteristic ending *-ūs* in Gsg, *-ī* in Dsg, and otherwise the endings of the first and second declensions. But it presents no new homonymies.

The ordering NVABDG is therefore consistent with a very wide range of homonymy patterns in the declension of nouns, pronouns and adjectives. The only problem — and this is the counter-example that Plank (1991c) had in mind — is the homonymy between Nsg and Gsg in about 100 nouns (§26), exemplified by *turris* in [46a], as well as in a large number of adjectives (e.g. *facilis* ‘easy’ m/f N/G sg, *acris* ‘sharp’ f N/G sg).

Let us imagine that this homonymy is systematic. An ordering that allows it and also all the other homonymies in nouns and adjectives is ANVGDB (or AVNGDB; it is only necessary for (VN) as a pair to be adjacent to G). This is unlike all other orderings required by the data in this chapter, as well as almost all the data considered by Plank, in not placing either N or V first. However, even though this has repercussions for the peripherality effects adduced by McCreight & Chvany (1991), and for the question of markedness (discussed in the following chapter), it is perfectly legitimate as a model of

homonymy potential.

The problem is that ANVGDB would make the AB homonymy in personal pronouns unrepresentable. And there seems to be little question that this homonymy is systematic. It is very old in Latin, and it co-extends under variations that appear in various periods and styles such as *mēd*, *mēmē* in the first singular, *tēd*, *tētē* in the second singular, and *sēsē* in the reflexive, each of them always functioning as both A and B (§100-2).

On the other hand one could make at least as good a case as in German (2.2.6) for a separate geometric arrangement in the personal pronouns. As in German the pronouns seem to lack a true genitive case, using for the purpose what are transparently genitive forms of the corresponding possessive determiners. The forms are obviously of the masculine/neuter genitive singular, except that the alternative forms in the plural represent archaic genitive plurals in *-um*.

[49]

		<b>Pronoun G</b>	<b>Determiner</b>
<b>sg</b>	<b>1</b>	<i>mēi</i>	me-us
	<b>2</b>	<i>tūi</i>	tu-us
	<b>refl.</b>	<i>suī</i>	su-us
<b>pl</b>	<b>1</b>	<i>nostrī, nostrum</i>	noster-Ø
	<b>2</b>	<i>vestrī, vestrum</i>	vester-Ø

In addition, and unlike German, the nominative forms have a special status inasmuch as Latin is a pro-drop language par excellence, so that the nominative forms of pronouns contrast with the nominatives of nouns in having a nuance of contrastive emphasis. That is, the nominative performs a different pragmatic function in the two syntactic categories.

One might on these grounds be prepared to exclude G and N (and perhaps V also) from the pronoun paradigm. Unlike the situation in German, however, where the mere exclusion of G opened up the appropriate adjacency relations for a homonymy that was otherwise unrepresentable, the parallel procedure here still does not have the desired effect. ANVGDB minus NVG is ADB, which does not provide adjacency of A and B (as well as treating the identity of N and A in the plural as an accident).

ABD would do the trick, but both this arrangement and those proposed for nouns and

adjectives with N somewhere in the middle are motivated solely by the desire to capture the NG homonymies as systematic. Is it worth it?

When the NG homonymies are examined more carefully, there is actually little if any evidence of systematicity. True, the homonymy occurs in a substantial number of nouns and adjectives. But this is irrelevant, since it does not involve more than (at most) one pair of suffixes, which one could designate as  $-is_1$  and  $-is_2$ . There is no co-extension of the homonymy under allomorphy or under different conditions of cumulation. At worst, then, there is a completely isolated homonymy of one suffix of the genitive singular with one suffix of the nominative singular, no more remarkable than the situation with English *bank*, and in fact even less so given the very limited phonotactics of Latin suffixes.

But it is not even clear that nominative *-is* is a suffix at all. In fact the evidence for segmentation in the nominative singular of third-declension nouns is quite ambiguous. A form like *turris* (N) could arguably be segmented as *turr+is*, *turri+s*, *turris-Ø* or even *turris+s*. Consider the relationship between Nsg and Gsg in a range of third-declension nouns:

[50]

	<b>N sg</b>	<b>G sg</b>	<b>Gloss</b>
(a)	stirps	stirpis	stalk
	urbs	urbis	city
	pāx	pācis	peace
	rēx	rēgis	king
	aetās	aetātis	age
	lapis	lapidis	stone
	flōs	flōris	flower
	sanguis	sanguinis	blood
	bōs	bōvis	ox
(b)	p̄rinceps	p̄rincipis	chief
	auceps	aucupis	fowler
	iūdex	iūdicis	judge
	rēmex	rēmigis	rower
	mīles	mīlitis	soldier
	obses	obsidis	hostage
(c)	pāvō	pāvōnis	peacock
	homo	hominis	human being
	carō	carnis	flesh

(d)	turris	turris	tower
	nūbēs	nūbis	cloud
	senex	senis	old man

The items in [50a] show a N with *-s* added to the same stem as G, subject to plausibly automatic phonological modification. The items in [50b] show additionally lowering of the final vowel of the stem. The items in [50c] show loss of stem-final *n*, with change (vacuous in the case of *pāvō*) of the stem-final vowel to *o*, with some variability as to length. The items in [50d] include the type that currently concerns us. They could be analysed as (1) *-is*, *-ēs* or *-ex* added to the stem of Gsg; (2) *-s* added to a special nominative stem *turri-*, *nūbē-* and *senec-* (or *seneg-*) respectively; or (3) zero (or *-s*, with final geminate simplification) added to nominative stem *turris*, *nūbēs* and *senex*.

In view of the whole system, the learner of Latin would have had considerable evidence to posit an ending *-s*/zero for N sg, frequently accompanied by some change in either or both of the vocalism and consonantism of the stem. Only the *-is* nominatives like *turris* would provide any evidence for a N sg ending *-is*; and this evidence would tend to be contradicted by the evidence of *lapis*, *sanguis*, etc. in which *-is* is clearly not a suffix. Given the need to set up different stems in so many instances anyway, the more parsimonious course would be to adopt analysis (2) or (3), thus reducing the number of N sg affixes in this declension to two: *-s* or zero.

While not conclusive, this suggests that the the whole-word homonymy of N and G in words like *turris* can be considered accidental, and the ordering NVABDG so far can stand.

### Wastage:

The gross wastage is eight out of fifteen, or 53%, but this apparently bad result is mainly because we meet none of the four-term homonymies made possible and only one of the three-term homonymies. Amongst pairwise homonymies, the wastage is a good 20% (i.e. VA).

### 2.2.9 Case in Russian

Russian has a system of six cases, nominative, accusative, genitive, locative (or prepositional), dative, and instrumental (N, A, G, L, D, I). It has two numbers singular

and plural (sg and pl), and three genders neuter, masculine, and feminine (n, m, f). There are several declensional patterns conventionally divided into three declensions, with some sub-declensions. Data in this section are from Unbegaun (1957), Chapters III, V and VI, to which references to page numbers refer<sup>27</sup>.

Russian is used as the main vehicle for exemplification of the geometric approach in McCreight & Chvany (1991). They show that the systematic homonymies within nominal paradigms can be captured by the unique ordering NAGLDI. However, as their exposition is somewhat cursory, a more detailed outline will be given here.

The formation of A deserves special notice. In most contexts, A has no distinct form of its own, but is expressed by the form for N in the case of inanimate nouns, and the form for G in the case of animate nouns. Occurrences of this pattern will be marked =N/G in the paradigms. On a geometric approach, this immediately establishes the partial ordering NAG or its inverse.

The first declension contains nouns which are feminine, apart from those which refer to male beings. It patterns as follows (p. 39):

[51] First declension: 'school'

	sg	pl
<b>N</b>	škol-a	škol-i
<b>A</b>	škol-u	=N/G
<b>G</b>	škol-i	škol-Ø
<b>L</b>	škol-´e	škol-ax
<b>D</b>		škol-am
<b>I</b>	škol-oj	škol-am´i

This establishes the adjacency of D and L. The singular of this declension is the only context in which A is distinct from both N and G.

The second declension consists of nouns which are grammatically masculine or neuter. The two genders are treated differently in the nominative and accusative cases, identically in the rest. With masculines, A conflates with either N or G according to the rule given above. The masculine paradigms for animate and inanimate nouns are as follows (p.44):

## [52] Second declension — masculine

	‘law’ (inanimate)		‘chief, leader’ (animate)	
	sg	pl	sg	pl
<b>N</b>	zakon-Ø	zakon-i	vožd’-Ø	vožd’-i
<b>A</b>				
<b>G</b>	zakon-a	zakon-ov	vožd’-a	vožd’-ej
<b>L</b>	zakon-´e	zakon-ax	vožd’-´e	vožd’-ax
<b>D</b>	zakon-u	zakon-am	vožd’-u	vožd’-am
<b>I</b>	zakon-om	zakon-am´i	vožd’-om	vožd’-am´i

Apart from the difference in the exponence of A attributable to animacy, there is also evident a difference in Gpl. This correlates strongly, but not perfectly, with whether the stem ends in a palatalized consonant or not.

Neuters of this declension differ from the masculines in N and A in both numbers, though a few including diminutives in *-ko* and augmentatives in *-išče* generally take *-i* in NApI like the masculines. In NAsG the suffix differs according to whether the stem ends in a palatalized consonant or not. Most differ from masculines also in Gpl, though there are many complications that need not detain us here. The paradigms are as follows (pp.58-60):

## [53] Second declension — neuter

	‘wine’ (non-palatalized)		‘torture’ (palatalized)	
	sg	pl	sg	pl
<b>N</b>	v´in-o	v´in-a	mučen´-e	mučen´-a
<b>A</b>				
<b>G</b>	v´in-a	v´in-Ø	mučen´-a	mučen´-ij
<b>L</b>	v´in-´e	v´in-ax	mučen´-´e	mučen´-ax
<b>D</b>	v´in-u	v´in-am	mučen´-u	mučen´-am
<b>I</b>	v´in-om	v´in-am´i	mučen´-om	mučen´-am´i

There is a third declension of nouns whose stems all end in a palatalized consonant. They are mostly abstract nouns, and all feminine except for *put´* ‘way, road, means’, which is masculine. The masculine member of this declension differs in Isg, in taking the typically masculine-neuter suffix *-om* rather than *-ju*. The paradigms, which exhibit considerable

homonymy in the singular, are as follows (pp.64-5):

[54] Third declension — non-neuter

		(a) 'bone' (feminine)		(b) 'way' (masculine)	
		sg	pl	sg	pl
<b>N</b>		kost'-∅	kost'-i =N/G	put'-∅	put'-i
<b>A</b>					
<b>G</b>		kost'-i	kost'-ej	put'-i	put'-ej
<b>L</b>			kost'-ax		put'-ax
<b>D</b>			kost'-am		put'-am
<b>I</b>		kost'-ju	kost'-am'i	put'-om	put'-am'i

The neuters of this declension also display a shortened stem in NAsg. The rest of their singular declension is like that of *put'* [54b], while their plural declension, built on a third stem without palatalization of the final consonant, is like that of non-palatalized neuters of the second declension. They all end in *-m'a* in NAsg (pp.67-8):

[55] Third declension — neuter 'time'

		sg	pl
<b>N</b>		vr'em'a-∅	vr'em'en-a
<b>A</b>			
<b>G</b>		vr'em'en'-i	vr'em'on-∅
<b>L</b>			vr'em'en-ax
<b>D</b>			vr'em'en-am
<b>I</b>		vr'em'en'-em	vr'em'en-am'i

Aside from indeclinables (mainly foreign loanwords such as *klub* 'club', but some native names also) and the archaic/poetic word *d'it'a* 'child', these enumerate the major and minor declension types for nouns. The patterns seen so far are compatible with either of the orderings NAGLDI (as here presented) or NAGDLI. To establish one or the other, we must find one of the following four homonymies:

[56]

To establish NAGLDI: GL or DI (or both)

To establish NAGDLI: GD or LI (or both)

In fact a homonymy of G and L is to hand, in the plural of the regular adjectival declension (p.96):

[57] Declension of adjectives — ‘new’, long form

	<b>m</b>	<b>n</b>	<b>f</b>	<b>pl</b>
<b>N</b>	nov-ij	nov-oje	nov-aja	nov-ije
<b>A</b>	<u>=N/G</u>		nov-uju	<u>=N/G</u>
<b>G</b>	nov-ovo		nov-oj	nov-ix
<b>L</b>	nov-om			
<b>D</b>	nov-omu			nov-im
<b>I</b>	nov-im			nov-im'í

The feminine part of the paradigm also establishes a homonymy GLDI, though this has to be treated with care, since in general *-oju* is an (archaizing) alternative to *-oj*, but *in the instrumental case only*. Nonetheless, the need for a grouping GLDI is established by the numerals *sorok* ‘40’, *d’ev’anosto* ‘90’ and *sto* ‘100’, which change the final *-o* to *-a* in all the oblique cases, i.e. GLDI. In addition, *poltora* ‘1 1/2’ (f. *poltori*) and *poltorasta* ‘150’ also have (morphologically peculiar) oblique forms *polutora* (f. *polutori*) and *polutorasta* (p.140).

This is a fairly complete presentation of the declension of nouns and adjectives in Russian, insofar as it relates to patterns of homonymy. In addition to the paradigms so far presented, there is a ‘short form’ of adjective declension, limited for all practical purposes to N (pp.97-9), a paradigm of ‘possessive adjectives’ (including a large proportion of Russian patronymics and surnames), and a related paradigm of ‘relative’ adjectives, mostly based on nouns denoting animals (pp.100-4). These offer various mixtures of typically nominal and typically adjectival declension, but do not show any homonymies beyond those already presented. There is also considerable idiosyncrasy in nouns’ formation of Gpl which has only been hinted at. This, too, is not relevant to homonymies. The question of the ‘secondary’ genitive and locative cases is dealt with below at 2.2.13.

There remain only the paradigms of the personal pronouns. These too fit into the ordering in a straightforward way (p.122). The AGL homonymy is new:

[58]

	1sg	2sg	reflexive	1pl	2pl
<b>N</b>	ja	ti	———	mi	vi
<b>A</b>	m'en'a	t'eb'a	s'eb'a	nas	vas
<b>G</b>					
<b>L</b>	mn'e	t'eb'e	s'eb'e		
<b>D</b>				nam	vam
<b>I</b>	mnoj	toboj	soboj	nam'i	vam'i

**Wastage**

The comparison of homonymies attested with homonymies made possible is as follows:

[59] <i>n</i> -tuple	Attested?
1 x 6-tuple: N—A—G—L—D—I	Yes (indeclinables)
2 x 5-tuples: N—A—G—L—D	No
A—G—L—D—I	No
3 x 4-tuples N—A—G—L	No
A—G—L—D	No
G—L—D—I	Yes (assuming feminine Isg -oj)
4 x triples N—A—G	No
A—G—L	Yes
G—L—D	Yes
L—D—I	No
5 x pairs N—A	Yes
A—G	Yes
G—L	Yes
L—D	Yes
D—I	No

It shows a wastage of just under 47%, or 7 out of the 15 possibilities. However this is better than it looks, when we see that the wastage amongst two-term homonymies is one

out of five, or 20%, and even the wastage amongst two- and three-term homonymies is three out of nine, or 33%.

## Seven-Term Systems

### 2.2.10 Case in Polish

Polish has a system of seven cases: vocative, nominative, accusative, genitive, dative, locative, instrumental (V, N, A, G, D, L, I). There are three genders — masculine, feminine, neuter (m, n, f) — and two numbers — singular, plural (sg, pl). There is also in masculines and plurals a morphologically relevant distinction of animacy, and a further sub-distinction of ‘personalness’ or personhood, which picks out nouns referring to male human beings.

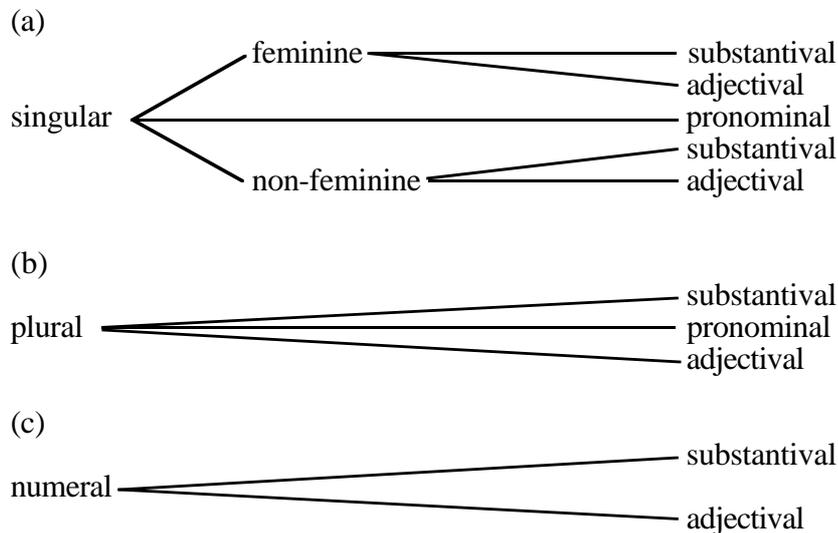
For Polish declension I have had the benefit of a work which specifically deals with homonymies, and in fact provides homonymy diagrams for all the declensional patterns: Schenker (1964). In this section I am therefore able to present Schenker’s results in summary form. References are to section numbers in his book. Polish word forms are cited in Schenker’s transcription.

Schenker does not treat V as a case, for reasons he gives in a footnote at p.18. These reasons do not seem particularly cogent — “vocative is not a category of case but rather a form of address” — but they may have been influenced by the fact that V does not fit into any linear ordering of the cases. They may also have been influenced by the fact that Schenker adopts an analysis in terms of the three cross-classifying features employed by Jakobson (1958) in his description of Russian case: with these three features there is no coherent way to characterize a vocative case. As a result, V is not included in Schenker’s homonymy diagrams, but is dealt with separately in an appendix. Since the distribution of V forms serves only to confuse an already complicated situation, I too will deal with V separately, below.

In Polish, homonymies affect all declined categories (§3.8). There are no nouns, adjectives or pronouns which formally distinguish amongst all the cases. Accordingly, Schenker uses the various patterns of homonymy as the main criterion in his finest division of patterns of declension into ‘inflectional sets’: “An inflectional set consists of the nouns whose declensional forms exhibit the same type of case syncretism”.

Schenker's primary division is based on number. All the paradigms of the language are divided first amongst singular, plural, and 'numeral' types. Within the singular types, there is a further division into feminine, pronominal, and non-feminine (i.e. masculine and neuter) types. Within the feminine and non-feminine classifications, there is a further sub-division into 'substantival' and 'adjectival' types. In the plural, the major divisions are between substantival, pronominal and adjectival types. The numerals also are divided into substantival and adjectival types. The system of classification can be summarized as follows (§3.1.1):

[60]



In addition to these types, there is in the singular a 'mixed' declension, in which the feminines pattern substantivally and the non-feminines pattern adjectivally. In matching up singular and plural declensions, the mixed singular declension corresponds with the substantival plural declension. Apart from this, singular substantival declensions correspond to the plural substantival declension, singular adjectivals to plural adjectival, and singular pronominal to plural pronominal.

Somewhat as in Russian (2.2.9), there is in masculines and plurals a peculiar distribution of the forms of A, which conflate with either N or G depending on animacy and 'personalness' (§3.5). This immediately establishes the partial ordering NAG or its inverse. For the rest, almost all homonymies not involving V can be captured by the incomplete ordering NAG{L,D}I. That is to say, there are some homonymies which require NAGLDI and some others which require NAGDLI. In addition, two inflectional

sets show a homonymy of  $A$  with  $I$ , and two show a homonymy of  $(GDL)$  with  $N$ .

The following table summarizes all the paradigms detailed by Schenker. It lists each inflectional set, grouped according to the hierarchies set out in [60], the relevant section number, and the homonymies found within that set. Additionally it picks out those homonymies that are a problem for NAGLDI and those that are a problem for NAGDLI (no other ordering need even be entertained).

[61]

Set	§	Homonymies	Problem for	
			NAGDLI	NAGLDI
<b>Sg Feminine Substantival</b>				
Set 1	6.1.1	D=L		
Set 2	6.1.2	G=D=L		
Set 3	6.1.3	G=D=L, N=A		
Set 4	6.1.4	G=D=L=N	(GDL)=N	(GLD)=N
Set 5	6.1.5	G=D=L=N, A=I	(GDL)=N, A=I	(GLD)=N, A=I
<b>Sg Feminine Adjectival</b>				
Set 1	6.2.1	G=D=L		
Set 2	6.2.2	G=D=L, A=I	A=I	A=I
<b>Sg Pronominal</b>				
	6.3	A=G, D=L		
<b>Sg Mixed</b>				
	6.4	A=G		
<b>Sg Non-Feminine Substantival</b>				
Set 1	6.5.1	A=N/G		
Set 2	6.5.2	D=L, A=N/G		
Set 3	6.5.3	N=A, L=G	L=G	
<b>Sg Non-Feminine Adjectival</b>				
Set 1	6.6.1	L=I		L=I
Set 2	6.6.2	L=I, A=N/G		L=I
<b>Pl Substantival</b>				
Set 1	6.7.1	A=N/G		
Set 2	6.7.2	N=A=G		
<b>Pl Pronominal</b>				
	6.8	A=G=L	L=G	
<b>Pl Adjectival</b>				
Set 1	6.9.1	G=L	L=G	
Set 2	6.9.2	G=L, A=N/G	L=G	
<b>Numeral Substantival</b>				
Set 1	6.10.1	G=L=D, A=N/G		
Set 2	6.10.2	G=L=D=I, A=N/G		
<b>Numeral Adjectival</b>				
Set 1	6.11.1	G=L, A=N/G	L=G	
Set 2	6.11.2	G=L=D, A=N/G		

The homonymies listed under 6.1.4, 6.1.5 and 6.2.2 cannot be captured under either ordering. Of these, the (GDL)=N homonymies in 6.1.4-5 have extremely limited distribution. 6.1.4 covers nouns formed with a particular derivational morpheme, ‘female’ *-iń-* (e.g. *gospodiń-* ‘hostess’), along with the single noun *kšeń-* ‘abbess’. 6.1.5 comprises the single noun *pań-* ‘lady’. Insofar as the inflectional class of derived stems is determined by the derivational morpheme (and not the root), the (GDL)=N pattern is therefore required by only three morphemes in the language: *-iń-*, *kšeń-* and *pań-*.

This deals with one of the A=I homonymies as well. The other, 6.2.2, is not so easily dismissed on the grounds of limited distribution. It is in fact the regular pattern for the feminine forms of adjectives and of feminine ‘adjectival substantives’ in *-ov-* (e.g. *krulov-* ‘queen’), as well as the feminine forms of the third-person pronoun. However, the homonymy is due to a single suffix *-on*. There is no co-extension under allomorphy or different conditions of cumulation. (The same is true of the (GDL)-N homonymies. Again, a single suffix *-i* is involved.)

If this is accepted, it leaves only instances of L=G as counterexamples to NAGDLI, and of L=I as counterexamples to NAGLDI. Apart from the fact that L=G occurs in twice as many paradigms as L=I, there is another, and decisive, reason to give more weight to the L=G homonymies. The L=G homonymy occurs in both the singular and the plural, and it involves at least three different affixes (as well as some variants found only in four numerals): *-u*, *-as* and *-ix*. The L=I homonymy, by contrast, occurs only in the singular, and involves only a single suffix *-im*. Therefore the NAGLDI analysis would have to countenance only a single homonymous string /im/ = L, I, whereas the NAGDLI analysis would have to countenance three different homonymous strings /u/, /as/, /ix/, the first singular and the latter two plural, each one homonymous as between locative and genitive.

In summary, the homonymies that must be accounted accidental under each ordering are as follows:

[62]

(a) Accidental homonymies under NAGLDI

(1)	<i>-i</i>	Nsg, GLDsg
(2)	<i>-on</i>	Asg, Isg
(3)	<i>-im</i>	Lsg, Isg

## (b) Accidental homonymies under NAGDLI

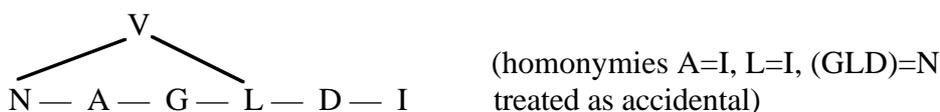
(1)	-i	Nsg, GLDsg
(2)	-on	Asg, Isg
(3)	-u	Lsg, Gsg
(4)	-as	Lpl, Gpl
(5)	-ix	Lpl, Gpl

Even more than the number of homonymies involved, the co-extension of the LG homonymy in two numbers and over three affixes, compared with the complete lack of co-extension of any of the homonymies in [62a], settles the question: the ordering is NAGLDI, the same as in Russian (2.2.9).

The homonymies involving V, however, pose a serious problem. (Data on the vocative is from Schenker's Appendix B, pp.93-4.) V conflates with N in the plural and in many singulars. As A may be distinct from N (and therefore V) in the plural, this establishes the ordering VNA... etc. Additionally, Vsg is distinct from all other case forms in the feminine declensions 6.1.1, 6.1.2 and 6.2, and the mixed declension 6.4. This has no ordering implications. However in feminine declensions 6.1.3, 6.1.4 and 6.1.5, and in most personal masculine nouns, V=L (and possibly also some other case(s) with which L conflates). That this is not accidental is settled by the fact that there are three different affixes involved in the homonymies — *-i*, *-e*, and *-u* — which amounts to more than half of all the Lsg affixes (the others being *-ej* and *-im*). There can be no doubt, then, that as a systematic fact about Polish, V conflates with L whenever it is not distinct from all other case-forms and it does not conflate with N.

The best that we can do in terms of ordering for the Polish case system, then, is a representation like the following, involving a 'circle' (in terms of Plank 1991c) from L back to N through V:

[63]



This is not a particularly bad result, however. Perhaps what is more surprising is that so many of the homonymies in a case system that is riddled with them can be captured by a single ordering. The only serious offender is V, the usual offender (along with G)

against linear ordering.

Even the putatively accidental homonymies entailed by this analysis are not very surprising, given the extremely restricted subset of its phonemic inventory that the language uses in declension. All declensional affixes consist of between one and three segments, in the pattern  $-V(C(V))$ , and with the single exception of  $-Vgo$ , all the consonantal segments are drawn exclusively from three of the language's fricatives, two nasals and the glide  $-j$ , i.e. a subset of the continuants and sonorants (§4). And of the 185 distinct affixes (not including  $-Vgo$ ) potentially made available by this restricted inventory and morphotactics, only 29 are in fact used (very close to Plank's (1986) proposed universal limit of 30). Given the large number of cases and the many different inflectional classes of the language, this means that massive homonymy is inevitable. And yet all of it, bar the three homonymous affixes in [57a] and the bigamous behaviour of the vocative, can be analysed as occupation of continuous segments of the ordering NAGLDI.

### 2.2.11 Another Case in Latin

It was shown in 2.2.8 that homonymies between the six cases of Latin can be accommodated within the ordering NVABDG. It is sometimes asserted that Latin has a seventh case, the locative (L). (By L is meant a morphological (not syntactic) expression of the role of location. References are to sections of Gildersleeve & Lodge 1948.)

Formally the locative is very rarely distinctly marked, virtually the only examples being the early Latin *noctū* 'at night' (§37), and classical *temperī* 'on time' and *domī* 'at home' the last of which can, however, function also as G (§61). In the plural it is always identical with BD (§386, where however, it is classified as a use of B). In the singular of the first and second declensions it is identical with G (§§29, 33). In the third declension the earlier form was identical with D, but later became identical with B in most instances (§37).

A case that conflates with all three of B, D and G cannot be accommodated within the ordering NVABDG, or indeed any other ordering that might be justified for Latin (see 2.2.8). But this failure to fit into the regular paradigmatic space may reflect L's extremely marginal status in the language.

Syntactically, L shows some signs of being treated as a form of B, even when formally it

conflates with D or G. For instance, a noun or noun phrase in apposition is put in B (§411):

- [64] Archiās Antiochīae nātus est celebrī quondam urbe.  
 ArchiasN AntiochL(=G) having.been.born is populousB once cityB  
 ‘Archias was born at Antioch, once a populous city.’

Commonly, though, a prepositional phrase, with the noun in B, is employed in apposition (§386):

- [65] Neāpolī, in celeberrimō oppidō  
 NaplesL in very.populousB townB  
 ‘At Naples, a populous town’

The locative *domī* ‘at home’, which is also an optional form of Gsg, takes any possessive determiners in Gsg (§411):

- [66] Domī suae senex est mortuus.  
 HouseL hisG old.manN is having.died  
 ‘The old man died at his own house.’

L has an extremely limited distribution. In the first and second declensions it is virtually restricted to proper names, and specifically names of towns and small islands (§411). In the following sentence of Cicero’s, the location on the small island of Rhodes is put in L, but the parallel location in the district of Bithynia is coded with a prepositional phrase:

- [67] Rhodī ego nōn fuī, sed fuī in Bithyniā.  
 RhodesL meN not I.was, but I.was in BithyniaB  
 I was not at Rhodes, but I was in Bithynia.

In the singular of the third declension, and the plural of all declensions, names of towns are put in the ‘ablative’ (i.e. L homonymous with B) to indicate location (§386). Half a dozen or so third-declension names of towns optionally have an L identical with D, e.g. *Karthāginī* (=D) or *Karthāgine* (=B) ‘at Carthage’ (§37).

L exists for only a very small number of common nouns [68] (§§37, 411). Even some of these show evidence of being lexical items in their own right, either because of an idiomatic or restricted meaning (*praefiscinī*), idiosyncratic form (*noctū*, cf. D *noctī*, B *nocte*) or both (*temperī*, cf. D *temporī* and the implication of appropriateness). Furthermore *bellī* and *mīlitiae* are mostly used in the stock phrases *domī mīlitiaeque*, *bellī domīque* ‘in peace and in war, at home and in the field’. For all intents and purposes these are synchronically lexicalized as adverbs.

[68]

Declension	Form	Gloss
1	mīlītiaē	‘abroad’ (i.e. on campaign)
	terraē	‘on land’
2	campī	‘in the field’
	bellī	‘at war’
	humī	‘on the ground’
3	herī	‘yesterday’
	lūcī	‘in the (day)light’
	noctū	‘at night’ (principally early)
	orbī	‘in the world’ (Cicero)
	peregī	‘abroad’ (i.e. on a journey) (early)
	praefiscinī	‘without offence’ (early)
	rūrī	‘in the country’
	temperī	‘on time, at the right time’
	vesperī	‘in the evening’
	4	domī

L is thus clearly outside the usual system of nominal inflection in Latin. This is not just a question of its almost complete lack of formal differentiation: rather, virtually all common nouns apart from those listed in [68], i.e. the vast majority of the nouns in the language, simply *do not have* a locative. In those syntactic contexts where nouns that have a morphological locative may employ it, nouns that lack one must appear as the complement of a preposition. This gives L a quite different status from the other six cases, and this may be reflected in its failure to fit into any single ordering of the cases. A rather similar, though not identical, situation operates with the ‘accessory’ cases of Russian (2.2.13).

## Eight-Term Systems

### 2.2.12 Case in Sanskrit

Sanskrit poses few problems for the geometric hypothesis, and in fact a geometric (or rather merely linear) representation was adopted by the ancient Hindu grammarians themselves. There are eight cases in Sanskrit, though the grammarians counted only seven, since they believed that the vocative was not a true case but merely a form of the nominative used in calling (Panini 6.1.69 in Katre 1987). The vocative is indeed formed, where it is distinct, in quite a different manner from the other cases. (References are to

sections of Whitney 1879.)

The cases, apart from the vocative (V), are nominative, accusative, instrumental, dative, ablative, genitive and locative (N, A, I, D, B, G, L). This is also the ordering established by the grammarians (N = *prathamā* ‘first’, L = *saptamā* ‘seventh’). It is one of only two possible orderings (along with their inverses), if N is taken as first<sup>28</sup>. The reluctance of the grammarians to treat V as a case may be in part attributable to the fact that the only place it can occupy in the ordering is before N. Apart from this, fitting V into the ordering causes no problems.

There are three numbers — singular, dual, and plural — and three genders — masculine, feminine, and neuter (§§263-4). In Whitney’s reckoning there are five declensions (§321); all but the first have sub-declensions.

Certain homonymies are pervasive, and immediately justify part of the ordering. In the dual, there is always homonymy of V, N, A, of I, D, B, and of G, L (§308). This immediately establishes three groups (VNA), (IDB) and (GL).

V always conflates with N in the plural<sup>29</sup> (§309). N and A always conflate in neuter nouns, in all numbers (§307-9). Neuters may have, in the singular, a V different from their N, A (e.g. NA *āsyam*, V *āsyā* ‘mouth’ §330). This establishes the sub-ordering VNA or its inverse ANV.

D and B always conflate in the plural, except in personal pronouns (§309). This establishes for the group (IDB) one of the orderings I—D—B or I—B—D and their inverses. In all noun declensions but the first, B and G conflate in the singular (§307). This requires that B be on the periphery of its sub-ordering so that it can be adjacent to G. Accordingly one of the sub-orderings IDBGL or its inverse LGBDI is required.

Therefore all the homonymies in Sanskrit noun declension can be accommodated by one of the following orderings:

[69]

- |     |           |
|-----|-----------|
| (a) | VNA IDBGL |
| (b) | ANV IDBGL |
| (c) | VNA LGBDI |
| (d) | ANV LGBDI |

Within the pronominal paradigms, there are two minor problems for (any of) these orderings.

The first- and second-person pronouns, in the singular and the plural, have alternative enclitic forms in A, D and G (§491):

[70]

		1	2
sg	A	mā	tvā
	D	me	te
	G	me	te
pl	A	nas	vas
	D	nas	vas
	G	nas	vas

The problem is that the homonymies between D and G in the singular, and between all three cases in the plural, cannot be expressed within any of the orderings so far established, because I and G are ‘in the way’. But the situation here is even clearer than that of the genitive of personal pronouns in Latin (2.2.8) and German (2.2.6). Since these enclitics exist only in these three cases, it is only necessary to subtract the rest from one of the generally applicable orderings to get an ordering that allows these homonymies. For example, VNAIDBGL – VNIBL = ADG.

The other problem concerns a partial morphological similarity in the ‘regular’ pronominal declension, namely the presence of a formative-*sm-* in the singular D, B and L of masculines and neuters. This is exemplified by the singular declension of *tat* ‘it; that’ (§495-6):

[71]

NA	tat
I	tena
D	tas <b>māi</b>
B	tas <b>māt</b>
G	tasya
L	tas <b>min</b>

This element occurs in the declension of demonstrative, interrogative and relative pronouns, as well as a number of adjectives which follow the ‘pronominal pattern’ always or under certain circumstances. Yet the context of its occurrence cannot be referred to a segment of

any independently needed linear ordering, since any ordering based on noun declension would require a segment B—G—L, with G ‘in the way’.

We can re-examine the reasons for the ordering B—G—L. Recall that the adjacency of B and G was motivated by the fact that B and G conflate in all noun declensions except the first. However, as B and G are distinct for singular masculines and neuters in the pronominal declension, it might seem possible to reverse the ordering G—L for the pronominal declension, thus creating a segment D—B—L(—G) which can serve as the context for occurrence of *-sm-*. Unfortunately, though, the feminines of the pronominal declension maintain the B—G homonymy, so that this option is not available unless we were prepared to entertain a separate ordering just for *non-feminine pronominal declension*. Clearly this would be desperate.

It is probably not necessary however. Quite apart from the rather marginal and questionable status of this *-sm-* formative (is it a morpheme? part of the stem? part of the suffix?), its distribution appears to have a clear phonological basis. The suffixes not preceded by *-sm-* are either consonant-initial (*-t*, *-sya*) or disyllabic (*-ena*). *-Sm-* appears only before monosyllabic suffixes beginning with a vowel (*-āi*, *-āt*, *-in*). Since *-sm-* occurs in a phonologically rather than paradigmatically definable context, its distribution is irrelevant to considerations of ordering.

**Wastage:** The pairwise wastage is 28% (2/7). ID is unaddressed except as part of IDB, and the lack of any homonymy between any member of the group (VNA) and a member of the group (IDBGL) is what allows for the four different orderings. Apart from VNA and IDB, there are no homonymous sets with more than two members.

### 2.2.13 Two More Cases in Russian

We saw in 1.1.9 that homonymies between the six cases of Russian can be accommodated within the ordering NAGLDI or its inverse, and no other. In addition to these six cases, certain Russian nouns have one or two additional cases, which Jakobson (1958:109), following Peškovskij, calls ‘accessory cases’. These are a second genitive (GII) and a second locative (LII).

Very few nouns have distinct forms for either GII or LII. They are restricted to the singular number, and to inanimate masculine and feminine nouns that have a zero suffix

in Nsg, and by no means all of these (Jakobson 1958:124). The paradigms that have a zero suffix in Nsg are (according to the numbering used in 2.2.9) the second declension (masculines only) and the third declension.

A distinct GII is found only in the second declension. Its suffix is stressed or unstressed *-u*, contrasting with *-a* for GI. This makes it homonymous with D. Jakobson (1935:91-2) approvingly cites Šaxmatov's characterization of GII:

He [Šaxmatov] establishes that genitives in *-u* [GII] are formed with noncount words with a meaning of substance, collectivity, or abstraction, and that the *-a* ending [GI] connotes "the individualization or concretization of the substance-concept"...

The difference between GI and GII may be felt in the following contrasting pairs (*ibid.*, transliteration here and elsewhere changed to that described in Appendix 2):

[72]

GI:	zapax kon'jaka	'the smell of cognac'
GII:	r'umka kon'jaku	'a glass of cognac'
GI:	n'e p'il kon'jaka	'drank no cognac', i.e. did not like or appreciate this drink
GII:	n'e p'il kon'jaku	id., but a mere assertion

In addition to this partitive use, GII is used also for the complement of certain prepositions that normally govern GI, but "this is an unproductive grammatical form, and its use is restricted to a few frozen constructions, such as, for example, *iz l'esu* 'out of the woods', *iz domu* 'out of the house', *s polu* 'from the floor' ..." (Jakobson 1935:93).

For those nouns (the vast majority) that do not have a distinct GII, GI supplies forms for the same syntactic frames. This fact, taken with the homonymy of GII with D, poses an ordering problem: there is no way to fit in a homonymy with either G or D, but excluding L, in the ordering NAGLDI.

Many of the nouns which have a distinct GII, and certain others besides, including some feminines of the third declension, also have a second form of the locative (LII). The affix for LII is always a stressed high vowel.

In the second declension, the ending for LII is *-ú* and it normally occurs only with words that otherwise take stress on the stem in the singular, alternating with stress on the affix in the plural (Unbegaun 1957:52). For this reason, nouns in LII *-ú* are normally not homonymous with their forms in D (and possibly GII) *-u*. In the third declension, the ending is *-í*. This is segmentally identical with LI, but prosodically distinct for all those nouns that have non-final stress in the singular. It follows therefore that with nouns that have final stress in the singular, we cannot tell if we are dealing with LI or LII. However the only nouns that qualify are some numerals and the word *l'ubóv* 'love' (Unbegaun 1957:66-7). In fact only a very few monosyllables of the third declension have a distinct LII: Unbegaun (*ibid.*) lists fourteen.

LII is used only after the prepositions *v* 'in' and *na* 'on'<sup>30</sup>. According to Unbegaun (*op. cit.* 52) it is used only when these prepositions have "a strictly local sense". Jakobson (1984a:93) characterizes it differently: LII is used when the noun's "function of container or measurement is the usual, or even the only possible property of the referent". He cites a minimal pair:

[73]

LI:	skol'ko krasoti v l'es'e	'how much beauty there is in a forest'
LII:	skol'ko krasoti v l'esu	'how much beauty there is in the forest'

Whatever the precise characterization of its functions, the important points for present purposes are: (1) most nouns do not have a distinct LII in the singular, and none do in the plural; (2) where a distinct LII does not exist, its functions are performed by LI; (3) where a distinct LII does exist, it is normally not homonymous with any other case form; but (4) LII is segmentally homonymous with D (and possibly GII) in second-declension nouns, and with LI in third-declension nouns.

Observations (1) and (2) establish that in terms of ordering, LII must be adjacent to LI. The rest depends on what weight we wish to give the specific stress pattern of LII. If we ignore the stress difference, then observation (4) ensures that LII must be ordered between LI and D. This would entail partial ordered paradigms such as the following:

[74]

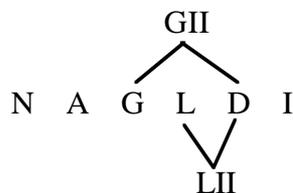
	2nd declension 'forest'	3rd declension 'bone'
<b>G</b>	l'ésa	kóst'í
<b>LI</b>	l'és'e	kóst'í
<b>LII</b>	l'esú	kost'í
<b>D</b>	l'ésu	kóst'í
<b>I</b>	l'ésom	kóst'ju

Note that there is a price for ignoring the prosodic difference between LII and the other cases: in the third declension, the full-word homonymy between G, LI and D has been broken up by a word form with a different stress pattern.

However, giving weight to the distinctive LII stress pattern does not help much either: there is still no place adjacent to LI (i.e. between G and LI) that would not also break up the contiguity of the word form *kóst'í* in its various functions. And placing LII somewhere which is not adjacent to LI, in order not to break up the contiguity of *kóst'í* etc., is incompatible with the fact that LI performs the functions of LII in the plural and also in the singular of most nouns.

LII therefore cannot be ordered consistently with respect to the other cases. As noted above, neither can GII, for similar reasons: when distinct, it is homonymous with D and, in segmental terms, with LII when it exists; but when there is no distinct GII, its functions are performed by GI. The best one can do is to partially order GII and LII, somewhat as follows:

[75]



This is reminiscent of the failure of the Latin locative case to fit into any ordering of cases. In both languages, the cases involved are 'accessory' in the sense that they exist as distinctive forms only for a very small minority of nouns. But there is nevertheless an important difference. Latin nouns which lack a locative have *no* morphological form

which is compatible with the syntactic frames in which the locative can be used; rather a prepositional phrase with the noun as its complement must be used in those frames. By contrast, Russian nouns which lack GII or LII can always employ GI and LI in the same contexts, albeit possibly with loss of the nuance that the use of the accessory cases can impart.

## Multi-Dimensional Representations

### 2.3.0 Introduction

I have so far considered the ability of the geometric approach to model homonymies between terms of a single category, principally case. It is apparent that to a very great degree, a fixed ordering of those terms can be established such that homonymies are restricted (either totally or at least very substantially) to discrete segments of this ordering.

But the geometric hypothesis does not stop at one dimension of representation. It also allows for the possibility of systematic homonymies across categories, such as between some case(s) in the singular and some case(s) in the plural. All that is required is the rather natural extension of the concept of linear adjacency to the more general concept of spatial contiguity. And McCreight & Chvany (1991:104) propose just this:

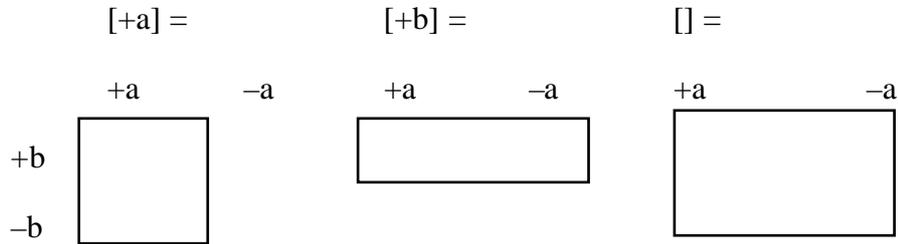
We propose that lexical entries in the geometric account are governed by a contiguity constraint: a lexical entry may be of any shape, but all its parts must be contiguous.

On the geometric approach, the total number  $n$  of inflectional categories for a particular word is modelled as an  $n$ -dimensional space. Within that space, any contiguous region can form the locus of a particular word-form, if thinking in terms of full-word homonymies, or more generally, any contiguous region can provide the context for some morphological rule.

This ability to model sets of grammatical properties that differ in category is not confined to the geometric hypothesis. It is straightforwardly done in feature-based approaches also. Consider the ‘space’ defined by two cross-classifying features  $[\pm a]$  and  $[\pm b]$ . A feature-based approach can define the following sub-spaces as ‘natural classes’ (based

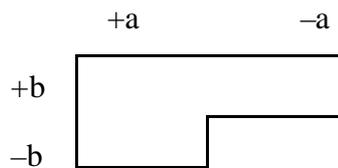
on McCreight & Chvany 1991:103):

[76]



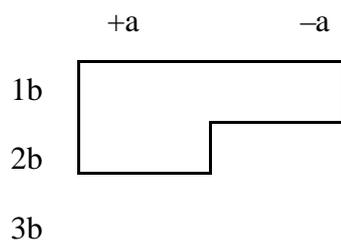
Pure feature-based approaches, however, are limited to expressing natural classes which are rectangular in such a representation. By contrast, the geometric hypothesis can also model irregularly shaped spaces:

[77]



Spaces such as that in [77] cannot in general be modelled in terms of features. It is true that in the case of [77], a negative specification can be made because the excluded space itself forms a natural class: so the space could be defined as the complement of  $[-a, -b]$ , or  $\sim[-a, -b]$ . Another way of putting it would be to say that the region in [77] is ‘elsewhere’ with respect to the definable region  $[-a, -b]$ . Such a use of ‘elsewhere’ cases is an important strategy in extending the expressive power of feature-theoretic accounts. But it depends completely on the definability of the complementary region(s) with respect to which the region under consideration constitutes the ‘elsewhere’ case. It need not in general be true that there is such a definable complementary region. Consider the following space, where the vertical dimension represents a three-term category:

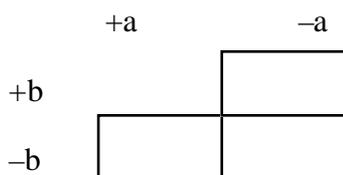
[78]



In [78], neither the enclosed space nor its complement is definable as a natural class based on features. Neither is representable in feature-theoretic terms except as a disjunction of two separate natural classes, viz. [1b] and [2b, +a] for the enclosed space, [3b] and [2b, -a] for its complement. Under the geometric hypothesis, however, both the space and its complement are legitimate single contiguous regions in two dimensions, and so qualify as ‘natural classes’ which might provide a context for lexical insertion, for the choice of an affix or stem allomorph, etc.

Regions which are not contiguous (even if they touch at a corner) are not considered valid geometric objects in McCreight & Chvany’s terms. So the following could not represent a single context under the geometric approach:

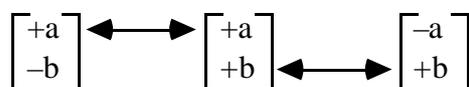
[79]



In a feature-theoretic approach enriched with the ‘elsewhere’ notion, the region(s) in [79] could be defined as ‘elsewhere’ with respect to the definable regions [+a, +b] and [-a, -b]. But this would not work if [+a, +b] and [-a, -b] themselves constituted a natural class for some purpose<sup>31</sup>.

The requirement of contiguity in the McCreight & Chvany approach can itself be re-interpreted in terms of features, but only to a certain extent. The idea is that any two sets of properties may be involved in a homonymy provided that one can go from one to the other via a series of intermediary links, each link involving at least one property in common. For instance, in [77] the homonymy of the slot representing [+a, -b] with the slot representing [-a, +b] — two slots that have no properties in common — is made possible because one can go from one to the other via a slot representing [+a, +b]:

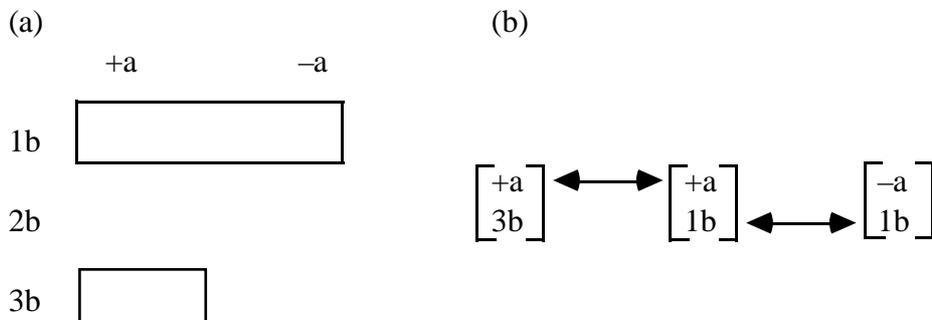
[80]



By contrast, the identical two sets of properties in [79] cannot be linked via any intermediate steps.

The geometric approach is not merely a notational variant of a feature-based approach allowing such chain-link relations, however. The crucial difference emerges when categories of more than two terms are considered. For instance, the region represented in [78] can be given a chain-link interpretation very similar to [77]. On the other hand, the regions in [81a], though also susceptible of a chain-link connection [81b], nevertheless do not constitute a contiguous region *geometrically*.

[81]



That is, the geometric hypothesis can define as natural classes only a subset of those that can be modelled in terms of chain-link relations.

On the other hand, even more restrictive geometric representations are imaginable, and have been used. It was pointed out at 1.0 that McCreight & Chvany's use of linear ordering to model natural classes has antecedents in Panini's Astadhyayi. There are also parallels in the use of two-dimensional regions to model natural classes, but in this instance Panini's descriptive apparatus is considerably more constrained. An example from the description of Sanskrit declension will illustrate something of the scope of two-dimensional representations in Panini.

The underlying forms of the Sanskrit case-number suffixes are set out in a list at sūtra 4.1.2, [82]. (The transliteration is based on that of Katre 1987. '–' represents a boundary unaccompanied by sandhi processes, '=' a boundary where sandhi takes place; the sandhi itself is not indicated. Plain letters represent real segments. Boldface letters are 'IT-markers', which serve to individuate the affixes and/or to define 'sigla' as described below.)

[82] Astadhyayi 4.1.2

su = au – jas = am – auṭ = śas = ṭā – bhyām – bhis – ṇe – bhyām –  
 bhyas – ṇasi – bhyām – bhyas – ṇas – os – ām = ṇi – os – sup

By sūtra 1.4.103 we are instructed to regard these as a two-dimensional matrix, with three columns per row. The columns represent number (singular, dual, plural) while the rows represent case (nominative, accusative, instrumental, dative, ablative, genitive, locative):

[83]	<b>sup</b>			
		<b>sg</b>	<b>du</b>	<b>pl</b>
	<b>N</b>	<b>su</b>	au	<b>jas</b>
	<b>A</b>	am	auṭ	śas
	<b>I</b>	ṭā	bhyām	bhis
	<b>D</b>	ṇe	bhyām	bhyas
	<b>B</b>	ṇasi	bhyām	bhyas
	<b>G</b>	ṇas	os	ām
	<b>L</b>	ṇi	os	sup

From the elements of this matrix we can form various ‘sigla’ to represent natural classes. To form a siglum we take a real initial element and concatenate to it a final IT-marker. Thus **sup**, made from initial **su** (Nsg) and final **p** (from Lpl) represents all the declensional affixes. Similarly **suṭ** (**su** + **auṭ**) represents a certain morphological context (for whose utility see 2.2.3) encompassing all three numbers of the nominative case as well as the singular and dual of the accusative. **suṭ** therefore represents an irregularly shaped morphological context [84]. (**suṭ** is referred to e.g. in sūtra 1.1.43.)

[84] **suṭ**

		<b>sg</b>	<b>du</b>	<b>pl</b>					
<b>N</b>	<table border="0" style="width: 100%; height: 100%;"> <tr> <td style="padding: 2px;"><b>su</b></td> <td style="padding: 2px;">au</td> <td style="padding: 2px;"><b>jas</b></td> </tr> <tr> <td style="padding: 2px;">am</td> <td style="padding: 2px;">auṭ</td> <td style="padding: 2px;">śas</td> </tr> </table>	<b>su</b>	au	<b>jas</b>	am	auṭ	śas		
<b>su</b>		au	<b>jas</b>						
am	auṭ	śas							
<b>A</b>									

This shape is reminiscent of McCreight & Chvany’s proposed lexical entry for *kirjansa* (2.3.1). However, Panini’s descriptive apparatus allows irregular shapes only when the irregularity consists in failing to include all of the beginning of the first row or all of the

end of the last row. It would not be possible to form a siglum to describe a shape similar to the above but excluding the accusative singular:

[85] **No siglum generable**

	s g	d u	p l
N	su	au	jas
A	am	auṭ	śas

In general, the Astadhyayi can characterize irregularly shaped morphological contexts only when the irregularity is in one of the three forms generically displayed in [86].

[86]

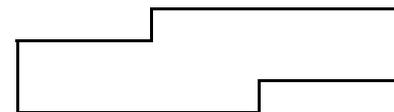
- (a) Not all of first row included



- (b) Not all of last row included



- (c) Combination of (a) and (b)



The reason is that the elements are only *interpreted* as forming a two-dimensional matrix by dint of an instruction that specifies a row size. In fact the elements are really only linearly ordered, and any regions defined over them must constitute a discrete segment of the linear ordering to which the matrix reduces, taking the elements in row-first order. This makes for a much more constrained use of irregularly shaped regions than what McCreight & Chvany propose: “*any* shape, as long as all its parts are contiguous” (my italics). It remains to be seen whether the extra descriptive power available in their model is in fact necessary.

I have briefly summarized a number of approaches to modelling cross-categorical

homonymies: the geometric approach as espoused by McCreight & Chvany, the Paninian geometric approach, pure feature-based approaches, and feature-based approaches enhanced with some notion of ‘elsewhere’ cases. The differences between these approaches is an empirical matter, in that each makes slightly different claims about the ‘space’ of possible homonymies. In this part I examine several instances of cross-categorial homonymy, concentrating on those which, either because of their irregular shape, or because they would involve a logical disjunction of feature specifications, would be difficult to characterize in feature-theoretic terms. In the case of irregularly shaped lexical entries or morphological contexts, I will also from time to time examine whether it is possible to reduce the irregularity to the canonical form allowed by Panini.

I will begin with McCreight & Chvany’s own example of a putative irregularly shaped lexical entry in Finnish, even though it is not a particularly good example. However, I will follow it with better.

### 2.3.1 Case and Number in Finnish

McCreight & Chvany (1991:104-5) suggest that the Finnish form *kirjansa*, which is homonymously nominative singular, genitive singular, and nominative plural, can provide syncretistic resolution of its genitive singular and nominative plural readings, as in [87].

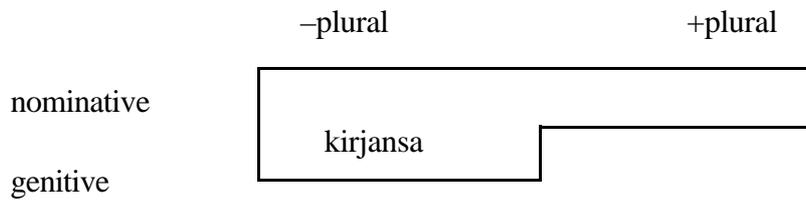
[87]

He lukivat hänen uusimman – ja me hänen parhaat – kirjansa.  
 They read his newest(G sg) and we his best(N pl) book(s).  
 ‘They read his newest book and we read his best books.’

(Data from Zaenen & Karttunen 1984)

McCreight & Chvany claim that this represents a neutralization of genitive singular and nominative plural, and so argues for an irregularly shaped lexical entry in the form of [88]. They point out that a feature account provides no way to define *kirjansa* in its various functions as a single lexical entry.

[88]



However closer investigation reveals that whereas *kirjansa* does represent a neutralization of singular and plural, the alleged neutralization of case is probably illusory (McCreight & Chvany do advise that the form be treated with caution: p.109 n8). The matter turns on the characterization of the accusative case in Finnish. It can be argued that *kirjansa* in [87] is neither nominative nor genitive, but accusative, and that therefore the feature conflict involved is only one of number, not of number and case. It can further be argued that in this instance, even the singular-plural homonymy is only a superficial result of a regular phonological rule operating on distinct underlying forms. Establishing this requires a slight digression.

Traditionally, Finnish is taken to have four ‘structural’ cases, viz. nominative, genitive, partitive and accusative (Nikanne 1993:75). The accusative case, so conceived, is in nouns always identical to the genitive in the singular and to the nominative in the plural. The homonymy in the singular is historically due to the change of final *-m* to *-n*, a change that occurred in early Proto-Finnish according to Hakulinen (1979:538). Since *-n* is the marker of the genitive, and originally *-m* was the marker of the accusative, this change brought the two forms together. The personal pronouns, however, have a distinct accusative ending in *-t*.

Now it must be appreciated that, as Holmberg & Nikanne (1993:11) comment in their introduction to a book containing several papers on the topic, “[p]robably the most controversial issue in Finnish case theory, if not in Finnish grammar as a whole, is the proper characterization of the variation in the form of the ‘accusative’ object.” However, as papers by Maling (1993), Reime (1993), Toivainen (1993) and Vainikka (1993) make clear, the controversy does not surround the *existence* of the accusative case, but rather the question of whether to characterize certain apparently *nominative* objects (in the singular, contrasting with accusative=genitive) as actually nominative or as a special syntactically or semantically induced ‘endingless’ form of the accusative. The problem can be seen by contrasting the following sentences (from Holmberg & Nikanne 1993:9-10):

[89]

a.	Jussi osti kirjan/*kirja. Jussi bought book+n/book+Ø 'Jussi bought the book'.	a´.	Jussi näki sinut/*sinä. Jussi saw you+t/you+Ø 'Jussi saw you'.
b.	Ostettiin kirja/*kirjan. bought-PASS book+Ø/book+n 'A book was bought'.	b´.	Sinut/*sinä nähtiin. you+t/you+Ø saw-PASS 'You were seen'.

In sentences [89a] and [89a´], the object is in the accusative, which is morphologically distinct from all other cases for the pronoun *sinut*, and identical with the genitive for the noun *kirjan*. In [89b], however, *kirja* at least appears to be nominative, whereas the pronominal equivalent *sinut* in [89b´] is clearly accusative. The dilemma, then, is this: if one maintains that *kirja* in [89b] is, as it appears, nominative, then one has to countenance different case-marking rules applying to nouns and pronouns; if, on the other hand, one wants to maintain that there is a single case-marking system applying to both nouns and pronouns, then one has to give an account for why the accusative object in [89b] appears in an endingless form which is identical with the nominative.

These apparently nominative objects (in the singular) occur in specific syntactic contexts, such as passive clauses, obligationals, and imperatives. However, there is no question that the totally affected object of a finite, affirmative, non-imperative verb is in the accusative, and this is the case of the object in [87].

For the noun *kirja* 'book' the forms of the nominative, accusative and genitive are as follows:

[90]

	s g	p l
N	kirja	kirjat
A	kirjan	kirjat
G	kirjan	kirjojen

Now in addition to the endings for number and case (in that order), Finnish nouns can also take a further suffix to indicative possession. The third-person possessive suffix is *-nsa* alternating with *-nsä* according to vowel harmony (op. cit. at 55). When added to a case form ending in a consonant, that consonant is dropped. So underlying /kirja-nsa/,

/kirjan-nsa/ and /kirjat-nsa/ all surface as *kirjansa*.

It is now clear that the form *kirjansa* in the cited sentence represents both underlying /kirjan-sa/ in the accusative singular (morphologically, the genitive singular) and /kirjat-nsa/ in the accusative plural (morphologically, the nominative plural). This is clearly accidental in a sense. What gives it a systematic appearance, however, is the great regularity of Finnish morphology and its absence of competing affixes and arbitrary declension classes. (There are severe qualifications to this as a general statement, but they do not affect the matter at hand here.) As a result, not just *kirjansa* but any noun suffixed with the possessive marker *-nsa*, or indeed any other possessive suffix, is formally identical in the genitive singular and the nominative plural (and often, also, the nominative singular), and thus in the singular and plural of the accusative. This is because the genitive singular is marked by *-n* and the nominative plural by *-t*, both of which get deleted before a possessive suffix that begins with a consonant, as they all do.

So we see that *kirjansa* in the cited sentence represents a neutralization of a feature conflict as to number, but not as to case. This means that there is no need for an irregularly shaped lexical entry, and the situation is not very different from the marginally acceptable *I caught one and John caught three fish*. Conceivably the acceptability of the Finnish sentence is enhanced, and that of the English sentence is reduced, by the fact that number neutralization is regular in the presence of a possessive suffix in Finnish (as a result of automatic phonological rules), whereas the case of *fish* is more sporadic in English.

McCreight & Chvany's putative 'irregularly shaped' lexical entry *kirjansa* is therefore not a particularly cogent argument for the multi-dimensional geometric approach. However, there is better evidence for it.

### 2.3.2 Mobile Stress in Russian nouns

Recall from 2.2.9 that the ordering NAGLDI was uniquely established as the only ordering able to account for all the homonymies in Russian declension. Since Russian nouns, adjectives and pronouns are declined for two numbers as well as six cases, the declension of any particular form can be accommodated within the following two-dimensional grid:

[91]

	<b>sg</b>	<b>pl</b>
<b>N</b>		
<b>A</b>		
<b>G</b>		
<b>L</b>		
<b>D</b>		
<b>I</b>		

Now a rather large number of Russian nouns exhibit the phenomenon of mobile stress. This is a variation in the position of the stress as between different case-number forms. The most common variation is as between singular and plural, but there are also other more complicated patterns. They are all shown in [92], along with an example of each. As the genitive, locative, dative and instrumental cases always act together for purposes of mobile stress placement, they are abbreviated as G-I. (References in this section are to pages of Unbegaun 1957. The patterns of mobile stress are set out at pp.41-3, 50-1, 61-2, 66-7.)

[92] Russian patterns of mobile stress

	(a)	(b)	(c)								
	sg pl	sg pl	sg pl								
N	<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td>i</td></tr></table>		i	<table border="1"><tr><td>f</td><td></td></tr></table>	f			
	i										
f											
A	<table border="1"><tr><td>f</td><td>p</td></tr></table>	f	p	<table border="1"><tr><td>f</td><td></td></tr></table>	f		<table border="1"><tr><td></td><td>i</td></tr></table>		i		
f	p										
f											
	i										
G-I	<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td></td></tr><tr><td colspan="2">f</td></tr></table>			f	
f											
	<i>v'esna</i> 'spring'	<i>guba</i> 'lip'	<i>ruka</i> 'hand'								
	(d)	(e)	(f)								
	sg pl	sg pl	sg pl								
N	<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td></td></tr></table>				
A	<table border="1"><tr><td>nf</td><td>f</td></tr></table>	nf	f	<table border="1"><tr><td>i</td><td></td></tr></table>	i		<table border="1"><tr><td colspan="2">nf</td></tr></table>	nf			
nf	f										
i											
nf											
G-I	<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td>f</td></tr></table>		f	<table border="1"><tr><td colspan="2">f</td></tr></table>	f			
	f										
f											
	<i>m'ir</i> 'world'	<i>gost'</i> 'guest'	<i>kon'</i> 'horse'								
	(g)	(h)	(i)								
	sg pl	sg pl	sg pl								
N	<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td></td></tr></table>				
A	<table border="1"><tr><td>A</td><td>B</td></tr></table>	A	B	<table border="1"><tr><td>i</td><td></td></tr></table>	i		<table border="1"><tr><td>i</td><td>s</td></tr></table>	i	s		
A	B										
i											
i	s										
G-I	<table border="1"><tr><td></td><td></td></tr></table>			<table border="1"><tr><td></td><td>f</td></tr></table>		f	<table border="1"><tr><td></td><td></td></tr></table>				
	f										
	<i>slovo</i> 'word'	<i>dv'er'</i> 'door'	<i>vr'em'a</i> 'time'								

**Legend:** i=initial, f=final, nf=nonfinal, p=penultimate, s=on suffix  
 A, B: if A=i, B=f; if A=f, B=p

Patterns (a), (d), (f), (g) and (i) involve natural classes of number or case which could readily be defined in terms of features. But the context for final stress in (b), and for initial stress in (e) and (h) cannot readily be so modelled. On the other hand these contexts constitute a contiguous region of the two-dimensional space defined by the sequence NAGLDI on its vertical axis and the sequence singular-plural on its horizontal axis. While not an irregularly shaped lexical entry, they are clear examples of an irregularly shaped morphological context.

Pattern (c) is geometrically 'illegal', on the reasonable assumption that the two occurrences of final stress — in the nominative singular and the genitive-to-instrumental singular and plural — are in fact 'the same thing'. It is worth observing, then, that the group comprises a very small number of nouns (fewer than 25), all of them of very high frequency, and including several body parts such as *ruka* 'hand, arm', *golova* 'head', *noga* 'foot, leg', as well as basic words for 'water', 'mountain', 'earth', 'winter' and 'Wednesday'. Even

more interestingly, “[i]n this group the acc. sing. may adopt sometimes a final stress” (p.43), a minimal change which transfers these nouns into the geometrically legal pattern (b).

(The complete list comprises *ruka* ‘hand, arm’, *golova* ‘head’, *voda* ‘water’, *gora* ‘mountain’, *doska* ‘board’, *duša* ‘soul’, *z’eml’a* ‘earth’, *z’ima* ‘winter’, *noga* ‘foot, leg’, *pora* ‘time’, *r’eka* ‘river’, *sp’ina* ‘back’, *sr’eda* ‘Wednesday’, *st’ena* ‘wall’, *cena* ‘price’, *ščeka* ‘cheek’, *boroda* ‘beard’, *borozda* ‘furrow’, *borona* ‘harrow’, *ž’el’eza* ‘gland’, *polosa* ‘stripe’, *storona* ‘side’, *skovoroda* ‘frying pan’.)

On the other hand, it is also worth noting that the only ‘living’ pattern of mobile stress is that which contrasts the singular and the plural (p.38), that is, a type which is readily modelled in feature-theoretic as well as in geometric terms.

### 2.3.3 Strong and Weak Cases in Sanskrit

Sanskrit shows a distribution of stem types remarkably similar to the distribution of stresses in [92e]. Recall that in 2.2.12 it was established that for Sanskrit one of the orderings that paired VNA with IDBGL was required to account for the systematic homonymies in declension. That ordering was based on the distribution of suffixes. In addition, though, a large number of mainly consonant-stem nouns and adjectives distinguish between a fuller and a reduced version of the stem. (References are to sections of Whitney 1879.)

An example of the variation between the ‘strong’ and ‘weak’ forms of the stem is furnished by the masculine declension of the participle *bhávant-* ‘being’ (§447):

[93]

	sg	du	pl
V	bhávan	bhávant-āu	bhávant-as
N	bhávant-am		bhávad-bhyam
A		bhávāt-ā	
I	bhávāt-e	bhávāt-os	bhávad-bhyas
D	bhávāt-as		bhávāt-ām
B	bhávāt-i		bhávāt-su
G			
L			

The two stems are *bhávant-* (strong) and *bhávāt-* (weak). Both are subject to regular morphophonemic changes: the *-t* of *bhávant-* is deleted word-finally in VNsg (§150);

while the *-t* of *bhávāt-* is voiced before a suffix beginning with a voiced stop, i.e. the suffixes beginning with *-bh-* (§159). These regular modifications apart, the distribution of the stems is as follows:

[94]

	sg	du	pl
V	bhávānt-		
N			
A			
I-L	bhávāt-		

Clearly, neither context (for strong or weak stem) could be readily characterized as a natural class in terms of features. And since they are both irregularly shaped, and between them cover the entire inflectional space, neither can be described in terms of a context which is elsewhere to some other, feature-theoretically definable, context. Nor can either context be described, synchronically, in phonological terms, as the minimal pair NVpl ~ Apl makes clear<sup>32</sup>.

A subtype of these alternating stems divide the weak cases into ‘middle’ and ‘weakest’, and show an alternation between three stems. An example is the declension of ‘soul, self’ (§424):

[95]

	sg	du	pl
V	átman	ātmán-āu	ātmán-as
N	ātmá		
A	ātmán-am	ātmá-bhyām	ātmán-as
I	ātmán-ā		ātmá-bhis
D	ātmán-e		ātmá-bhyas
B	ātmán-as	ātmán-os	ātmán-ām
G			
L	ātmán-i		ātmá-su

The patterning of the three stems in this form is somewhat obscured in Vsg and Nsg. Vsg stands somewhat outside the system of alternations, being, as most commonly in Sanskrit, the bare stem (§307), accented, if at all, on the first syllable (§314). In this

class of nouns, Nsg drops the stem-final *-n*. Apart from these, it is possible to discern three different stems: strong *ātmán-*, middle *ātmán-*, and weakest *ātmá-*. The distribution of the stems, including the special nominative but excluding Vsg, is as follows:

[96]

	sg	du	pl
V			
N	ātmá-	ātmán-	
A			ātmán-
I			
D		ātmá-	
B			
G			
L		ātmán-	ātmá-

This is geometrically deviant. But the situation is saved for the geometric hypothesis when one notes that, unlike the distribution of strong and weak stems, the distribution of middle and weakest stems is phonologically conditioned: the weakest stem occurs precisely before those suffixes that begin with a consonant (*bh* or *s*), the middle stem before those suffixes that begin with a vowel. When this is taken into account, the geometry becomes perfectly legal:

[97]

	sg	du	pl
V			
N	ātmá-	ātmán-	
A			
I			
D		ātmán- / ___+V	
B			
G		ātmá- / ___+C	
L			

Apart from Vsg, these stems are just the sort of ‘irregularly shaped lexical entry’ that the geometric approach predicts to exist, but which are very difficult to model in any feature-based approach. (If V is excluded, they can also be modelled within the constraints of the Paninian geometric framework.) And the fact that Vsg is identical with the middle stem in the case of *ātmán-* is an accidental characteristic of this particular stem (deriving from the fact that the sequence *-tmn-* in the ‘expected’ middle stem *\*ātmn-* contains a prohibited

combination of consonants: §421). The nouns ‘head’ and ‘king’ show the general pattern, in which Vsg differs from all three stems:

[98]

	‘head’	‘king’
<b>Vsg</b>	mūrdhan	rājan
<b>Strong Stem</b>	mūrdhān-	rājān-
<b>Middle Stem</b>	mūrdhn-´	rājñ-
<b>Weakest Stem</b>	mūrdhá-	rāja-

### 2.3.4 Sonorant Stems in Ancient Greek Declension

In the Ancient Greek ‘third declension’, a great many nouns used a different stem in Nsg (also VAsg if neuter) from that used in the rest of the declension. Typically Nsg would exhibit a lengthened grade of the stem-vowel used in the other forms. For instance  $\text{ῥῆ:}\text{t}\text{̥o:}\text{r}$  Nsg ‘public speaker, orator’ uses the stem  $\text{ῥῆ:}\text{tor-}$  in the remainder of its declension. (Recall that the orderings NVAGD and ANVDG were rather weakly established in 2.2.7 for different stages of Greek. I will use the order NVAGD here, though nothing turns on it.)

The full declension of  $\text{ῥῆ:}\text{t}\text{̥o:}\text{r}$  is shown at [99a]. [99b] abstracts away from the inflectional affixes to highlight the distribution of the stems.

[99]

	(a)		(b)	
	sg	pl	sg	pl
<b>N</b>	$\text{ῥῆ:}\text{t}\text{̥o:}\text{r}^{\text{33}}$	$\text{ῥῆ:}\text{tores}$	$\text{ῥῆ:}\text{t}\text{̥o:}\text{r-}$	$\text{ῥῆ:}\text{tor-}$
<b>V</b>	$\text{ῥῆ:}\text{tor}$			
<b>A</b>	$\text{ῥῆ:}\text{tora}$	$\text{ῥῆ:}\text{toras}$		
<b>G</b>	$\text{ῥῆ:}\text{toros}$	$\text{ῥῆ:}\text{tóro:n}$		
<b>D</b>	$\text{ῥῆ:}\text{tori}$	$\text{ῥῆ:}\text{torsi}$		

The distribution of the stem  $\text{ῥῆ:}\text{tor-}$  constitutes an irregularly shaped morphological context (and perhaps lexical entry, if one assumes that unpredictable stem alternants are lexically listed). On the other hand it is ‘elsewhere’ to the definable space occupied by

Nsg.

Where the (Nsg) stem ends in *-n*, there are usually three stem alternants. This is shown in the declension of *daímō:n* ‘god, fate, daemon’:

[100]

	sg	pl	sg	pl
<b>N</b>	daímō:n	daímōnes	daímō:n-	
<b>V</b>	daîmon			
<b>A</b>	daímona	daímonas	daímon-	
<b>G</b>	daímōnos	daímōnō:n		
<b>D</b>	daímoni	daímosi		daímō <sup>34</sup> -

A number of nouns have four stem alternants, with a separate one for GDsg and Gpl. An example is *patē:r* ‘father’:

[101]

	sg	pl	sg	pl
<b>N</b>	patē:r	patéres	patē:r-	patér-
<b>V</b>	páter			
<b>A</b>	patéra	patéras		
<b>G</b>	patrós	patrō:n	patr-´	
<b>D</b>	patrí	patrási		patrá-

Given the orderings NVAGD and sg—pl, these irregularly shaped morphological contexts are also representable in the more restrictive Paninian geometric framework. If we number the slots of the paradigm going from left to right and from top to bottom [102a], we can represent the relevant contexts in purely linear terms [102b]:

[102]

	(a)		(b)	
	sg	pl	Stem	Context
<b>N</b>	1	2	patē:r-	1
<b>V</b>	3	4	patér-	2–6
<b>A</b>	5	6	patr-´	7–9
<b>G</b>	7	8	patrá-	10
<b>D</b>	9	10		

### 2.3.5 Mood-Tense Stems in Spanish

In Spanish a large class of verbs displays a stem alternant in the first-person singular of the present indicative. Mostly, the same stem alternant appears also throughout the present subjunctive:

[103]

		(a)		(b)	
		indicative	subjunctive	indic.	subjunc.
<b>sg</b>	<b>1</b>	traigo	traiga	tra-	traig-
	<b>3</b>	trae			
	<b>2</b>	traes	traigas		
<b>pl</b>	<b>1</b>	traemos	traigamos		
	<b>3</b>	traen	traigan		
	<b>2</b>	traéis	traigáis		

This would be a good example of an irregularly shaped pair of morphological contexts, neither of which can be characterized in terms of features, were it not for one thing: the contexts are actually purely phonological. As the *Gramática de la Lengua Española* §§145-6 makes clear, the extended stem (here *traig-*) occurs in precisely those present-tense contexts where the suffix begins with a back vowel, i.e. *a* or *u* (no suffixes happen to begin with *u*). Although this example is therefore not a good argument for geometric representations, it does highlight one mechanism which can be responsible for creating irregularly shaped items. It would take only a change of vowel in one of the suffixes to render the phonological conditioning completely opaque, and so produce a genuine irregularly shaped entry<sup>35</sup>.

### 2.3.6 Gender and Number in German Declension

The main characteristics of the German pronominal declension were set out at 2.2.6. There we were interested in homonymies within the dimension of case, ignoring homonymies that were evident between genders or between genders and numbers. In 2.2.1 some evidence from Latin was set out to argue for an ordering of the genders which connects the masculine with both the feminine and neuter genders (hence n—m—f

or the inverse). Similar considerations hold for German, there being a particularly close parallel between the declension of masculines and neuters, amounting to identity throughout the genitive and dative cases. (References are to sections of Borgert & Nyhan 1976.)

There is, however, far less similarity between the declension of masculines and feminines than we see in Latin. Rather, in the pronominal declension, the affinities of the feminine gender are with the plural number, which itself conflates all three genders. This can be seen in the inflection of the definite article, repeated here from 2.2.6 but with horizontal homonymies now made explicit as well:

[104]

	<b>n</b>	<b>m</b>	<b>f</b>	<b>pl</b>
<b>N</b>	das	der	die	
<b>A</b>		den		
<b>G</b>	des		der	
<b>D</b>	dem			den

We see homonymy of the neuter and masculine genders in Gsg and Dsg. This is certainly systematic since as an exceptionless fact about German declension, masculines and neuters, whether nouns, adjectives, or pronouns, decline alike in the ‘oblique’ cases.

The homonymy between the feminine singular and the plural occurs in three out of four cases, and involves two different strings. Comparison with related forms of declension — those of determiners and pronouns, as well as the ‘strong’ declension of adjectives [26b] — shows that the homonymy co-extends to the suffixes *-e* and *-er*. But in addition, its systematic character is assured by the declension of the third-person pronoun [105] (§152). Here we see the same homonymy maintained *even to the choice of the same suppletive stem* in NA (and similarly for masculine and neuter in Gsg):

[105]

	<b>n</b>	<b>m</b>	<b>f</b>	<b>pl</b>
<b>N</b>	es	er	<b>sie</b>	
<b>A</b>		ihn		
<b>G</b>	<b>seiner</b>		ihrer	
<b>D</b>	ihm		ihr	ihnen

There are two homonymies in [104], and likewise two partial homonymies as to the choice of final inflectional consonant in [105], which are not, and in geometric terms cannot be, presented as a systematic homonymy. They are the homonymy of mNsg *-r* with Gpl *-r* (*der* and *der*, *er* and *ihr*) and the homonymy between mAsg *-n* and Dpl *-n* (*den* and *den*, *ihn* and *ihnen*). The representation forces us to regard these as accidental. And in fact there is evidence that they should so be regarded.

The distinctness of mNsg *-r* and Gpl *-r* can be established by a pronominal declension pattern which differs from that in [104] and [105] precisely in rejecting the inflections of mNsg and nNAsg. It is exemplified by the negative determiner ‘no, not a’:

[106]

	<b>n</b>	<b>m</b>	<b>f</b>	<b>pl</b>
<b>N</b>	kein		keine	
<b>A</b>		keinen		
<b>G</b>	keines		keiner	
<b>D</b>	keinem			keinen

This pattern rejects, or replaces with zero, the mNsg suffix but not the homonymous Gpl suffix. That is, the homonymy does not co-extend to this inflection class. The corresponding argument for *-n* is that in the declension of nouns, to be dealt with presently, the Dpl *-n* is used whenever the plural does not already end in *-n* (or it ends in *-s*), whereas the mAsg *-n* is never used, except in those ‘weak’ and ‘mixed’ nouns that have *-n* in all forms except Nsg.

The preceding considerations suggest that, for the pronominal declension, all systematic homonymies can be captured by an ordering which pairs masculine and neuter on the one hand and feminine and plural on the other. We have seen no evidence of homonymies between members of the two groups, and so have no grounds to establish a specific ordering involving all four terms. However in the ‘weak’ declension of adjectives, feminine singulars pattern with singulars of the other two genders rather than with plurals. Homonymy diagram [26a] from 2.2.6 is here repeated, modified to display horizontal homonymies:

[107]

Weak adjectival declension — ‘red’

	<b>m</b>	<b>n</b>	<b>f</b>	<b>pl</b>
<b>N</b>	rote			
<b>A</b>		rote		
<b>G</b>	roten			
<b>D</b>	roten			

This is another pair of ‘irregularly shaped lexical entries’ that appear as if they would be difficult to characterize in terms of features.

In this weak declension of adjectives we see that in NA, feminines pattern with other singulars rather than with the plurals. We also see that they pattern somewhat more closely with the neuters than with the masculines. The same affinities are to be observed in the declension of nouns.

Nominal declension presents more radical homonymies than those that are found in the pronominal declension. Though the generalization stands that feminines, neuters, and plurals never distinguish N and A, it is extended in the case of feminines and plurals. Plurals never distinguish between N, A, and G and feminines never distinguish any of the cases. Masculines also usually do not distinguish N and A, though some do. These patterns mean that nominal declension operates within the following grid, which displays obligatory homonymies:

[108]

	<b>m</b>	<b>n</b>	<b>f</b>	<b>pl</b>
<b>N</b>				
<b>A</b>	---			
<b>G</b>				
<b>D</b>				

In the singular, a single pattern of suffixes characterizes all the feminine nouns and all but the ‘weak’ and ‘mixed’ declensions of masculine and neuter nouns:

[109]

	<b>m</b>	<b>n</b>	<b>f</b>
<b>N</b>	∅		
<b>A</b>	∅		
<b>G</b>	-(e)s		
<b>D</b>	-(e)		

The feminine has less affinity with the plural, however. The question of how to analyse German plural nouns is not without difficulty, and is addressed at greater length at 2.2.6. However, one can anticipate by saying that two alternative analyses are available. In one, [110a], there is a range of plural suffixes, one of which (zero in NAG) overlaps with the feminine singular suffixation. On another analysis [110b], all but two of the elements considered as inflectional suffixes in [110a] are either reassigned to the stem or produced by automatic phonological rule, and only two patterns of suffixation, neither similar to the feminine singular, are postulated:

[110]

(a)

<b>N</b>	∅	e	er	en	s
<b>A</b>					
<b>G</b>					
<b>D</b>	n	en	ern		

(b)

e	s
en	

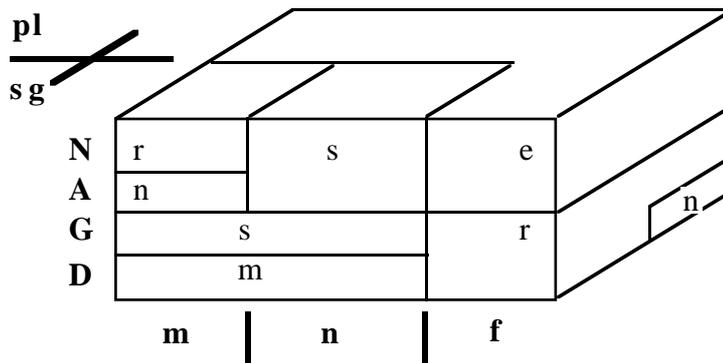
It seems, then, that the declension of feminine singulars in German has points of contact with the other singular declensions on the one hand (in nouns and weak adjectives), but with the plural on the other hand (in pronominal declension). Because of this, and of the fact that gender is completely neutralized in the plural, it is actually possible to model the paradigmatic space defined by the three categories of number, gender and case in only two dimensions, one for case and one for gender-number, considered as values along a single inflectional dimension. The gender-number ordering required is either m—n—f—pl or n—m—f—pl or their inverses. Of these, the former ordering, though not motivated by any homonymies of actual word-forms or of affixes, allows the context of an important constraint to be described geometrically also:

[111]

<b>Constraint: N = A</b>			
m	n	f	pl

It is not, however, *necessary* for the geometric approach to model these three different categories in only two dimensions. A three-dimensional representation would also be adequate, insofar as it would provide a contiguous volume to include the appropriate cases of the feminine singular and the gender-blind plural. Such a representation of the suffixes of the pronominal declension might look something like this (think of the affixes as labelling a three-dimensional slab):

[112]



But this is inferior to the two-dimensional account in two respects. It makes the invariable homonymy of genders in the plural look like an accident: the representation suggests that it would be equally possible to differentiate two or three genders in the plural. And it also makes the special affinity of the feminine singular with the plural look like an accident: it could equally well be the masculine, or the neuter, or no gender in the singular that has such an affinity. This is discussed further at 4.2.

### 2.3.7 Person, number and gender in Arabic

The Classical Arabic prefix (imperfect) conjugation supplies an example of a three-dimensional space, which unlike that representing German gender, number and case,

cannot be reduced to two dimensions. The paradigm of the indicative mood, with the dimensions of person and gender reduced to one purely for typographical convenience, is given in [113], after Noyer (1992:60):

[113]

	<b>sg</b>	<b>du</b>	<b>pl</b>
<b>3m</b>	y-aktub-u	y-aktub-aani	y-aktub-uuna
<b>3f</b>	t-aktub-u	t-aktub-aani	y-aktub-na
<b>2m</b>	t-aktub-u	t-aktub-aani	t-aktub-uuna
<b>2f</b>	t-aktub-iina	t-aktub-aani	t-aktub-na
<b>1</b>	'-aktub-u	*	n-aktub-u

It is to be noted that the distinction of genders is neutralized in the first person, and that the first person does not have a dual. The latter fact will be represented as a hole in the paradigm, although it could equally well be regarded as a neutralization of the distinction between the dual and the plural in the first person. Additionally, the distinction between the genders is always neutralized in the second-person dual.

The only word-form homonymies evident from this data are those between the third-person feminine and the second-person masculine in the singular and dual numbers, and the situation does not change if we regard the prefixes and suffixes as forming single discontinuous ‘circumfixes’. This is compatible with the geometric hypothesis in an uninteresting way.

However, one consideration shows and another suggests that we have here not a number of circumfixes but rather separate prefixes and suffixes.

First, the suffixes alone vary to indicate mood. Specifically, the subjunctive has *-a* and the jussive has zero wherever the indicative has (single) *-u*, and in addition the second syllable of all the disyllabic suffixes (*-iina*, *-uuna*, *-aani*) is dropped in the subjunctive and jussive moods (as well as in some other circumstances). The lack of co-variance between prefix and suffix across mood, then, establishes that they are distinct entities.

In addition, some suggestive evidence is the fact that some of the prefixes seem to re-appear in the traditional ‘perfect’ conjugation, albeit here as, or as part of, suffixes. These are highlighted in boldface (data from Thatcher 1976:62):

[114]

	<b>sg</b>	<b>du</b>	<b>pl</b>
<b>3m</b>	katab-a	katab-aa	katab-uu
<b>3f</b>	katab-at	katab-ataa	katab-na
<b>2m</b>	katab-ta	katab-tumaa	katab-tum
<b>2f</b>	katab-ti	katab-tumaa	katab-tunna
<b>1</b>	katab-tu	————	katab-naa

Some parts of these suffixes look related to suffixes of the imperfect conjugation. Note in particular the *-aa* of the dual forms, the *-uu* of the masculine third-person plural forms, and the *-na* of the feminine plural forms. On the other hand the forms that contain a *t* in the suffix are, with only the exception of the first-person singular, precisely the forms that in the imperfect conjugation have the *t-* prefix. Similarly the *n-* prefix of the first-person plural in the imperfect conjugation is matched by a suffix containing *n* in the perfect conjugation, a suffix distinct, moreover, from the *-na* associated (as suffix) with the feminine plural in both conjugations. And this ‘first-person’ *n* appears also in the first-person plural object/possessor suffix *-naa* and the first-person singular verbal object suffix *-nii* (*op.cit.* p.49).

Although I follow Halle & Marantz (1993) in assuming that affixes are generally inherently specified as prefixes or suffixes, it is plausible that in languages exhibiting templatic morphology, such as this one quintessentially, some affixes might not be inherently specified for linear position with respect to the stem, but rather get linearized in accordance with a morphological template (see McCarthy 1981, 1982 for an analysis of Classical Arabic making heavy use of abstract morphological templates). It is true that to show that the set of prefixes of the imperfect conjugation and the set of suffixes in [111] are not wholly disjoint would require attention to details of allomorphy and of the precise structure of the suffixal template that are beyond the scope of this discussion. In any case it is not necessary for establishing that the prefixes and suffixes of the imperfect conjugation are indeed separate entities rather than circumfixes, since that is adequately established by the lack of co-variation in the different moods. But the fact remains that the similarities between prefixes of the imperfect conjugation and suffixes of the perfect conjugation tend to reinforce this conclusion.

I will therefore consider the prefixes and suffixes as separate objects. Doing so brings out extensive homonymies between prefixes and between suffixes across every dimension. In the following, I omit the second syllable of the disyllabic suffixes *-iina*, *-uuna* and *-aani*:

[115]

(a) Prefixes

	<b>sg</b>	<b>du</b>	<b>pl</b>
<b>3m</b>	y-	y-	y-
<b>3f</b>	t-	t-	y-
<b>2m</b>	t-	t-	t-
<b>2f</b>	t-	t-	t-
<b>1</b>	'-	*	n-

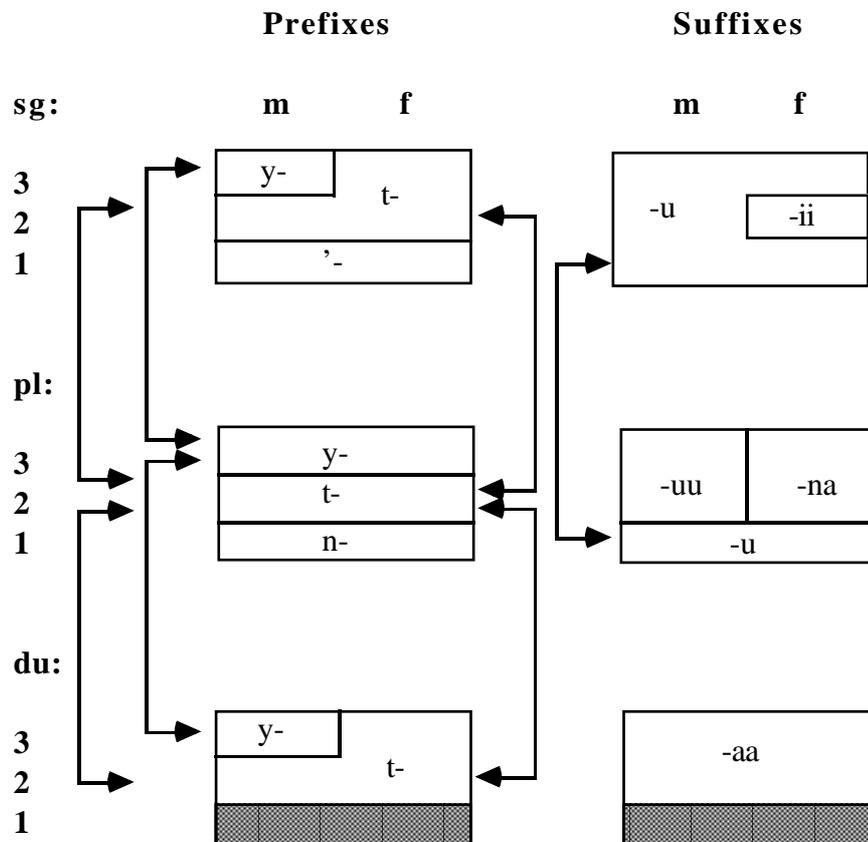
(b) Suffixes

	<b>sg</b>	<b>du</b>	<b>pl</b>
<b>3m</b>	-u	-aa	-uu
<b>3f</b>	-u	-aa	-na
<b>2m</b>	-u	-aa	-uu
<b>2f</b>	-ii	-aa	-na
<b>1</b>	-u	*	-u

These patterns of homonymy can readily be modelled in a three-dimensional geometric space. To do so it is necessary to order the dimension representing number as *sg—pl—du* rather than as *sg—du—pl* (at least if the lack of first-person duals is considered a hole rather than a homonymy with the plural), in order to connect the first-person plural suffix *-u* with the other occurrences of *-u*, via the first-person singular. The dimension representing person must bring the third and second persons into contiguity, so that the traditional (in Semitic studies) arrangement of 3—2—1 can stand, though 2—3—1 would do just as well.

Because of the difficulty of displaying such a space in a two-dimension medium, I first give separate homonymy diagrams for each of the numbers.

[116]



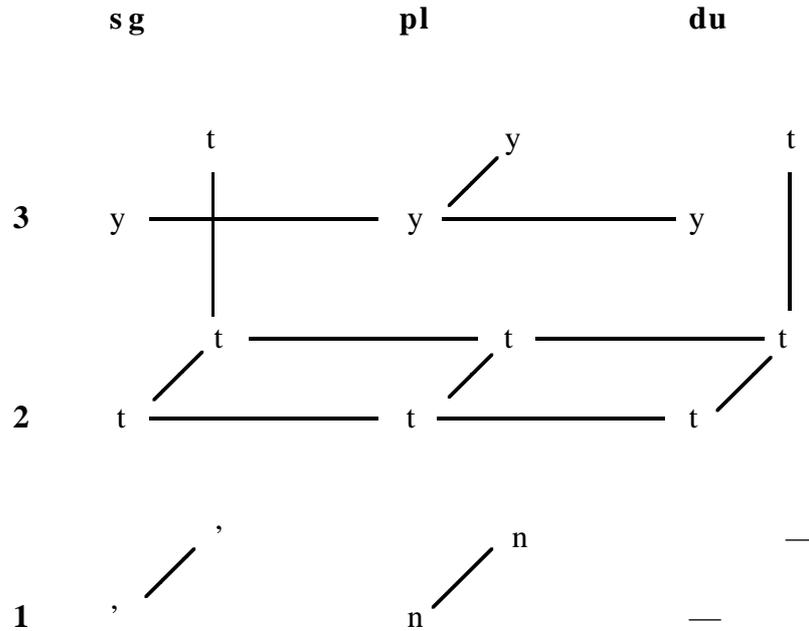
The diagrams show directly that the homonymies involving genders and persons within a single number form contiguous regions. In addition, the arrows are intended to highlight the fact that geometric contiguity between identical items is also obeyed as between the three numbers. Where the same prefix or suffix occurs in two or more numbers, the arrows indicate a contiguity along the dimension of person. So for instance the *-u* of the first-person plural is contiguous, in the hard-to-represent third dimension, with *-u* of the first-person singular. Similarly, contiguity obtains between the three third-person masculine instances of *y-* in the three numbers, and between the three second-person masculine instances of *t-* in the three numbers. The singular and dual instances of *t-* are additionally linked via contiguity of the masculine and feminine forms in the singular and plural, and by the contiguity of the second-person feminine singular and the second-person feminine plural.

I give the same information in something more like three-dimensional form in [117]. Here, though, the prefixes and suffixes are shown for each ‘slot’, and the requirement of contiguity can be verified directly by ensuring that every instance of a particular affix can

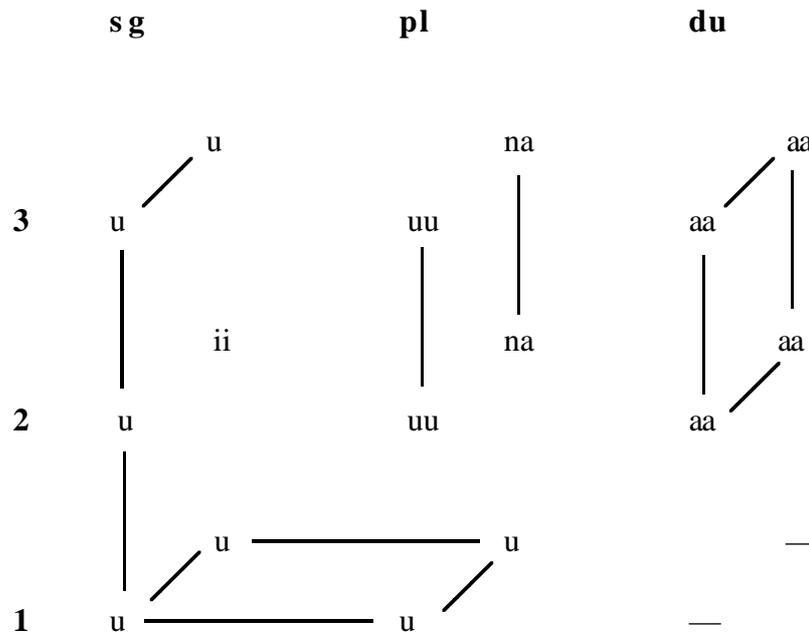
be connected with every other by means of single-step links in a horizontal (number), vertical (person) or diagonal (gender) direction:

[117]

(a) Prefixes



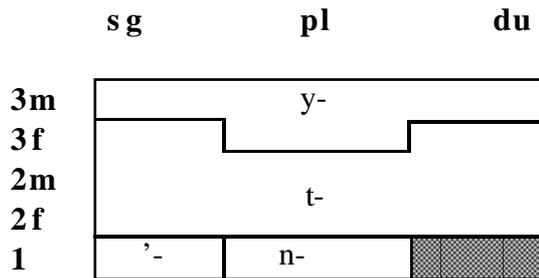
(b) Suffixes



These regions in three dimensions are far more complex than anything I have shown so

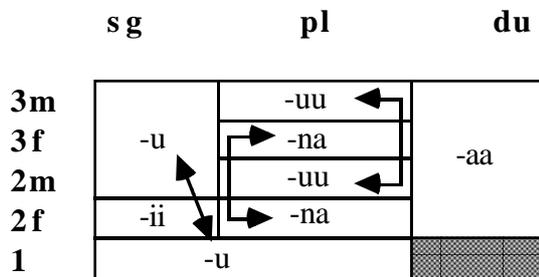
far. Moreover it is not possible to collapse the paradigmatic space into two dimensions by combining person and gender features as was done informally in the whole-word paradigms [113] and [114]. The reason is that gender and person cross-classify in different ways in the prefixes and in the suffixes. The homonymies amongst the prefixes can be captured straightforwardly by using the same geometric arrangement as in [113], i.e. grouping the numbers more closely than the genders:

[118]



However the same arrangement fails to allow for three homonymies amongst the suffixes:

[119]



To achieve this requires grouping the genders more tightly than the numbers, and in addition the contiguity of the first person with the third:

[120]

	sg	pl	du
1			
3m	-u	-uu	-aa
2m			
3f		-na	
2f	-ii		

However this arrangement makes it impossible to represent as systematic the homonymy between the prefix *y-* in the third-person feminine plural and the other instances of *y-*:

[121]

	sg	pl	du
1	'-	n-	
3m	y- ←		
2m	y- ←		
3f	t-	y- ←	
2f			

I conclude, then, that the homonymies within the Classical Arabic prefix conjugation can be modelled within a three-dimensional, though not a two-dimensional, paradigmatic space. Of the two dimensions consisting of three cells each, the ordering within the number dimension must be constrained so as to bring the singular and the plural into adjacency (thus excluding *sg—du—pl* or its inverse), and the person dimension must be constrained so as to bring the third and second persons into adjacency (thus excluding *3—1—2* or its inverse). There is of course no constraint on the ordering of the two-celled gender dimension.

Interestingly, a feature-based account of this data making heavy use of relativized elsewhere contexts (Noyer 1992) is still forced to regard as accidental the homonymy between the *t-* that is associated with the second person and the *t-* that is associated with the feminine gender.

## Inherently Unrepresentable Cross-Categorial Homonymies

### 2.4.1 Genitive singular and nominative plural in Latin

Some patterns of homonymy, though plausibly systematic, nevertheless cannot be represented geometrically. In the instances to be considered in this section, the reason is not the contingent one that no ordering of properties can be found which would make the homonymies representable geometrically. Rather, the homonymies cannot be modelled geometrically *in principle*, because the elements involved have no properties in common along any inflectional dimension (see 2.3.0).

An example in point comes from Latin. In 2.2.8 we surveyed the various declensional patterns of Latin, looking for homonymies in the dimension of case. However there is also one cross-categorial homonymy in Latin declension which is common enough to be regarded as systematic. It occurs in the first, second and fourth declensions, and it is a homonymy of Gsg with Npl. I repeat the relevant portions (NG) of the paradigms concerned:

[122]

	(a)		(b)		(c)	
	sg	pl	sg	pl	sg	pl
<b>N</b>	mēnsa	<b>mēnsae</b>	hortus	<b>horfī</b>	frūctus	<b>frūctūs</b>
<b>G</b>	<b>mēnsae</b>	mēnsārum	<b>horfī</b>	hortōrum	<b>frūctūs</b>	frūctuum

The homonymy involves at least two pairs of two homonymous affixes, if both the types in (a) and (b) are analysed with (say) an underlying /+ī/, as /mēnsa+ī/ and /horto+ī/ respectively. And if a less abstract analysis is adopted, there are three different pairs of affixes involved: *-ae*, *-ī* and *-ūs*. If the homonymy is taken to be accidental, we would have to posit entries for these affixes in something like the form [123], missing an obvious pattern:

[123]

-ae <sub>1</sub> :	Gsg	-ī <sub>1</sub> :	Gsg	-ūs <sub>1</sub> :	Gsg
-ae <sub>2</sub> :	Npl	-ī <sub>2</sub> :	Npl	-ūs <sub>2</sub> :	Npl

These homonymies, even if regarded as systematic, cannot be represented within the

constraints of the geometric hypothesis. They can, however, be represented in feature-theoretic terms if Greek-letter variables are admitted. Without being a commitment to any particular analysis, the following is a demonstration of how this could be done.

Assume that the cases are represented in terms of a cross-classifying set of features. For the sake of argument, we can say that N and G are singled out from all the other cases by the feature value  $[-arg]$  (suggesting “not a verbal argument”), and that they are distinguished from each other as  $[\pm adn]$  (suggesting “adnominal”), where G is  $[+ adn]$ . The two cases are therefore represented as in [124a], with the representation of A added to show the role of  $[\pm arg]$ . The numbers are represented as  $[\pm pl]$ .

[124]

	<b>arg</b>	<b>adn</b>
<b>N</b>	–	–
<b>G</b>	–	+
<b>A</b>	+	–
etc.		

Now the disjunction of Gsg and Npl can be represented as follows:

[125]

$$\left[ \begin{array}{l} -arg \\ \alpha adn \\ -\alpha pl \end{array} \right]$$

On the other hand the geometric approach can take some comfort from the fact that in the declensions of [122b] and [122c], the corresponding neuters do not exhibit the same homonymy. The nouns in [122] are masculine. When neuters of the same declension are considered, the homonymy disappears since they share the suffix of Gsg but not of Npl:

[126]

	<b>sg</b>	<b>pl</b>	<b>sg</b>	<b>pl</b>
<b>N</b>	bellum	bella	cornū	cornua
<b>G</b>	belli	bellōrum	cornūs	cornuum

This means that the suffixes *-ae*, *-ī* and *-ūs* are actually found in three different morpho-syntactic contexts each:

[127]

-ae, -ī, -ūs:

- (a) masculine Gsg
- (b) neuter Gsg
- (c) masculine Npl

This is now impossible to express as a natural class in feature terms also, which puts the two approaches on an equal footing in this respect. Either approach can do no more than reduce them to two natural classes. The geometric approach can only so reduce (a) and (b). The feature-based approach could so reduce (a) and (c) with something like the formulation in [125], though a much simpler formulation would serve to reduce (a) and (b). And since it is an exceptionless generalization about Latin declension that corresponding masculines and neuters never differ in G, the reduction of (a) and (b) must be the preferred choice even on the feature-based approach. Nevertheless, it leaves one a little uneasy that something has been missed.

#### 2.4.2 Genitive and nominative in Russian

Russian exhibits a similar frequent homonymy of Gsg and Npl, but in addition shows an intriguing polarity relationship between Nsg and Gpl.

Gsg conflates<sup>36</sup> with Npl in the first declension, in neuters of the second declension, and in non-neuters of the third declension. Examples taken from the fuller tables in 2.2.9 are:

[128]

	(a)		(b)		(c)	
	sg	pl	sg	pl	sg	pl
<b>N</b>	škola	<b>školi</b>	v'ino	<b>v'ina</b>	kost'	<b>kost'i</b>
<b>G</b>	<b>školi</b>	škol	<b>v'ina</b>	v'in	<b>kost'i</b>	kost'ej

Again there is the problem that if we were to regard these as accidental homonymies, we would have to list several such sets of affixes, each pair exhibiting the same homonymy. It might appear as though the *-i* of *školi* and the *-i* of *kost'i* are the same affix, but they cannot be, since (apart from belonging to different declensions) the *-i* of *školi* conflates Gsg and Npl, whereas the *-i* of *kost'i* conflates all of GLDsg and Npl: see 2.2.9,

[54]<sup>37</sup>. Therefore we appear to need lexical entries as follows:

[129]

-i <sub>1</sub> :	1, Gsg	-i <sub>3</sub> :	3, GLDsg	-a <sub>1</sub> :	2, Gsg
-i <sub>2</sub> :	1, Npl	-i <sub>4</sub> :	3, Npl	-a <sub>2</sub> :	2, Npl

The situation is a little better than this appears at least for *-a*, however. In fact *-a*<sub>2</sub> is a general-purpose suffix for neuter plurals in NA in both the second and third declensions [130a], contrasting with *-i* as the masculine-feminine Npl marker (but see below). Since there are no neuters in the first declension, we can say simply that *-a*<sub>1</sub> is the general-purpose suffix for neuter NApl in nominal paradigms. On the other hand *-a*<sub>1</sub> is a second-declension Gsg suffix for both masculines and neuters [130b].

[130]

(a) *-a* as neuter NApl suffix

	<b>Declension 2</b>	<b>Declension 3</b>
<b>NApl</b>	vín-a, mučen'-a	vrém'en-a

(b) *-a* as masculine/neuter Gsg suffix

	<b>neuter</b>	<b>masculine</b>
<b>Gsg</b>	vín-a, mučen'-a	zakon-a, vožd'-a

It would appear, then, that the homonymy of Gsg and NApl in *vína* etc. really is a coincidence, as far as formal representability is concerned.

In many instances, although the suffixes of Gsg and Npl are homonymous, the word-forms that contain them are not, since they differ in stress according to one of the patterns of mobile stress (see 2.3.2) which distinguishes the singular from the plural, or at least the singular oblique cases from Npl. This leads to the following pattern:

[131]

	'lip' (p.43)		'word' (p.62)	
	<b>sg</b>	<b>pl</b>	<b>sg</b>	<b>pl</b>
<b>N</b>	gubá	gúbi	slóvo	slová
<b>G</b>	gubí	gub	slóva	slov

Jakobson (1956:138) suggests that this relation of Gsg and Npl — segmental identity with prosodic differentiation — not only is a salient pattern in the language but in fact a living one, which in relatively recent times has drawn nouns with originally fixed stress into the mobile stress pattern.

Further evidence for the salience of the pattern of segmental identity with prosodic differentiation as between Gsg and Npl comes from the extension of an originally dual suffix for NA to the plural of masculines. The suffix is *-á*, it is always stressed, and it is applied only to nouns of the declension with *-a* in Gsg which furthermore have mobile stress (Unbegaun 1957:53-5). Therefore there is always a contrast of Gsg in *-a* versus Npl in *-á*:

[132] ‘side’

N	bok	boká
G	bóka	bokóv

The use of this alternative suffix has been on the increase in the course of this century, applying particularly in modern loanwords (e.g. *d’ír’ektor* ‘director’, *lag’er’* ‘camp’, *pasport* ‘passport’). Jakobson (1956:139) suggests that one reason for this innovation has been pressure to conform to the system-wide expectation that Gsg and Npl should differ, if at all, only in stress and not in segmental content.

The impression of a special and systematic relationship between N and G grows stronger when we examine the forms of Nsg and Gpl. These are frequently related not by homonymy, but by a kind of polarity principle. To a great extent, the generalization is that when either of Nsg or Gpl is marked by a contentful affix, the other is marked by zero (Jakobson 1956:136, 1938:151). So, in the first declension, the mark of Nsg is *-a* and that of Gpl is zero [128a]. In the third declension the opposite situation prevails: Nsg is marked by zero and Gpl by *-ej* [128c].

The situation is even more remarkable in the second declension, for this principle overrides the otherwise exceptionless generalization that corresponding masculines and neuters differ only in N and A. Because the masculine Nsg suffix in this declension is zero, Gpl is marked by either *-ov* or *-ej* (essentially *-ej* after stems ending in a palatalized consonant, *-ov* otherwise). Neuter NASg has an overt suffix *-o* or *-e*. We might therefore expect that Gpl in second declension neuters is marked by zero, and this is true of those whose Nsg

ends in *-o*; however neuters whose Nsg ends in *-e* generally take a Gpl with overt suffix.

Even though the polarity correlation is not perfect, as attested by those second-declension neuters that have NAsg *-e* but Gpl *-ej*, *-ij* or *-ev*, nevertheless it is salient enough for Jakobson (1984c:137) to claim it has been a major factor in historical change:

Thus, with very few exceptions, each noun has no more, and usually no less, than one form with a zero desinence: either the NSg or the GPI.

The GPI desinences *-ov* and *-ej* were generalized in the declension of those nouns which have a zero desinence in NSg. The historical tendency to differentiate the GPI and the NSg by confronting a zero and a non-zero desinence is herewith confirmed.

We see, then, a tendency in Russian amounting not quite to a rule, but common and salient enough to have acted as a force in historical change, to mark N and G in ways that seem necessarily to refer to each other:

[133]	Gsg ~ Npl:	segmentally identical, preferably differing in stress (either may carry the stress)
	Nsg ~ Gpl:	zero versus non-zero suffix (either may have zero suffix)

This is a generalization over slots in a paradigm, which cannot be reduced to a statement about any particular suffix or set of suffixes. As such it provides some evidence for the reality of paradigms, as claimed by McCreight & Chvany (1991). But neither the homonymy between Gsg and Npl, nor less the antinomy between Nsg and Gpl, can be captured geometrically. However, polarity relations such as these, since they do not involve homonymies as such, are strictly speaking orthogonal to the predictions being examined here. Even so, one feels that they are relevant to those predictions, and interestingly enough, they seem to be subject to the geometric constraint that the relevant paradigm cells *not* be contiguous.

## 2.5 Overview

I have examined the effectiveness of the geometric approach in modelling homonymies in

a number of languages. In the realm of one-dimensional homonymies, the results have been encouraging. By and large, all the homonymies that one would not wish, a priori, to treat as accidental, have occurred between terms that can be made to constitute contiguous segments of a single invariant ordering. This remains true even as the number of terms becomes relatively large (i.e. in rich case systems), so that the possibility that the homonymies fall out this way due to chance is a slim one.

[134] summarizes the orderings established for the case systems that have been investigated. Parentheses enclose groups of cases which are ordered amongst themselves but not with respect to cases outside the group. The plus sign indicates cases that do not fit into the ordering.

[134]

2.2.2	Arabic	N (AG)
2.2.5	Modern Greek	NVAG
2.2.6	German	NAGD and NADG
2.1.7	Ancient Greek	((NV) A) (GD)
2.2.8, 2.2.11	Latin	(NV) ABDG + L
2.2.9, 2.2.13	Russian	NAGLDI + GII, LII
2.2.10	Polish	NAGLDI + V
2.2.11	Sanskrit	(VNA) (IDBGL)

Certain generalizations are immediately apparent. First place can always be occupied by one of N or V. In one instance (Modern Greek), N must come first, and in one other (Sanskrit) V must come first. In Ancient Greek and Latin N and V are permutable. In all languages but Polish, N and V must be adjacent, and even in that language, the difficulty for ordering is caused by the fact that V conflates sometimes with N, sometimes with L.

In all instances except Arabic, the ‘direct’ cases N (with V if applicable) and A, i.e. those that typically code the subject and direct object, are always grouped together as against the ‘oblique’ cases, i.e. those which typically perform functions which in morphologically less rich languages are performed by prepositional phrases. In the Slavic languages surveyed, G also is ordered next to the direct cases. This is unlikely to be accidental, since it is in just these languages that G can code the subject and direct object in certain contexts. In languages where G does not perform this function, it tends to wind up at or towards the end of the ordering. In Arabic, A and G group together without interacting with N. This is not surprising when one realizes that (1) G is the case of the complement of prepositions, just as A is the case of the direct object of verbs; and (2) G does not bear

the whole load of representing adnominal dependence, since the head noun also is marked for this construction by being put into a special ‘construct state’. It is therefore not an oblique case in quite the sense in which it is in the non-Slavic Indo-European languages.

Not only do the direct and oblique cases group together, but in several languages they show no signs of inter-group homonymy (e.g. Sanskrit, Ancient Greek), and in Latin the inter-group homonymy is restricted to three pronouns.

Where they exist, ‘accessory’ cases, i.e. cases which are marginal in the sense that few nouns have a distinct form for them, or as in Latin, any form for them, do not fit into an ordering that is suitable for the centrally systematic cases. This is true also of V in Polish.

These outcomes suggest that the linear ordering is to some extent representing functional groupings: of ‘extra-syntactic’ cases (N, V) versus ‘syntactic’ cases (the rest), of direct cases (N, V, A) versus oblique cases (the rest), and to some extent of ‘adnominal’ cases (G) versus ‘adverbial’ cases (the other obliques).

The multi-dimensional representations fall into two classes. One class encompasses the irregularly shaped lexical entries or morphological contexts. Every example which provided strong evidence for such representations was based on alternations of stem-form or of some prosodic factor (i.e. stress).

The other class encompasses lexical entries or morphological contexts that cut across categories in such a way that a disjunction of specifications would appear to be needed in order to characterize them in terms of features: specifically, the context feminine *or* plural in German declension.

Finally, there exist cross-categorial homonymies, or other mutual dependencies, which cannot be represented geometrically but which may be able to be expressed by means of a feature-based representation that makes use of ‘Greek-letter’ variables. The examples were in both cases dependencies between the nominative and genitive cases. A number of these dependencies took the form of an essential complementarity between the realizations of the paradigm cells concerned. I suggested tentatively that such effects may be subject to a restriction of *non-contiguity* in geometric representation.

<sup>1</sup>Some speakers, and some languages, employ strategies which can make even cases like [2] with *see* acceptable, e.g. by favouring the requirements of the nearest governor. Corbett (1983a, 1983b) reviews a range of such phenomena.

<sup>2</sup>In any case, this prediction does not seem to be borne out in all instances. For instance, McCreight & Chvany (1991:109 n7) note that homonymy does not resolve the syntactic feature conflict in the following ungrammatical Russian sentence:

\*Roman on čitaet i emu nraivitsja.

‘He’s reading and liking the novel.’

In this sentence, *roman* ‘novel’ has to be accusative with *čitaet* ‘reads’ but nominative with *nraivitsja* ‘likes’. The case feature is, presumably, imposed, but this does not save the sentence even though the homonymy of N and A *roman* is certainly systematic.

<sup>3</sup>This is why this chapter is not full of examples of inflectional systems that are ‘compatible’ with the geometric hypothesis, but in a totally uninteresting way. It should be clear that the notion of ‘wastage’ is relevant only to inflectional systems in which homonymy does in fact occur: thus the case system in a language like Turkish, where there is no homonymy, is not a counter-example to the geometric approach (or any other attempt to model homonymies) even though it exhibits ‘wastage’ of 100%.

<sup>4</sup>Henceforth I will refer to them as natural classes without scare quotes.

<sup>5</sup>At least its weak generative capacity, that is. In this chapter I am concerned only with weak generative capacity, i.e. observational adequacy. The question of what description a formalism associates with the objects that it generates, i.e. its strong generative capacity, receives some attention in Chapters 3 and 4.

<sup>6</sup>This is not to suggest that the practitioners constitute a ‘school’ in any other sense, nor that all proposals by the one practitioner have this character. Carstairs-McCarthy’s later (1994) No Blur Principle, for instance, is statable as a constraint on individual affixes. For discussion, see Noyer (1994).

<sup>7</sup>In fact theme vowels or the lack of them constitute a somewhat special case, inasmuch as the question reduces to the identity or otherwise of allomorphs associated with the same inflectional properties. That is, a co-occurrence of *-m* as the marker of the non-neuter accusative singular is not evidence so much of a homonymy as of lack of allomorphy in the realization of those properties.

<sup>8</sup>With the very marginal exception of the Latin N, V feminine-neuter plural relative pronoun *quae*.

<sup>9</sup>Though Corbett (1991:150ff) discusses the case of the ‘neuter’ or ‘ambigeneric’ gender in Rumanian, which has no overt markings of its own, but shows masculine agreement in the singular and feminine agreement in the plural. This would suggest an ordering m—n—f for Rumanian, contrary to all the other cases examined. Historically this has evolved from Latin neuters, which, as noted, pattern largely with the masculines in the singular, but which *look* like feminines (and singulars) in the plural, at least in the nominative.

<sup>10</sup>If the long vowels in the masculine sound plurals are analysed as a case vowel *u* or *i* and a separate element of length, then the homonymy occurs in a non-cumulative context. This is just the sort of context where, according to Carstairs (1987), we would expect such a ‘take-over’ to occur. Something similar could probably be done with the dual forms immediately following.

<sup>11</sup>I consider the homonymy of third-person singular and second-person plural *kauft* presently.

<sup>12</sup>Numbering more than 50 in a count made from the list of irregular verbs in the Collins German

Dictionary, Second Edition (1991), 817-23. The count was conservative: modal verbs were excluded, as were prefixed verbs where the corresponding unprefixed verb was itself counted. Some forms marked old, dated, or dialectic were also omitted.

<sup>13</sup>Some of these verbs are additionally subject to the stem alternation in the second- and third-persons singular of the present indicative, discussed in the previous section. Additionally, almost all of those that contain one of the vowels [a, o, u, au] in PST modify it to [ä, ö, ü, äü] to produce a past subjunctive, e.g. *tragen*, PST *trug*, past subjunctive *trüge*. A very few idiosyncratically use another vowel instead in the past subjunctive, e.g. *helfen*, PST *half*, past subjunctive *hülfe*. In most cases such forms co-exist with the expected form (e.g. *hülfe*), with unpredictable differences in social evaluation. The past subjunctive forms will be ignored here.

<sup>14</sup>The definition of ‘weak’ suffix I have in mind, in accord with common usage, is that the suffix consists of an alveolar stop and that it *invariably* conflates PST and PSP.

<sup>15</sup>Greek examples are transcribed in accordance with the practice detailed in Appendix 1.

<sup>16</sup>With all these Gpl forms, here uniformly listed with *-on*, there are variants *-o* and *-one*, the choice of which is governed by phonological, stylistic and other considerations (p.49).

<sup>17</sup>This is the only instance of a distinct vocative form. Were it not for these forms, the vocative would always be identical with the accusative in the singular, and with the nominative in the plural.

<sup>18</sup>There are some additional minor paradigms (e.g. of *fos* ‘light’) which have no extra bearing on the question of confluations. Additionally, there has long existed a condition of diglossia in which morphological patterns from the archaizing *katharevousa* style are sometimes mixed in with the ‘demotic’ patterns described here. This too is ignored.

<sup>19</sup>The current practice of writing these nuclei with an ‘iota subscript’ was a late Byzantine orthographic device (*ibid.*).

<sup>20</sup>Here and throughout this exposition of Latin declension, consideration of homonymies between singular and plural forms will be deferred till 2.4.1.

<sup>21</sup>The older form in *-ubus* is retained optionally or obligatorily in some words in the classical period (§61).

<sup>22</sup>A form in *-ū* (like the neuter, see below) is found from early times in various forms, in poetry in the classical period, and increasingly in prose from the Augustan age onwards (§61).

<sup>23</sup>The ending is usually *-ēī* after vowels (§63).

<sup>24</sup>Etymologically, the *i*-pattern was associated with stems ending in *-i* and the C-pattern with stems ending in a consonant. The etymological basis of the distinction was progressively blurred.

<sup>25</sup>Earlier *turrim* (§§37, 56-7).

<sup>26</sup>Leaving aside questions of the relationship between the two stems of third-declension C-stems, the variability between the *i*-pattern and the C-pattern, the declension of incompletely assimilated Greek nouns, and various irregular forms. These do not bear on the issue at hand.

<sup>27</sup>Russian examples are transcribed in accordance with the practice detailed in Appendix 2.

<sup>28</sup>Whitney claims (§266) that “putting the nominative first, there is no other order by which that object [sc. of bringing confluations together] could be achieved”. The same is said by Allen & Brink (1980:62) and by Plank (1991c:182). However I have been unable to find the crucial evidence of a conflation across the ‘divide’ between NA on the one hand and IDBGL on the other, so that an ordering NALGBDI would be just as effective for the purpose. The traditional ordering is perhaps further motivated by syntactic considerations: I

in a passive clause answers to N in the corresponding active, as expressing the agent; similarly I can replace A for the second object of a causative verb (§282). By contrast, most uses of L are clearly circumstantial (§§301-5).

<sup>29</sup>Except in the matter of accent: see below.

<sup>30</sup>Except that *polk* ‘regiment’ takes an LII form *polkú* after all locative-governing prepositions: Unbegaun (op. cit., 53).

<sup>31</sup>I ignore for the moment the possibility of using essential variables to characterize the regions as  $[\alpha a, \alpha b]$  and  $[\alpha a, -\alpha b]$  respectively.

<sup>32</sup>Diachronically, however, the difference is no doubt due to accentuation. A trace of this is found synchronically in stems which, unlike *bhávant-*, are either monosyllabic or else polysyllabic and accented on the final syllable. For with such stems, the suffixes of the weak cases tend to draw the accent to themselves, whereas the suffixes of the strong cases never do. The process is regular with monosyllabic stems, somewhat idiosyncratic with polysyllables (§§315-20).

<sup>33</sup>Transcribed on the assumption that Greek initial rho represents a voiceless sonorant: cf. Allen 1987:41-5.

<sup>34</sup>This form of stem without final *-n* is based on the assumption that the usual result of the underlying sequence /ns/ is loss of the *n* with compensatory lengthening of the preceding vowel: see Steriade (1982) for discussion.

<sup>35</sup>Maiden (1992) discusses some interesting cases in Italian, where in many verbs a particular stem allomorph is found in the first-person singular and the third-person plural of the present indicative — a distribution which, in itself, is geometrically unrepresentable. But (1) these are precisely the slots whose affix begins with a back vowel, as opposed to front vowels in the rest of the present indicative conjugation; and (2) even if this is not always so, the ‘gap’ is bridged, as it were, by the present subjunctive forms, which likewise feature this stem allomorph, and which allow a connecting link to be made as follows: 1sg ind — 1sg subj — 2sg subj — 3sg subj — 3pl subj — 3pl ind. As always, it is important to consider the *whole* paradigm.

<sup>36</sup>In terms of affixation. For many nouns the complete word forms would not be identical because of differences in the placement of stress: see 2.3.2.

<sup>37</sup>Russian speakers’ awareness of this homonymy as systematic is also suggested by the curious agreement behaviour of adjectives which accompany nouns which in turn depend on one of the numerals *dva* ‘2’, *trí* ‘3’, *čtir’è* ‘4’ or *óba/ób’è* ‘both’ in the nominative. In this situation, the noun goes into the genitive singular. The adjective normally goes into the genitive plural — but it may go into the nominative plural, either optionally or preferentially, if the noun is feminine, and particularly so if the noun is one of those in which the stress is identical in Gsg and Npl (Unbegaun 1957:141-3). It can hardly be an accident that it is just in these situations that the Gsg feminine noun *looks* like a Npl.

## Chapter 3

# Linearity and Classification

### 3.0 Introduction

I take the data and analyses of the previous chapter to have established, within a small but significant range of inflectional systems, the substantial observational adequacy of the geometric hypothesis in modelling the possibilities for systematic homonymy within a single inflectional ‘dimension’ corresponding to a morpho-syntactic category. In dealing with homonymies across inflectional dimensions the results are more mixed. Some quite complex distributions prove to be conformant with the arrangements established for one of the dimensions alone — for instance the Sanskrit strong and weak noun stems were distributed as contiguous regions of irregular shape within an arrangement that included as one dimension the ordering of case properties established on the grounds of suffixal homonymies. However a substantial number of multi-dimensional distributions are not so conformant, and in some cases could not, in principle, be conformant no matter what orderings are assigned to the properties along each dimension — for instance the co-variance of the genitive singular and nominative plural suffixes across inflection classes in Latin and Sanskrit.

Multi-dimensional geometric representations, however, raise rather different issues from single-dimensional ones. Some consideration of them is given in Chapter 4, but for the most part they await further research. In this chapter I focus on linear representations of a single morpho-syntactic category alone, and so I sometimes refer to the geometric hypothesis as it applies in this domain as the linear hypothesis, and the type of distribution of homonymies which it predicts as linearity or linearizability. I begin, then, with the assumption that linearizability is, to a very large extent, a characteristic of the types of inflectional systems examined in Chapter 2.

It may well be that the particular data analysed — or the languages from which they were drawn — share some property that makes for linearizability, some property that is not

universal or perhaps even very common cross-linguistically. The languages concerned are all of what was traditionally known as the ‘inflecting’ or ‘synthetic’ (Sapir 1921) type, i.e. languages which show abundant examples of Carstairs’ (1987) four Deviations (1.0). It is entirely possible that linearity effects are a feature of this linguistic typology rather than of the human language faculty as a whole. In any event, I make the assumption that the linearity effects which motivate geometric representations are real and must be accounted for in terms of something about the organization of the language faculty. This does not prejudice the issue of whether that same language faculty might not permit quite different forms of organization as well.

Substantial conformity of linguistic data with restrictive principles gives cause for confidence that those principles reflect something of the real underlying organization of that data. In the present instance, the linear hypothesis makes predictions about the distribution of homonymy patterns which are both substantially accurate and relatively tightly constrained. To that extent the hypothesis poses a challenge to alternative theoretical accounts of inflectional organization to show that the accuracy of their predictions meets and if possible exceeds the standard set by the linear hypothesis.

At first sight this is very surprising. Outside of phonology, there has been virtually no suggestion in modern linguistic theory that any constraints on the organization of a domain of language structure flow from *geometric* properties of that domain. And even in the odd cases where this has been suggested, such as Yip, Maling & Jackendoff (1987), an application of ideas from autosegmental phonology to syntactic case assignment, the linguistic constraints that were argued to follow from what could be regarded as geometric constraints were at least syntagmatic. That is, they related to the left-to-right sequence in which case assignment takes place to NPs *simultaneously present* in a clause.

McCreight & Chvany (1991), however, make the claim that constraints on paradigmatic organization — i.e. on the organization of morpho-syntactic properties that are competing rather than simultaneously occurring — also follow from constraints on geometry. This is an extraordinary suggestion. It is relatively easy to imagine why the co-occurrence of elements actually present in linguistic form might be constrained in ways that follow from the fact that the separate elements must occupy distinct regions of space-time. Given this, it makes sense to speak of notions such as sequence and contiguity, and it is reasonable to suppose that constraints on linguistic form might derive in part from this.

In morphology, an example might be the family of adjacency or locality constraints proposed on the context of allomorphic variation. Whatever else these proposed constraints might refer to, such as bracketing, they generally impose some condition of spatial contiguity or at least proximity. Crucially, though, such constraints make reference to simultaneously present elements.

When applying such notions to paradigmatically related items, however, one imagines that an element of metaphor comes into play, as when we say that  $x$  is ‘nearer’ in meaning to  $y$  than to  $z$ . This way of speaking is not normally taken to mean that  $x$  is literally in closer physical proximity to  $y$  than to  $z$ . Rather, statements like this are normally taken to mean something like the following: the meanings of  $x$ ,  $y$  and  $z$  are each complex in the sense that they are composed of several elements or that they are connected to several other items, i.e. they are not ‘atomic’;  $x$ , then, shares more of these components or connections with  $y$  than it does with  $z$ .

But what if  $x$ ,  $y$  and  $z$  are atomic? Then they have no components, connections or other properties of which they can have degrees of community in the first place. It only makes sense to claim that paradigmatically related items are both atomic in their composition and exhibit degrees of proximity to each other, if one imagines that they are literally stored somewhat like physical objects in some sort of spatially organized cognitive grid. Then, the spatial co-ordinates of points within that grid can stand in a relation of greater or lesser proximity to each other. This is just the claim that McCreight & Chvany make (p.92):

We suggest that the lexical entry be viewed as a form in  $n$ -dimensional space, each dimension corresponding to a grammatical property such as case, person, number, etc. The various values of a syntactic property comprise the coordinates of that dimension. Lexical retrieval selects the form in the paradigm which corresponds to the appropriate syntactic coordinates.

This notion, when combined with their espousal of lexical storage of whole inflected word forms, with every morpho-syntactic category for which those are inflected represented by a dimension, would obviously lead in many cases to objects in more than three (or even four) dimensions. This aspect may cause a cognitive difficulty, but in any case, does not impact on the question of the mental representation of single inflectional categories as purely linear arrangements. There seems to be no a priori difficulty in that. McCreight & Chvany, then, imagine that the properties that constitute a single inflectional dimension, corresponding to a single morpho-syntactic category — such as properties of case,

number, person, gender, tense, etc. — are represented as something like evenly spaced divisions along a line segment, which provides an interface between syntax and the lexicon. A lexical item occupies a certain range of the line segment, minimally a single division, but when there is a systematic homonymy, some larger range. The syntax generally identifies a specific division, or in the case of syntactic feature conflicts, a set of such specific divisions. A lexical item sitting ‘in’ the division (or all of them) can then be inserted into (or checked by) syntactic structures.

Homonymies, then, can be thought of as being made possible by the spatial relation of contiguity. Another spatially based characteristic of a linear representation, however, is the peripherality of two of its elements, and McCreight & Chvany claim that this too enters into observable linguistic patterns. Peripherality is thought to be particularly associated with the detachment of forms from the paradigm and their subsequent development as independent lexical items (e.g. adverbs spun off from the nominative and instrumental cases of various nouns in Russian). Relatively high detachability is of course the sort of property one would expect from an object situated at the periphery of a geometrical space and therefore linked to fewer neighbours than are non-peripheral objects. Two more peripherality effects cited are, paradoxically, particular susceptibility and particular resistance to morphological innovation. However, these effects are attributed to the opposite ends of a linear representation, which implies that the representation is asymmetrical: one end is the ‘beginning’ or the ‘top’ or the ‘front’ in a privileged orientation relative to the other end.

Rather than accepting the appropriateness of linear representations at face value, however, I attempt in this chapter to demonstrate that it is possible to reproduce the extensional results of the linear hypothesis without assuming any form of literally geometric representation. The approach I outline is entirely traditional in one sense, in that it assumes that paradigmatically related items have complex structure, made up of components by which they are classified. The notion of proximity in this sort of representation reverts to a metaphor: it really means something like the number of components two items have in common, as is usual when speaking of paradigmatically related items.

The approach is untraditional in another sense, though, because the type of classification employed is sub-classification rather than cross-classification. Cross-classification is rejected as a model of the phenomena under investigation, even though it has been

widely assumed, because it makes entirely the wrong predictions about the distribution of homonymies. In particular, it does not predict linearizability. In fact it predicts that in the general case patterns of homonymy should *not* be linearizable.

Modelling homonymy by sub-classification, by contrast, has the characteristic of ensuring that the set of all definable homonymies is linearizable. It seems better to start from this foundation than from a type of representation that guarantees quite the opposite. However, a sub-classification is not equivalent to a linear representation, and in fact defines only a subset of the natural classes that any of its possible linearizations would do. Therefore it is necessary to augment it, preferably in some principled way, so as to define a somewhat larger number of natural classes. A number of such procedures is considered, and one particular scheme is advanced as providing an even closer fit for the data than does the linear model.

A sub-classification (with or without the sorts of augmentations just mentioned) defines a relatively rich form of organization, as compared with a mere linearization. The set of items under sub-classification is recursively partitioned into disjoint subsets until ultimately the cardinality of each subset is one. At each stage of this partitioning, some criterion must be used in assigning sets of items to one partition rather than another, and it is therefore important to address the question of what this criterion is.

This chapter is therefore organized as follows. After a brief introduction to the theory of distinctive features, I discuss the question of the motivation for imposing one particular classification rather than another, in other words the criteria used in partitioning the items being classified, and come to the conclusion that a partitioning on purely formal grounds is required to account successfully for systematic homonymies. Because sub-classifications arrived at in this way turn out to have a consistently asymmetrical character, and because that asymmetry is crucially involved in a suggested scheme of augmentation, I then review the issue of paradigmatic asymmetry, i.e. ‘markedness’. With these preparations in hand, the bulk of the chapter is then devoted to the question of how a classification of inflectional properties should be structured.

### **3.1 Distinctive Features and Natural Classes**

In generative grammar, the usual analytical strategy for extracting generalizations out of paradigmatic systems has been the use of distinctive features. Distinctive features — or

rather their antecedents, a formalized system of particular oppositions — were pioneered by the Prague School in the 1920s and 1930s particularly in the domain of phonology. Trubetzkoy (1958) summarizes and epitomizes this approach. Meanwhile Jakobson (1931, 1935, 1958) pioneered the use of feature-based analyses in morphology.

The phonological use of features was incorporated into the formalisms of generative grammar by Halle (1959) and especially Chomsky & Halle (1968). And features to effect various syntactic classifications were introduced in Chomsky (1965) and have since become an integral part of frameworks that follow in the line of intellectual descent from that work. In the recent Minimalist Program (Chomsky 1995a), features bear virtually the entire responsibility for driving the ‘computational module’ of language, and differences in the ‘strength’ of features account for most of the differences between individual languages, lexical arbitrariness apart (Chomsky 1995c). Features do a great deal of the work of the syntactic component in unification-based approaches such as GPSG (Gazdar *et al.* 1985), HPSG (Pollard & Sag 1994) and LFG (Bresnan 1982).

In inflectional morphology also, following Jakobson’s lead in the matter, and the hints in Chomsky (1965), features have been used to capture generalizations in such areas as the declension of German (Bierwisch 1967) and the conjugation of Modern Greek (Warburton 1973). They are assumed in virtually all contemporary models of morphology, however much these differ amongst themselves in other respects.

The theory of distinctive features is, fundamentally, very simple. The idea is to consider what would otherwise be an atomic unit as a set of components. Typically these components are binary, i.e. Boolean, specifications for whether a particular property holds of that item. For instance, in phonology the segment /b/ might be cross-classified to specify that it is labial and voiced, and that it is not a continuant or a nasal. By contrast /p/ would share all these specifications except for the one concerning voice, /m/ would share all the specifications except for the one concerning nasality, and /v/ would share all the specifications except for the one concerning continuance. These segments might be said to be at a distance of one from /b/, since they differ from it in respect of only one feature. On the other hand /f/ differs in respect of both voicing and continuance, and is therefore at a greater distance than from /b/ than are /p/, /m/ and /v/. And /x/ is at a greater distance still, because it differs from /b/ not only in voicing and continuance, but also in the fact that it is not labial.

In this way distinctive features are able to define degrees of likeness between objects. By the same token, they are able to define ‘families’ of objects which are alike in certain specified respects. While a complete specification for every phonological feature characterizes a particular segment, a set of specifications that is incomplete in some respect serves to define a set of segments, namely all those for which the specifications hold. Thus the set of segments { p b f v m } all share the property of being labial, but no other (apart from being consonants), and might be characterized by the one-membered set of specifications { [+labial] }. Sets of segments picked out in this way by under-specification are called natural classes. By contrast, no set of specifications could pick out the set of segments { a b k }, and this is therefore an ‘unnatural class’.

This means that natural classes are ‘cheaper’ to refer to in a grammar than are unnatural classes (or for that matter individual segments), since they can be characterized with fewer features. This entails that the choice of features to characterize segments is an empirical one. ‘Cheapness’ of reference in a grammar is taken to reflect ‘naturalness’, and naturalness is understood to be attested by such things as frequency of occurrence in the world’s languages, frequency of occurrence in a particular language, relatively early acquisition in child learning, frequent implication in historical change, and so on. Thus the choice of distinctive features, and the classification of segments by them, should reflect such phenomena.

*Ceteris paribus*, the same considerations apply to the choice of a set of distinctive features to characterize natural classes of items in other domains, such as syntax and morphology. For instance, in syntax, it has become customary since Jackendoff (1977) to characterize the major lexical categories N, V, A and P by means of two binary-valued features. The features now generally in use are  $[\pm N]$  and  $[\pm V]$ .  $[+N]$  makes a natural class of N and A,  $[-N]$  makes a natural class of V and P,  $[+V]$  makes a natural class of A and V, and  $[-V]$  makes a natural class of N and P. The empirical claim is that it is more natural to refer to nouns and adjectives as a class, for instance, than it is to refer to nouns and verbs as a class. And this seems to be borne out by facts such as the inability of nouns and adjectives to assign case to their complements, and their frequently similar form of inflection. Nouns and verbs, by contrast, share few syntactic properties, and this is reflected in the fact that they fail to comprise any natural class according to the classification.

## 3.2 Motivation

### 3.2.1 Introduction

The fundamental motivation for the use of features is, then, to capture similarities and differences of behaviour between paradigmatically related items, and in so doing, to establish ‘natural classes’ of items which can be characterized more simply than mere sets of unrelated items.

In phonological and syntactic studies, it goes without saying that the motivation for phonological and syntactic natural classes is to capture linguistically significant phonological and syntactic generalizations respectively.

So it would appear to follow that the purpose of morphological natural classes is to capture linguistically significant morphological generalizations. But this immediately implies that there are such generalizations, and that they cannot be reduced to semantic, syntactic or phonological generalizations, or some combination of these. The question is, then, whether there actually exists a relatively autonomous domain of morphology, containing its own primes and generalizations about their combination and distribution. For many linguists, the answer has been no, which is not surprising given the relentless reductionism that has characterized the generative linguistic enterprise, coupled with the apparently chaotic nature of many inflectional systems.

In the ‘standard theory’ model of Chomsky (1965) and Chomsky & Halle (1968), for example, there is no separate morphological component. The syntax itself handles whatever is general and predictable about the way morphemes combine (i.e. morphotactics), while the phonology handles as much variation in the surface forms of these morphemes (i.e. morpho-phonology) as can possibly be accommodated within the framework of standard phonological rules. In between is a rather shadowy area consisting of ‘re-adjustment rules’, which handle whatever allomorphy cannot be accounted for phonologically. Although these re-adjustment rules are arguably the seed of a full-blown morphological component, the inference is not drawn at this stage. These works set the tone for morphological studies in generative grammar. It was long assumed that morphology consists mostly of the parochial and inherently uninteresting residue left when all significant

generalizations have been captured by the syntactic and phonological components of the grammar.

Following Chomsky's (1970) argument that certain phenomena should not be handled in the regular syntax or phonology, but instead in the lexicon, now enriched in terms of the 'internal computations' it is expected to perform, there began a period of intensive research devoted essentially to two questions: which grammatical regularities should be handled in the lexicon, and how the internal computation of the lexicon should be characterized. One might have assumed that this would involve some reference to morphological objects and a set of principles concerning their interrelationships, but it did so only to a very limited extent. Rather, this period saw a great deal of effort expended on characterizing how phonological rules operate 'in the lexicon', culminating in an important sense in the theory of Lexical Phonology (Kiparsky 1982a, 1982b; Mohanan 1986). At the same time, others were concerned to characterize how essentially syntactic regularities, such as the relationship between corresponding active and passive sentences, could be handled by lexicon-internal processes. A substantial programme of research along these lines finally led to the emergence of 'lexicalist' syntactic theories, notably Lexical-Functional Grammar (Bresnan 1982) and Generalized Phrase Structure Grammar (Gazdar *et al.* 1985).

Despite all this effort in developing a theory of the lexicon, the lexicon was still conceived as a 'place' (module, component, level) where syntactic objects are correlated, as directly as possible, with phonological objects. Whatever computation took place in the lexicon was couched in either syntactic or phonological terms. There was still no notion of specifically morphological objects or relationships, to any great extent.

Nor have things changed greatly in this regard. To take three influential contemporary theories of inflectional morphology, Lieber's (1992) 'deconstructed' approach, Anderson's (1992) A-Morphous Morphology, and Halle & Marantz's (1993) Distributed Morphology, they all have this in common, that the only types of objects they deal with are either clearly syntactic or clearly phonological. Lieber specifically denies the very existence of morphology as a domain of inquiry that cannot be reduced to independently motivated syntactic and phonological principles. Anderson's and Halle & Marantz's models incorporate a specifically morphological component, but in both cases its function is to map, as directly as possible, syntactic configurations onto phonological ones. In Anderson's case the job of the (inflectional) morphological component is to specify the changes that

need to be made to lexical stems in order to realize the syntactic features associated with them in a given context. That is, syntactic features trigger phonological processes. In Halle & Marantz's model, the syntactic features are conceived of as terminal nodes ('functional categories') in the syntactic representation, and the job of the morphological component is to merge, fuse and split these terminals appropriately before lexical items, consisting of stems and affixes, are inserted under them. After lexical items have been inserted, further 're-adjustment' rules, which transform one phonological representation into another, account for conditioned allomorphy. Again, there are no specifically morphological objects at any stage of the analysis. Rather, the 'morphology' consists of a component that transforms syntactic configurations into other syntactic configurations prior to lexical insertion, and a component that transforms phonological representations into other phonological representations prior to the application of subsequent, more general, phonological rules.

On all these views, there is really no such thing as morphology per se. Rather morphology is conceived of as a morpho-syntactic component and a morpho-phonological component. There is no unhyphenated morphological component and no unhyphenated morphological primes or principles<sup>1</sup>.

Prior to the emergence of generative grammar, many phenomena now regarded as syntactic were believed to be semantic in nature, but even then, morphology was seen as essentially a relationship between semantics and phonology: 'morpho-semantics', one might call it.

Despite their many and important differences, then, all such approaches have in common that they characterize the role of morphology as specifying a mapping between configurations of syntactic (or semantic) features and configurations of phonological features. Little surprise, then, that the motivation for partitioning the categories I have been considering morphological is primarily to capture syntactico-semantic regularities that correlate significantly with specific phonological patterns.

This has the result that, in the default case, unity of semantic or syntactic characterization is expected to correlate with unity of phonological characterization, so that allomorphy is "something of an embarrassment" (Carstairs-McCarthy 1992:152). My concern here, however, is more with the complementary result, namely that unity of phonological characterization is expected to imply unity of semantic or syntactic characterization. Most notably, this has led to great efforts to provide a unitary syntactic or semantic account of

morphological case. That is, because for any given lexical stem there is a single phonological object that might be called, say, the genitive case of that stem, it is assumed that there must be a unitary semantic and/or syntactic category of genitive case.

There is a third possibility, rarely considered, namely that notions such as ‘genitive case’ are unitary only at the specifically morphological level, and that just as they may correlate with different phonological configurations (because of allomorphy in the phonological realization), so they may correlate with different syntactico-semantic configurations. If this is indeed the case, it is likely that an attempt to define such morphological objects in syntactico-semantic terms runs the risk of doing a serious disservice to both the morphology itself and to the semantics/syntax. I will argue that this is in fact just what happens, and that evidence of purely morphological organization, such as patterns of homonymy, tends to be used or ignored rather opportunistically as best suits the desired syntactico-semantic characterization. And on the other hand, the relatively half-hearted attempt to endow the syntactico-semantic characterization with such structure as will allow for the characterization of morphological phenomena, such as homonymy patterns, leads to representations that are thoroughly undermotivated at the syntactic or semantic level.

I deal first with Jakobson’s analysis of the Russian case system, where the motivation for the classification is semantic. I then consider the appropriation, and wholesale transferral to syntax, of Jakobson’s system by Neidle. At least both these scholars are clear about how the features that define morphological categories should be motivated. But this is perhaps atypical, so I deal briefly with the kind of information that is presented about the use of features in morphology in a modern pedagogical work, only to emphasise how unconsidered the question of motivation in morphological classification can be. Finally I suggest that morphological classification should, in an inductive manner, be motivated by purely morphological regularities, and that by doing so one can give a better account not only of the morphology itself but also of the other grammatical components that interact with it.

### **3.2.2 Morpho-Semantic Motivaton**

Jakobson’s are the first and most important attempts to characterize the structure of inflectional categories, and therefore their possibilities for systematic homonymy, in semantic terms. His work is important not only in its own right, and not only because it was pioneering, but also because it has had much influence on subsequent analyses of

the same and similar data. For instance, his ultimate classification of the Russian cases by means of three binary-valued features has been taken over wholesale in more recent work such as Neidle's (1982) LFG-based syntactic analysis of Russian case agreement, and by Schenker (1964) in his morphological analysis of Polish declension<sup>2</sup>.

Jakobson assumes that, since cases are unitary morphological categories, they must have some underlying semantic unity — some *Gesamtbedeutung* or 'general meaning', in fact a combination of semantic components which cross-classifies the morphological cases and is responsible, amongst other things, for the observed homonymy patterns. His analysis of the Russian case system is expounded in two papers (1935 and 1958), which differ in some substantive details and even more on the emphasis placed on semantic as opposed to formal criteria for classification. Despite this, the thrust of the papers is similar enough that they can be thought of as constituting a single analysis of the Russian case system.

Central to the analysis is the claim that each of the eight Russian cases does indeed have a core or 'general' meaning. Jakobson argues that earlier treatments of declension, especially Slavic declension, suffered by treating the cases as exponents of more-or-less arbitrary lists of functions. The sort of thing he was complaining about is particularly familiar in classical pedagogy. As an example, Gildersleeve & Lodge (1948) treat of the non-morphological aspects of the dative case in Latin at §§344-359. The first section is as far as the authors go in trying to characterize any general meaning or function of the dative case. Even this is less explicit than it might seem to a modern reader, since the notions 'indirect object' and 'direct object' are themselves defined only notionally (§328):

The Dative is the case of the Indirect Object, and always involves a Direct Object, which may be contained in the verb or expressed by the complex of verb and object.

The real characterization of the dative case occupies the next fourteen sections, which deal respectively with:

[1]

- Dative with Transitive Verbs
- Dative with Intransitive Verbs
- Dative and Verbs Compounded with Prepositions
- Dative with Verbs of Giving and Putting
- Dative of Possessor
- Dative of Personal Interest
- Ethical Dative
- Dative of Reference
- Dative of the Agent
- Dative of the Object For Which
- Dative with Derivative Substantives
- Dative with Adjectives

There are similar treatments of the other cases, by way of lists of their various functions.

Jakobson rejects this approach. He also rejects an analysis which picks out the ‘principal’ meaning, i.e. the statistically most frequent ‘specific’ meaning of a case. For instance, he castigates Hjelmslev’s characterization of the Gothic nominative and accusative in the following terms (1935:65):

Here, the problem of general meanings is clearly pushed aside, on the one hand, in favor of the traditional **list of individual meanings**, or of the list of syntactic functions of each of the two cases (e.g. nominative as the case of the subject and of the predicate, as a predicate-less form, and as an address-form) and, on the other hand, in favor of establishing the principal meaning of each case (in the nominative “the value of ‘subject’ **predominates**,” while in the accusative “the value of ‘object’ **predominates** and is often the only one envisaged”), although the author condemns such a procedure in principle (6 and *passim*). [emphasis in original]

Rather, Jakobson wishes to establish the ‘general meaning(s)’ present in each and every use of a particular case. He insists that the meanings of morphological cases are not parallel to the meanings of syntactic constructions (in particular, word order). Rather, case-inflected word forms contribute to the utterance the general meaning of their case, as well as signalling a particular syntactic role (at 63):

Yet we are not entitled to assert that word order can express case; word order can merely express the syntactic function of words, which is not at all the same thing. Brøndal correctly perceived that case is morphological and not syntactic in nature: “every case has its definition or ‘function’; but there is no necessary relationship between a case function and a syntactic function; case theory and morphology are

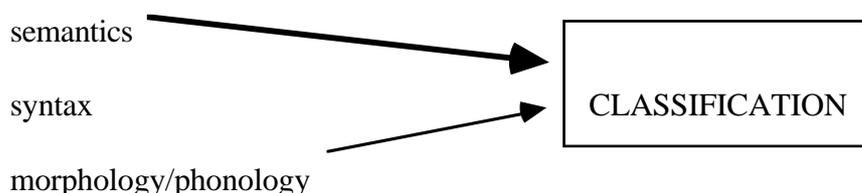
not syntax” [. . .]. Transferral [*sic*] of the question of the general meanings of case forms from morphology to syntax could only have occurred within a linguistic framework in which case was not a morphological category.

(It is worth observing in this context that, despite appearances, Jakobson is not invoking any notion of ‘pure morphology’. He seeks to deny that cases have a syntactic characterization only in order to assert that they have a semantic one. For him, ‘morphological category’ really means ‘morpho-semantic category’.)

These general meanings, Jakobson continues, can only be established by considering the whole system of oppositions of the Russian cases. One member of each such opposition signals the existence of the general meaning concerned; it is therefore marked with respect to that opposition. The other, or unmarked, member of each pair, however, does not signal the absence of that general meaning: it merely fails to signal its presence. (This aspect of the analysis, namely Jakobson’s theory of markedness, is discussed further below at 3.3.2.)

The evidence used in determining the system of oppositions is semantic and formal, where by ‘formal’ I mean morphological/phonological. In the 1935 paper, the formal evidence is virtually confined to complete homonymies in the realization of different cases, which insofar as it occurs between cases that form a natural class on the basis of the semantic evidence, reinforces that evidence. In the 1958 paper attention is paid also to other systematic patterns that can be attributed to the classification, falling short of total homonymy (for instance, presence of a certain number or a certain class of phonemes in the affixes associated with some natural class of cases). The following diagram outlines the criteria used. The relative weight of the arrows is intended to suggest the relative weight given to the corresponding type of evidence.

[2]



The general meanings arrived at primarily on semantic criteria, but which are thought to be confirmed also by the distribution of purely formal similarities, are very general indeed. They comprise:

[3]

- “the statement of the existence of directedness” or “directional correlation” (p. 67);
- the indication of “the limit of the referent’s involvement in the content of the utterance” or “scope correlation” (p. 72);
- the indication that “a referent occupies a peripheral status in the overall semantic content of the utterance” or “status correlation” (p. 78);
- the indication that referents “function in the content of the utterance not as shapes, but as something shaping or being shaped” or “shaping correlation” (p. 92).

In the 1958 paper, the ‘shaping correlation’ is removed, the distinctions it formerly made being taken over by an even more general version of the directional correlation, now called ‘ascriptive’ (1958:125):

Accordingly, each of the four cases — G<sub>1</sub>, L<sub>1</sub>, A, and D — as distinct from the G<sub>2</sub>, L<sub>2</sub>, N, and I, ascribe to the object a property, or a state resulting from the action directed towards the object, and consequently may be called ascriptive (directional) cases.

These ‘correlations’ function as cross-classifying binary features, which characterize the eight cases of Russian (including the two ‘accessory cases’ G<sub>2</sub> and L<sub>2</sub>) as follows:

[4]

[±**ascriptive**] [±**quantifying**] [±**marginal**]

<b>N</b>	–	–	–
<b>A</b>	+	–	–
<b>G<sub>1</sub></b>	+	+	–
<b>G<sub>2</sub></b>	–	+	–
<b>L<sub>1</sub></b>	+	+	+
<b>L<sub>2</sub></b>	–	+	+
<b>D</b>	+	–	+
<b>I</b>	–	–	+

The semantic evidence adduced for the classification consists of more-or-less subtle native speaker intuitions about the nuances of utterances involving specific cases, including nuances of focus, presupposition, and ellipsis. Where possible, (near-) minimal pairs are

presented and the differences in meaning are either captured in the gloss or explained directly. As an example of the contribution to meaning made by using a case positively marked to indicate “the limit of the referent’s involvement in the content of the utterance” (here G), Jakobson gives (amongst many others) the following (1935:73):

[5]

<i>strašno smerti</i> [G]	‘it is frightening in the face of death’
<i>strašna smert’</i> [N]	‘frightening is death’

He explains:

[I]n the first instance death is the negative “main figure” in the utterance and thus remains outside its content — its positive “main figures” are those who are cringing before death, while in the second instance death is the positive and only main figure.

Again, as an example of the (supposedly) very same semantic distinction (*ibid.*):

[6]

<i>otveta</i> [G] <i>ne prišlo</i>	‘there came no answer’
<i>otvet</i> [N] <i>ne prišël</i>	‘the answer did not come’

The explanation here is:

[I]n the first case the answer itself is denied as if removed from the content of the utterance, while in the second only the action is denied.

And again, though here contrasting the genitive with the accusative (at 74):

[J]*a ne slychal ètoj sonaty* [G] ‘I have not heard this sonata’ — the emphasis is on the unknown-ness of the sonata on the part of the speaker; *ja ne slychal ètu sonatu* [A] — this emphasis is lacking, and the fact that I have not heard it becomes mere accident, which is unable to eliminate the sonata from the content of the utterance — the presence of the sonata takes precedence: this nuance requires the A as opposed to the G.

Examples of this sort could be multiplied greatly. One has little doubt that the characterizations are highly insightful, the product of a very sensitive *Sprachgefühl* further equipped with great professional linguistic talents. But it cannot fail to strike the contemporary reader that the characterizations are of little value operationally: they give no sure guide to the outsider as to which case is used in any particular circumstance. It so struck Wierzbicka (1980), for instance, when she characterized Jakobson’s formulations as “too vague, too general to be empirically adequate” (p.xvi). As she notes, specifically

in regard to the instrumental case, (p.xv):

But there is also a weakness in his [Jakobson's] method, a weakness which shows itself in unverifiability (beyond a purely subjective impression of his analysis). Formulas like “+peripheral, –affected [ascriptive]” are not self-explanatory (indeed they are certainly less so than traditional labels like “manner” or “instrument”), and one could stretch them in many different ways to make them fit the facts. Even if we limited ourselves to blind imitation of Jakobson's way of using and interpreting his formulas, we would still often go wrong because these formulas have very limited predictive power, and insofar as they do have predictive power, the predictions they generate are often incorrect. A person who does not know Russian *cannot* learn to use the Russian cases on the basis of Jakobson's formulas.

To give an example, one can say in Russian:

*Ivan ubil Petra toporom.*  
Ivan-Nom. killed Peter-Acc. axe-Instr.  
(Ivan killed Peter with an axe)

using an instrumental to refer to the axe because, one might say, the axe is seen by the speaker as “peripheral” to the action and not affected by the action; Jakobson's formula seems to fit; but if so, one should also be able to say:

*\*David ubil Goliafa prašcej.*  
David-Nom. killed Goliath-Acc. sling-Instr.  
(David killed Goliath with a sling)

because the sling, too, is “peripheral” and “not affected”; *this* prediction, however, proves false. (italics in original; transliteration unaltered)

By contrast with this attempt at extreme reductionism which arguably founders on vagueness, Wierzbicka proposes a list of seventeen distinct and concrete ‘meanings’ of I. This does not, however, represent a return to the traditional list of labels such as “Ablative of Manner”, “Ablative of Comparison”, etc. Wierzbicka's approach differs from this in two ways. First, the various ‘meanings’ of the instrumental case are given in precise formulas in Wierzbicka's semantic meta-language — they are not merely labels. Second, these formulas contain overlapping components, which, according to her, is what leads linguists to search for semantic invariants in cases and what also frustrates attempts to find these invariants. Rather,

Cases do have meanings; each case has a large number of meanings [*sic*], which, however, can be clearly separated from one another. All the different meanings of

each case are interrelated. Since every meaning is complex (i.e. contains a number of distinct components), most meanings share some components with most of the others; it is possible, and even likely — though by no means necessary — that *all* the meanings of one case may share some of the components (hence the impression that each case has a semantic invariant). (p. xix; italics in original)

Wierzbicka's analysis of the instrumental case, if substantially correct, thoroughly undermines the semantic basis for Jakobson's notion of a single 'general meaning' of each case, and therefore the features that are supposed to represent that meaning. But we might suppose that the classification is adequate at least in characterizing the natural classes that are required on the formal level. And Jakobson does provide a great deal of such formal evidence.

In the 1935 paper, this evidence is mostly restricted to 'syncretisms', i.e. systematic homonymies between various cases (at 96-8). Syncretisms are shown to comprise various natural classes made available by his classification, and to that extent furnish additional evidence for it. In addition, he adduces some evidence from defective paradigms, root suppletion, stem formation, and stress placement as demonstrating the special, maximally unmarked, status of the nominative case.

Much more formal evidence for the classification (slightly revised, as noted above) is supplied in the 1958 paper. Here Jakobson sets out to show that natural classes within the classification according to 'general meanings' are implicated also in a variety of formal confluences. These are not restricted to complete syncretism, but comprise a number of phonological regularities (underlining is my own):

Substantival endings in the direct cases [JJ: N, A: p.110] consist of no more than one phoneme. All the definite cases (A, D, G, L) of the substantival declension of the sg. are characterized by monophonemic desinences. (p.120)

Polyphonemic desinences always contain *-j-* in the direct cases. (p.120)

Thus a nasal phoneme serves as the mark of the marginal cases [JJ: instrumental, dative, prepositional/locative], while fricative consonants mark the quantificational cases: *-x-* the prepositional [JJ: =L] and *-v-* the genitive. (p.121)

When the D or the A sg. has an independent desinence, its sole or final phoneme is always /u/: [. . .] In other words, in the six-case system, final /u/ belongs uniquely to the directional cases; it is not shared by them with any other cases, and therefore serves as the mark of the directional cases. (p.121)

In addition, relations of complementarity between members of a natural class are noted. In the following, the natural class comprises the non-directional, non-marginal cases N and G:

The zero ending occurs only in the N sg. [...] and the G pl. [...] of substantives, as well as in the N m. of those nominal [...] and pronominal [...] adjectives which make use of substantival endings in their direct cases [...]. If there is zero ending in one of the paradigms of either the singular or the plural, then no zero ending occurs in the other paradigm of the same word, with very rare exceptions [...]. (p.120)

The majority of the monophonemic endings of the G sg. and N pl. are either identical or are differentiated only prosodically by the presence or absence of stress.

Piecemeal formal evidence of this positive sort is, of course, valuable, but it is not sufficient to establish the adequacy of a particular classification. For this we need to be sure of two further things: does the classification characterize as natural classes *all* the systematic homonymies? and, does the classification, as far as possible, *fail* to characterize as natural classes sets of cases which do *not* participate in systematic homonymies?

As it happens, Jakobson's scheme fares badly on both scores. It is able to characterize as natural classes NA — [–quantifying, –marginal] — and GL — [+quantifying]. But making natural classes of all the other sets of cases involved in homonymies is impossible, partly due to Jakobson's decision to treat the 'second' genitive and locative cases as cases in their own right, differing from their respective 'first' counterparts in being [–ascriptive]. Since the vast majority of nouns do not have a separate second genitive or locative case, we need natural classes simply to encompass the two genitive and the two locative cases; these are [+quantifying, –marginal] and [+quantifying, +marginal] respectively. But this in turn entails that none of the remaining homonymy sets can be characterized. [7a] shows the homonymy sets defined as natural classes. [7b] shows the intersection of the sets of features characterizing the members of each other homonymy set, which in every instance includes extra, unwanted, members:

[7]

(a)	NA	[–quantifying, –marginal]	
	GL	[+quantifying]	
(b)	AG	*[–marginal]	<i>defines</i> NAG
	LD	*[+marginal]	<i>defines</i> LDI
	AGL	*[]	<i>defines</i> NAGLDI
	GLD	*[]	<i>defines</i> NAGLDI
	GLDI	*[]	<i>defines</i> NAGLDI

Things are made only slightly better by including just one of the two genitives and locatives in each set:

[8]

AG <sub>1</sub>	[+ascriptive, –marginal]	
L <sub>1</sub> D	[+ascriptive, +marginal]	
AG <sub>1</sub> L <sub>1</sub>	*[+ascriptive]	<i>defines</i> AG <sub>1</sub> L <sub>1</sub> D
G <sub>1</sub> L <sub>1</sub> D	*[+ascriptive]	<i>defines</i> AG <sub>1</sub> L <sub>1</sub> D
G <sub>1</sub> L <sub>1</sub> D <sub>1</sub>	*[]	<i>defines</i> NAG <sub>1</sub> G <sub>2</sub> L <sub>1</sub> L <sub>2</sub> D <sub>1</sub>

Apart from the fact that this classification cannot model the homonymies that do occur, it models all too readily homonymies which do not. (I exclude indeclinable nouns from consideration here, for obvious reasons.) For instance, N and I differ only in marginality, forming the natural class [–ascriptive, –quantifying]. However N and I are *never* homonymous in Russian declension. Again, A and D form the natural class [+ascriptive, –quantifying]. But there are no homonymies involving A and D. NAG are straightforwardly [–marginal]. But there are no homonymies involving NAG. LDI are straightforwardly [+marginal], but there are no homonymies of LDI (without G). [–ascriptive] picks out N, G<sub>2</sub>, L<sub>2</sub> and I, but these never comprise a homonymy set. And so on.

Jakobson's classification of Russian cases on semantic criteria, with an eye to formal correlates, may be regarded as insightful or merely vague, on the semantic end. On the formal end, however, even his exposition shows the all-too-typical practice of citing formal correlates opportunistically, where they happen to bolster the classification, and of not citing formal correlates which do not help, and the lack of formal correlates which would be expected. When this is done systematically, the classification loses much of its appeal, at least from the morphological point of view.

The problem, I suggest, is that it is merely assumed that morphological organization is nothing more than a reflection of organization at some other grammatical level. The danger for the analyst is that, if this assumption is incorrect, a classification of morpho-syntactic or morpho-semantic phenomena that proceeds with one eye to the morphology and the other eye to the other level that is assumed to be reflected in it, is likely to be less than optimal in accounting for regularities at either level.

### 3.2.3 Morpho-Syntactic Motivation

In more contemporary work it is likely to be syntactic rather than semantic properties that are presumed to be reflected in inflectional morphology. Indeed this has been proposed as a *definition* of inflectional morphology: “inflectional morphology is what is relevant to syntax” (Anderson 1982: 587).

Of course it is perfectly possible to carry on syntactic work involving the manipulation of morpho-syntactic categories with little or no regard to the purely morphological structuring of those categories, in particular with no attempt to characterize natural classes of properties of a particular morpho-syntactic category for the purpose of describing homonymy patterns. In this case there is no classification of properties belonging to a single syntactic category and therefore no question of the motivation for that classification. However there have been occasional attempts to describe morpho-syntactic phenomena by means of features which cross-classify a single morpho-syntactic category, and these raise the question of motivation.

Consider in this respect Neidle’s (1982) analysis of case agreement in Russian. For the purposes of her analysis, Neidle uses Jakobson’s three cross-classifying features to define the cases, noting that “[t]he use of such a system results in economy, both within the phrase structure component and, especially, within the lexicon (as ‘lexicon’ is understood here)” (p. 396). In other words, Neidle is explicitly invoking the need to characterize natural classes of cases (her ‘economy’) for both syntactic and for morphological purposes, and she believes that the same classification is efficient at performing both tasks.

Since her features are the same as Jakobson’s, there is no more to be said about their efficacy in defining morphological natural classes. But whereas Jakobson believes that

the natural classes defined by his features embody valid semantic generalizations, Neidle believes that they help to state significant syntactic generalizations. However they do not live up to this promise in any substantial way.

In Neidle's phrase-structure rules, underspecified cases are employed in only two contexts. In one, a natural class is made of the accusative and (first) genitive cases, defined respectively as  $(-, -, +)$  and  $(-, +, +)$  (the feature specifications in parentheses are in the order marginal, quantifying, ascriptive). The context is that of the direct object of the verb, which is in the accusative normally, but in the (first) genitive in certain negative and quantified contexts, which Neidle associates with a feature  $[+Q]$ . Accordingly, Neidle is able to annotate the phrase-structure rule that expands verb phrases in the following way:

$$\begin{array}{l}
 [9] \\
 \text{Assign to} \\
 \text{the annotation}
 \end{array}
 \quad
 \left(
 \begin{array}{l}
 \dots (\uparrow\text{OBJ}) = \downarrow \dots \\
 (\downarrow\text{CASE}) = (-, \alpha, +) \\
 (\uparrow\text{Q}) =_{\text{c}} \alpha
 \end{array}
 \right)$$

This ensures that when the value of  $Q$  is positive, which it will be if the verb phrase contains *ne* 'not' and in certain other circumstances, the direct object will be assigned case  $(-, +, +)$ , i.e. the (first) genitive. If the value of  $Q$  is negative, the direct object will be assigned case  $(-, -, +)$ , i.e. accusative.

The only other syntactic use Neidle makes of a set of cases concerns the case-marking of subjects of tensed and non-tensed clauses. The subject of a tensed clause is normally in the nominative, i.e. case  $(-, -, -)$ . Neidle also adopts arguments for a rule marking the subject of an infinitive with the dative, i.e. case  $(+, -, +)$ . Accordingly she can provide a single annotation for both matrix clauses and infinitival clauses:

$$\begin{array}{l}
 [10] \\
 \text{Assign to} \\
 \text{the annotation}
 \end{array}
 \quad
 \text{S}^{(\cdot)} \longrightarrow \quad \dots \text{VP} \dots$$

$$\begin{array}{l}
 (\downarrow\text{SUBJ CASE}) = (\alpha, -, \alpha) \\
 (\downarrow\text{TENSE}) = -\alpha
 \end{array}$$

Note here that there is a sleight of hand made possible by Greek letter variables: the nominative and dative cases *do not even constitute a natural class*. They have only one common feature, viz.  $[-\text{quantifying}]$ , but this by itself defines a natural class including

the accusative and instrumental as well as the nominative and dative cases.

At any rate, these are the only two *syntactic* uses Neidle makes of the internal structuring of the cases represented by their decomposition into three cross-classifying binary features. One such use picks out a genuine natural class, viz. [–marginal, +ascriptive] comprising the accusative and (first) genitive cases, and the other makes use of formal devices in such a way as to pick out two cases that do not comprise a natural class. This is hardly a ringing endorsement of this particular classification, particularly when coupled with its manifest inadequacy in defining necessary morphological natural classes.

### 3.2.4 Mixed Motivations

At least Jakobson and Neidle have the merit of being clear about the motivation of the system of classification they espouse: it is designed to characterize natural classes in morphology and in one other domain that is thought to be reflected in morphology, be it semantics or syntax. But this is not the norm. Rather often, a number of vaguely stated criteria of classification are offered. When these criteria converge on a single classification, this is presented as a success for the theory. When they do not, the inconvenient facts are dismissed. Consider the following statement (which is exhaustive) of the motivation for features in a relatively recent pedagogical work, Jensen (1990:43):

Grammatical meanings are represented by **morphological features**, such as [+plural], which we have assigned to the plural suffix /-z/ in English. An example of a morpheme with both a sense and a grammatical meaning is English *went*, which combines the sense of ‘go’ with the grammatical feature [+past]. (emphasis in original)

Yet the notion ‘grammatical meaning’ is sufficiently protean to encompass many things, so it is no surprise to find a proposed list of features to cross-classify cases in languages “like German or Latin” justified by an assortment of criteria (p.58):

Most linguists would agree that nominative, accusative, and vocative should form a natural class, and these are often grouped together as nonoblique cases, opposed to the oblique cases genitive, dative, and ablative. The nominative, accusative and vocative often syncretize in Latin, always so in neuter nouns. The accusative, dative, and ablative can be grouped together as cases associated with objects of verbs, and so we can unite them with the feature [+theme]. The genitive, ablative, and vocative can be thought of as the source of something else, as the genitive and ablative both express source or material and the vocative

implies a call to someone intended as the source of something wanted by the speaker.

In this short passage, several criteria for classifying cases together are cited: authority (“most linguists would agree...”), homonymy (“often syncretize in Latin”), syntactic distribution (“cases associated with objects of verbs”), and role-theoretic meaning (“can be thought of as the source of something else”).

There is a danger of circularity here. Jensen justifies his choice of features, and therefore of ‘natural classes’, partly on the basis of homonymies. Yet later in the same work (p.123), he *defines* ‘syncretism’ in terms of natural classes:

SYNCRETISM OCCURS when a single form expresses two or more meanings that form a NATURAL CLASS in terms of morphological features. Thus, syncretism can be thought of as the NEUTRALIZATION of one or more inflectional features. (small capitals in the original)

The implication is that the difference between (systematic) syncretisms and (accidental) homonymies is a matter of whether the feature content of the homonymous forms constitutes a natural class or not. This is made explicit in a discussion of the German ‘pronominal’ declension, which is based on the exposition in Bierwisch (1967), but with one notable exception. Jensen presents the data as follows (at 125):

[11]

	<i>singular</i>			<i>plural</i>
	<i>masculine</i>	<i>neuter</i>	<i>feminine</i>	<i>(all genders)</i>
<i>nominative</i>	dieser	dieses	diese	diese
<i>accusative</i>	diesen	dieses	diese	diese
<i>dative</i>	diesem	diesem	dieser	diesen
<i>genitive</i>	dieses	dieses	dieser	dieser

Note the lack of boxing around the homonymies between the feminine singular forms of three cases and the corresponding plural forms. Jensen explains:

The arrangement is Bierwisch’s, and differs from the usual textbook order of the paradigm. It is designed to allow systematic recognition of the syncretisms; otherwise, the physical arrangement is arbitrary. Additional boxing could have

been done if the only criterion had been identity of form, and in fact Bierwisch unites the feminine nominative and accusative with the plural of these cases, and he joins the genitive plural with the feminine dative and genitive. *However, since these do not count as natural classes by our definition, we have left them unboxed.* (my italics)

And this is despite the fact that the homonymies in question are quite as systematic within the declensional type concerned as are the ones that are boxed and therefore given status as syncretisms (i.e. it is not a question “only” of identity of form, but of *systematic* identity of form). The problem arises because within Jensen’s scheme, ‘syncretism’ is both *definiens* and *definiendum*. And to that extent, so is the notion of ‘natural classes’, and of the features used to define them.

The cited work by Jensen is obviously pedagogical in intent. On the one hand this excuses it from the requirements of rigour that might be expected in a research monograph, but on the other hand it highlights the fact that fuzzy thinking about the motivation for positing one classification of phenomena rather than another is so prevalent that it can be presented to students as standard practice.

### 3.2.5 Morphological Motivation

Compare this with the approach taken in the previous chapter. At various points there arose the question of whether a particular homonymy was to be taken as systematic or not. The criterion employed was that a homonymy is more likely to be systematic the greater the number of separate morphological items (or processes) that need to refer to it. Specifically, co-extension of a homonymy under allomorphy or under different conditions of cumulation was taken as evidence of systematicity. This is a relatively precise criterion, and it can lead to surprising results. In particular, the mere number or frequency of homonymous forms was considered of little account if, after all, the homonymy could be ascribed to the homonymy of a single pair of elements present in those items. For this reason, relatively little weight was given to the frequent homonymy of the nominative and genitive singular in certain Latin nouns, since at worst this could boil down to accidental homonymy of a single pair of suffixes, nominative *-is* and genitive *-is*. On the other hand, great weight was placed on the homonymy between certain first- and third-person verbal forms in German, since this homonymy co-extends to two different suffixes, involving cumulation with different properties of number, and to a suppletive stem. The idea is that if the grammar has to address the same disjunction more than once, it

probably should not be regarded as a disjunction of separate elements, but as a genuine class comprising both those elements.

On the basis of probably-systematic confluences established in this way, partial orderings were posited, so as to bring the systematically conflating categories into adjacency. The aim of the investigation was to see if the various partial orderings established under this procedure were susceptible of being subsumed under a consistent total ordering, as predicted by the geometric hypothesis, and to a very great extent they were. It could then be observed that the orderings arrived at in this way correlated to a fair extent with traditional distinctions between direct and oblique cases, between ungoverned and governed cases, etc. *But no such classification was assumed at the beginning of the procedure.*

There is both a substantive and a procedural question at issue here. The substantive one is whether a single classification of inflectional material suffices to create the natural classes that are relevant in various parts of the language system, i.e. whether the set of inflectional terms is partitioned in the same way with respect to their semantics, their syntactic properties, their morphological distribution, their susceptibility to systematic conflation, and so on.

The second question is procedural: given that, except as an article of faith, we cannot yet know the answer to the substantive question in the general case, is it more fruitful to arrive at a classification on the basis of one clearly defined criterion or on the basis of a hotchpotch of criteria of varying degrees of rigour, drawn from several separate domains of investigation? Clearly, the former procedure is likely to prove more fruitful. For the classification arrived at on the basis of one clear criterion, e.g. susceptibility to systematic conflation, must be reflecting something of the underlying organization of the elements being classified. If it turns out that this classification is also well suited to accounting for some other aspect of the items' distribution or behaviour (e.g. their syntax), so much the better. And if it does not so turn out, then something has been discovered. By contrast, the latter procedure runs a severe risk of ignoring evidence from one field (say, homonymies) when it happens to conflict with evidence from another (say, syntactic distribution). There seems to be little to be gained by this.

By contrast, inquiry into how morphological objects are related in terms of pure morphology has been a rather recent enterprise. And the phenomena most clearly diagnostic of the organization of pure morphology are likely to be inflection classes (i.e. co-variance of

allomorphs), and systematic homonymy patterns (i.e. co-extension of homonymies).

### 3.3 Markedness

#### 3.3.1 Introduction

Markedness is both a ubiquitous and a highly vexed notion in linguistic theory. The latter characterization is obvious when comparing, for instance, the breathless view of Togeby (1965:71) that the discovery of markedness relations was “un événement comparable à la découverte de l’Amérique par Christophe Colomb en 1492” [an event comparable with the discovery of America by Christopher Columbus in 1492] with the deflating view of Lass & Anderson (1975:290) that markedness involves nothing more than a vicious circle. One view implies that the discovery of markedness relations opened up limitless opportunities, the other that the notion is entirely vacuous.

The history which has included such a divergence of views is thoroughly covered in a variety of works such as Andrews (1980) and Andersen (1989), so I will not retread that ground here. For present purposes a few observations about markedness will suffice.

McCreight & Chvany (1991), in advocating geometric representations of grammatical categories, and in particular linear representations of case systems such as that of Russian, did not explicitly invoke markedness considerations, confining themselves to the observation that there may be some special properties associated with the extreme positions of a linearization. In that spirit, I was careful always to point out in Chapter 2 that all the proposed linear representations were reversible: a representation such as N—A—G—D was considered completely equivalent to its mirror image D—G—A—N. Yet the reader cannot have failed to notice that in the overwhelming majority of cases the particular orderings dictated by the pattern of confluences included at one end the term of the system that we may, intuitively, regard as the ‘unmarked’ term in one sense. For instance almost all the case systems examined required the nominative case to be at one end, and the exceptions differed only in having the nominative second (or second-last) next to the vocative<sup>3</sup>.

At the other end of the ordering we invariably found that it was either necessary or possible to place a case that serves oblique or principally adnominal functions (e.g.

instrumental or genitive), a case that again, we may regard, intuitively, as relatively ‘marked’. McCreight & Chvany’s suggestion of special — and distinct — roles for the terms at either end of the ordering introduces the idea that the orderings are not strictly symmetrical, i.e. that one end of the ordering is functionally different from the other. This is tentative, but we could extend it further (as they declined to do) to argue that the asymmetry applies throughout the ordering, and in fact that the ordering is nothing but a ranking with respect to some property. That property may, then, be markedness in one of its many senses. Looked at in this way, their theory would state that connotations implicate terms which comprise a contiguous segment of a consistent markedness ‘hierarchy’ (i.e. ordering) rather than a contiguous region in some kind of geometric ‘space’.

I will not pursue that possibility — which they do *not* argue for — directly, because my purpose in this chapter is to argue for an alternative approach to modelling the phenomena, based on classification rather than a simple ordering relation. However it will be seen that the data themselves drive us to positing a classificatory relationship between terms which is (in many but not all instances) fundamentally asymmetric, and therefore perhaps interpretable as an aspect of markedness. It is therefore necessary to say something in advance about what particular notion of markedness is being invoked.

### 3.3.2 Praguian Markedness

The notion of markedness originated in correspondence by Jakobson in 1921, and first appeared in public in work by Trubetzkoy in 1931, applied strictly to phonology (Andrews 1980). Jakobson first introduced the notion into morphology in his study of the Russian verb (1931). There are a number of subtle and obvious differences between the two scholars’ approaches, one of which is important in the present context.

For Trubetzkoy (1958:75), oppositions were of three types, gradual, privative and equipollent. Gradual oppositions are those where the opposed terms are characterized by degrees of a single property (e.g. vowel height), whereas privative oppositions are those where one term is characterized by the presence, and the other by the absence, of a ‘mark’, such as voice or nasality (hence the terminology). Equipollent oppositions are those where neither of these conditions apply, i.e. the opposed members are distinguished neither by varying degrees of one property nor by the presence or absence of a property.

In his morphological studies, Jakobson modified this system in two important ways. First, he saw all oppositions as privative, and therefore binary. Second, he changed the meaning of the privative opposition from presence or absence of a property to presence or absence of *signalization* of that property. That is, for Jakobson, [+A] signals the presence of A, whereas [-A] does not signal the presence of A. This is what he means when he says that [+A] is marked for A whereas [-A] is unmarked for A. In particular, [-A] does *not* mean “signalization of non-A” but rather “non-signalization of A” (1932:12). It follows that the choice of features is not arbitrary: it is an empirical question whether, say, plural number is characterized as [+plural] or as [-singular]. For the former implies a definite signalization of plurality (and therefore cannot, except by way of metaphor or word play, encompass the singular as well), whereas the latter implies merely a non-signalization of singularity (and therefore might encompass singulars as well), and not a signalization of non-singularity. It further follows that in any context where the distinction expressed by a feature is neutralized, it must be neutralized in favour of the unmarked term, because only it fails to signal anything about the presence or the absence of the relevant property.

Jakobson recognizes, however, that in particular pragmatic contexts the choice of the unmarked form, in overt contrast with the marked form, does in practical terms signal the absence of the relevant property. But this is a restricted use (1931:1-2):

When Category II [the unmarked value] in a particular context does in fact announce the absence of A [the relevant property], this merely reflects one of the applications of the given category: here the meaning is conditioned by the situation, and even if it is the most current function of this category, linguists should not equate the statistically preponderant meaning of the category with its general meaning. Such an identification leads to misuse of the concept of **transposition**. The transposition of a category takes place only where the transference of the meaning is perceived (here I consider transposition solely from the standpoint of synchronic linguistics). The Russian word *oslica* ‘she-ass’ indicates the female sex of the animal, whereas the general meaning of the word *osěl* ‘donkey’ contains no indication of the sex of the animal in question. If I say *osěl*, I make no decision as to whether I have to do with a male or a female, but if I am asked *èto oslica?* ‘is it a she-ass?’ and I answer *nét, osěl* ‘no, a donkey’, then in this case the masculine gender is indicated — the word is used in a restricted sense. But should one not rather interpret the genderless meaning of the word *osěl* as an extension? No, for in this case there is no perception of a figurative meaning, in the same way that the phrases *továřišč Nína* ‘comrade Nína’ or *èta dévuška — egó stáryj drúg* ‘this girl is his old friend’ are not metaphors. [emphasis in original]

A number of points about Jakobson's conception of markedness here need emphasizing. First, markedness is a property of the linguistic code, not the message. It is therefore not necessarily correlated with textual frequency, though it is, naturally enough, correlated with order of acquisition in normal development (i.e. the unmarked term is acquired before the marked), and conversely with the loss of distinctions in aphasia (1971).

Second, the property or 'mark' which either is or is not signaled by the opposing terms is something outside the linguistic system per se. In phonology, Jakobson assumed that the relevant properties were perceptual, though most later work has assumed a physiological basis to phonological distinctive features (e.g. Halle 1995). In morphology, by contrast, the relevant properties were assumed to be conceptual. In other words, phonological features refer to aspects of the signifier (or *signans*), while morphological features refer to aspects of the signified (or *signatum*). This difference in reference implies that the parallelism between phonological and morphological features is not complete (Jakobson & Waugh 1979:91f.):

There is an intrinsic communality between markedness on the level of grammatical categories and markedness on the level of [phonological] distinctive features. This communality is, however, combined with the considerable difference between these two types of opposition, one based on the semantic level of *signatum*, the other on the sound level of the *signans*. The constraining, focusing character of the marked term of any grammatical opposition is directed toward a more narrowly specified and delimited conceptual item. In the dyads of [phonological] distinctive features the marked term is opposed to the unmarked one by its closer concentration on a certain either positive or negative perceptual sound property polar to that of the unmarked term.

The fact that the marked term of a morphological opposition perforce signals the presence of some semantic property implies that for any pair of terms distinguished in this way there is a fundamental or 'general' meaning (*Gesamtbedeutung*) for which one is specified.

Third, the assignment of markedness is context-free. This has both paradigmatic and syntagmatic implications which not all have found welcome. For instance, if the voiced/voiceless contrast is modelled by a feature [ $\pm$ voice], implying (in Jakobson's terms) that the marked member is [+voice], then this is so regardless of any other co-occurring features. Thus voice is still marked even in the case of sonorants, although voiceless sonorants are cross-linguistically far rarer than voiced ones. And again, syntagmatic context is irrelevant, so that [+voice] is still the marked term even when the

term concerned occurs between (voiced) vowels, a context in which the historical change from voiceless to voiced is extremely common, while the reverse is vanishingly rare. (It was considerations such as these that prompted Chomsky & Halle (1968, Chapter 9) to try to develop, not very successfully as it turned out, a context-sensitive scheme of markedness assignment.)

All this is nevertheless consistent with Jakobson's view that markedness consists in no more and no less than the signalization of some extra-linguistic property: this either occurs or it does not occur, regardless of context. It is obvious, though, that in the case of morphological features, where the property concerned is 'semantic' in the broadest sense, this strategy runs the risk of being no more than an unverifiable supposition. This is perhaps a minor problem where the property is, or at least appears to be, relatively objective, as with plurality or femininity. It becomes a major concern where the property is highly abstract, such as ascriptiveness or quantification.

### **3.3.3 Greenbergian Markedness**

A radically different approach to markedness is perhaps epitomized by Greenberg (1966). Within this tradition, markedness is seen as a quasi-statistical indicator of 'normality', 'naturalness' or 'simplicity'. Unmarked segments, distinctive features, and grammatical and semantic categories are those which are common in the world's languages, which have high textual frequency in particular languages, and which tend to be gained or retained in language change. Marked items and categories, by contrast, are uncommon cross-linguistically, have low textual frequencies in particular languages, and tend to get removed or replaced in the course of historical change. It is of course an empirical question whether these various criteria, and others such as order of acquisition and order of loss, in fact converge on a single characterization of a particular item or category as marked or unmarked.

Greenberg's plan was to set out to discover inductively if these criteria converge, and to a large extent he found that they do. Having discovered this, he also wished to see if the various criteria could in fact be reduced to one, but found that the only plausible candidate was textual frequency. The problem, as he realized, was that this was more likely to be a symptom than a cause of any property of the linguistic system, thus closing the 'vicious circle' of which Lass & Anderson complained (3.3.1).

It cannot be said that there has been a great deal of progress since Greenberg in defining what markedness actually consists of, though Greenberg and subsequent work have enriched our armory of diagnostic tools in deciding which of a pair of oppositions is the marked member. There is an analogy here with other basic notions in grammar, most notably that of ‘word’. Everyone (probably) agrees that languages have things called words, and that wordhood is a very important property in syntax, morphology and phonology, but no one has managed to pin down a single defining criterion for wordhood (see, for example, DiSciullo & Williams 1987). Rather, a cluster of properties seems to characterize words, no one of which, it appears, is in itself necessary or sufficient. So with markedness. Some of the characteristics of marked and unmarked items and categories, as catalogued in Greenberg, are the following, based on the useful summary in Andersen (1989:27-35):

(1) *Textual frequency*. Unmarked items/categories tend to have a greater textual frequency than their marked counterparts. Greenberg shows that this applies to phonemes (14-21), and to grammatical categories such as number, gender, case, person, voice, mood and others (31-53).

(2) *Neutralization*. Where an opposition is neutralized, it tends to be neutralized in favour of the unmarked member. This is shown for phonological oppositions (13ff.), for a limited number of grammatical oppositions (28ff.) and for lexical oppositions (52ff.). An example of the latter is the English *dog* (= any dog or specifically male dog) versus *bitch* (= female dog).

(3) *Allophony/Allomorphy*. Unmarked items/categories tend to show greater allophony/allomorphy than marked categories (21, 29). So, in Latin and Ancient Greek, for instance, it is usually the nominative singular of nouns that employs an allomorph of the stem different from that used in the rest of the paradigm. Similarly, in French, it is the present indicative of irregular verbs that shows several different stem-allomorphs, while other tenses and moods generally maintain the same stem-form throughout.

(4) *Unpaired phonemes and syncretism*. In phonology, the number of phonemes with a certain marked feature is always less than or equal to the number of phonemes without it. So a language will always contain as many or more non-nasal vowels as it contains nasal vowels (21). In morphology, marked categories are more susceptible to syncretism.

(5) *Default contexts*. Where it is possible to distinguish a basic form or category, which is not limited as to context, from non-basic forms or categories which occur only in specific contexts, the basic form will tend to be the unmarked form. Greenberg's example from morpho-syntax concerns grammatical agreement for gender: conjoined items of differing gender will be accompanied by adjectives agreeing with the unmarked gender (59ff.).

(6) *Zero exponence*. It is unmarked categories which tend to get realized by 'zero morphemes'.

All these, with the exception of the generalization concerning unpaired phonemes in (4), are only statistical tendencies, of varying strengths. There are counter-examples to most, if not all, of them, some of which are discussed later in this chapter. For present purposes, however, their main value is in confirming (or not) an asymmetrical relationship between categories, a relationship which can be interpreted as being one of markedness, but which is arrived at inductively on the basis of confluations alone.

As an example of this procedure, consider the Polish case system, over which the linearization NAGLDI was argued for in 2.2.10 on the basis of confluations alone. This linearization could, as I suggested above, be interpreted as a ranking in terms of markedness. If so, we would expect that the ranking would correlate with textual frequency. And indeed, a study of spoken texts consisting of about 2000 case-forms (reported in Laskowski 1989), confirms this:

[12] **Overall case frequencies in Polish texts**

N	A	G	L	D	I
34.2	29.8	19.2	7.6	4.8	4.4

And a parallel study for Russian (Zemskaja 1979:74) *almost* confirms the same ordering for that language (but D and I are out of order):

[13] **Overall case frequencies in Russian texts**

N	A	G	L	D	I
32.6	25.3	22.0	11.0	4.1	5.0

### 3.3.4 Markedness and Sub-Classification

The notion of markedness that will be invoked here has characteristics of both the Praguian and Greenbergian approaches. It is Praguian in two respects. First, I assume always that the unmarked value of a feature is the negative value. Despite the arguments of Chomsky & Halle (1968) for context-sensitive markedness assignment in phonology, I know of no reason not to assume this simpler hypothesis in morphology. Second, I argue that it is unmarked (i.e. negative) values of features exclusively that are implicated in a scheme of feature transmission which I call ‘re-marking’.

When these assumptions are combined, the result is that to a very large extent the observed homonymy patterns settle the issue of relative markedness. Only occasionally does a genuine choice remain, and in these cases I appeal to an intuitive version of Greenbergian markedness. I trust that this does not in practice prove controversial. For instance, I assume that when faced with a choice of two classifications, one of which characterizes the nominative as the least marked case, and the other of which characterizes it as the most marked case, it is safe to opt for the former.

It will be seen that when sub-classifications are constructed according to these criteria, the result looks very much like a hierarchization of (Greenbergian) markedness. I make no further claims for it than that.

As a matter of typographical convention, trees representing a hierarchization of features are always displayed with negative values left-branching and positive values right-branching.

## 3.4 Structure

### 3.4.1 Introduction

In classifying phenomena by means of distinctive features, it is generally assumed that each feature is an independent ‘mini-classification’ of all the items under analysis, and

that every item is exhaustively cross-classified with respect to these features. The model for this procedure is phonology, or more specifically, earlier generative phonology, where all segments were cross-classified with respect to all features, such as [ $\pm$ voice] or [ $\pm$ distributed]. However, since at least Clements (1985) there has been a growing consensus that the features of phonology should themselves be given a hierarchical organization, so that some features have contrastive value only in the presence of others higher in the tree: in effect, the former cross-classification by means of independent features has taken on some of the attributes of a sub-classification. As Halle (1995:1) points out, “[a] major argument in support of this proposal was the observation that only a small fraction of the logically possible pairs, triplets, . . . ,  $n$ -tuples of features have been shown to figure in actual phonological rules.”

Work in morpho-syntax, by contrast, has continued to assume (or perhaps just take for granted) a non-hierarchical scheme of classification. Such a cross-classification can be taken to different lengths. In particular, the analyst may assume cross-classification only between inflectional ‘dimensions’, or both between and within inflectional dimensions. The former approach is exemplified by GPSG (e.g. Gazdar *et al.* 1985:17ff). There are a number of ‘features’ (often also called ‘attributes’ within this tradition), corresponding by and large to inflectional dimensions like case, number and person (though they include also such notions as syntactic category and ‘bar level’ in terms of X-bar theory). The features, or attributes, may take a range of ‘feature-values’ (or just ‘values’). There is no requirement that the cardinality of the values appropriate to a given attribute be 2, i.e. features are not necessarily binary. Therefore the values can, and in practice often do, correspond to the traditional notion of a term of an inflectional dimension<sup>4</sup>. For instance, there might be a feature called CASE with feature-values drawn from the set {nominative, accusative, genitive ... } just as in traditional descriptions. Clearly a scheme like this cannot, and is not intended to, model natural classes *within* a single inflectional dimension<sup>5</sup>.

The usual solution to this problem is to extend cross-classification so as to operate within as well as between inflectional dimensions. The most complete extension of cross-classification possible envisages that *all* features are binary-valued. This is the procedure pioneered by Jakobson, and his application of it to Russian case is discussed more extensively in the preceding section. (It has the interesting consequence that the traditional notion of an inflectional dimension disappears, except as an epiphenomenon. This aspect of it is dealt with in the following chapter.)

Before we adopt, for any given set of data, an analysis by way of exhaustive cross-classification by means of binary features, we should ask the following questions:

- (1) is the classification ‘enough’ — does it produce all the natural classes we need to partition the phenomena adequately in light of the data (e.g. does it provide natural classes to express all the undoubtedly systematic homonymies)?
- (2) is the classification ‘too much’ — how great is its unused potential, i.e. natural classes to which the grammar makes no reference?
- (3) can it be ‘just right’ for the phenomena under investigation and yet at the same time be composed of elements drawn from a universal inventory?

With regard to (1), it is obvious that the uninhibited use of cross-classification can provide a trivially affirmative answer. This is because for any set of items that comprise a natural class with respect to some rule or principle R, it is possible to posit an arbitrary feature [+R] which singles out all members of the set, all other items being marked [-R]. Any limitation on the use of such a procedure must come, not from the nature of cross-classification itself, but from some extrinsically imposed restriction, such as the requirement that the features so posited be drawn from a finite universal set. And at the moment it remains more assumption than a demonstrated fact that there is any such set — on the contrary, features are usually brought into existence by fiat of the analyst as the occasion requires.

With regard to (2), it is equally obvious that, except in the accidental case that the cardinality of the items to be cross-classified happens to be a power of 2, any set of cross-classifying binary features is going to define non-existent items. This is because the number  $n$  of binary features necessary to uniquely characterize each of  $m$  items is the smallest integer such that  $2^n \geq m$ . Therefore 2 features are necessary to cross-classify 3 or 4 items, 3 features are necessary to cross-classify 5, 6, 7 or 8 items, 4 features are necessary to cross-classify 9, 10, 11, 12, 13, 14, 15 or 16 items, and so forth. In each case the difference  $m - 2^n$  (zero only in case  $m = 2^n$ ) is unused potential of the cross-classification.

But even when the cardinality of the items is a power of two, so that the cross-classificatory potential is not wasted in the definition of the items themselves, there remains the question whether the cross-classificatory potential for defining natural classes is actually used. Natural classes are defined, of course, by a feature specification containing some number less than the full complement of features available. The number of such definable natural classes actually grows exponentially as the number of features increases. Whether all of these putative natural classes are addressed by any rule or principle of the language is an empirical question, but even with a rather small number of features their number is sufficient to give cause for concern.

Consider that a system of two binary features, say  $[\pm a]$  and  $[\pm b]$ , which is capable of defining four fully specified items  $[-a-b]$ ,  $[-a+b]$ ,  $[+a-b]$  and  $[+a+b]$ , also defines the four natural classes  $[-a]$ ,  $[+a]$ ,  $[-b]$  and  $[+b]$ . If the number of features is increased to three, the minimum necessary to characterize a set of between five and eight terms, the number of definable natural classes jumps to 18: six definable by a single feature specification, and another 12 definable by a pair of feature specifications. With four binary features, there are in addition to the 16 definable fully specified items no less than 64 definable natural classes. In general,  $n$  binary features define  $3^n - 2^n - 1$  natural classes of cardinality greater than one.

Moreover, this proliferation in the sheer number of definable natural classes is not the only problem: in addition, if the evidence of linearity effects in the last chapter is at all cogent, many of these natural classes are of entirely the wrong character. If cross-classification were actually operating, we would expect that the natural classes operating in real linguistic systems would be not only far greater in number than they appear to be, but also that they would not, in the general case, be linearizable.

As an example, consider a system of four terms A, B, C and D, which are represented by two cross-classifying features  $[\pm x]$  and  $[\pm y]$ :

[14]

(a) *Terms*

$$A = [-x -y]$$

$$B = [-x +y]$$

$$C = [+x -y]$$

$$D = [+x +y]$$

(b) *Natural Classes*

$$[-x] \equiv \{A B\}$$

$$[+x] \equiv \{C D\}$$

$$[-y] \equiv \{A C\}$$

$$[+y] \equiv \{B D\}$$

Shown against a linearization A—B—C—D, the natural classes look as follows:

[15]

	-x	+x	-y	+y
A				
B				
C				
D				

With a greater number of terms, the non-linear character of the defined natural classes is even clearer. For a system defined by three features they are as follows:

[16]

(a) *Terms*

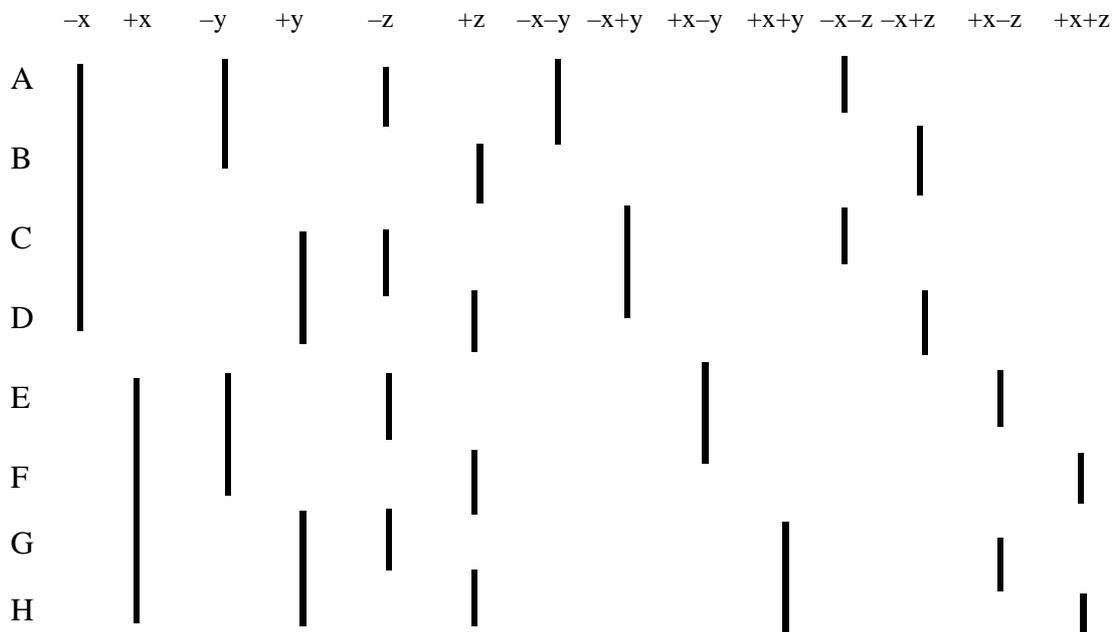
$$\begin{aligned} A &= [-x -y -z] \\ B &= [-x -y +z] \\ C &= [-x +y -z] \\ D &= [-x +y +z] \\ E &= [+x -y -z] \\ F &= [+x -y +z] \\ G &= [+x +y -z] \\ H &= [+x +y +z] \end{aligned}$$

(b) *Natural Classes*

$$\begin{aligned} [-x] &\equiv \{A B C D\} \\ [+x] &\equiv \{E F G H\} \\ [-y] &\equiv \{A B E F\} \\ [+y] &\equiv \{C D G H\} \\ [-z] &\equiv \{A C E G\} \\ [+z] &\equiv \{B D F H\} \\ [-x -y] &\equiv \{A B\} \\ [-x +y] &\equiv \{C D\} \\ [+x -y] &= \{E F\} \\ [+x +y] &= \{G H\} \\ [-x -z] &= \{A C\} \\ [-x +z] &= \{B D\} \\ [+x -z] &= \{E G\} \\ [+x +z] &= \{F H\} \end{aligned}$$

Graphically:

[17]



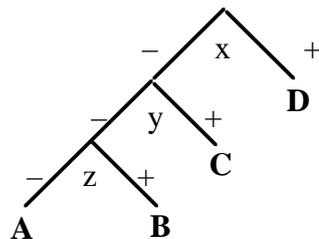
(A system of greater than four but fewer than eight terms would be identical to this, except that some terms would be ‘missing’.)

It is clear, then, that the linear patterns extensively demonstrated in the preceding chapter — specifically, the extent to which the patterns of conflation are *confined* to those which can be represented linearly — suggest that cross-classification is not an appropriate representation for these systems. At first sight, the patterns rather suggest sub-classification. This is because the natural classes definable over a sub-classification are invariably linearizable.

For example, given four elements A, B, C and D, defined by three strictly sub-classifying features  $[\pm x]$ ,  $[\pm y]$  and  $[\pm z]$ , all possible hierarchical arrangements of those elements produce natural classes which are various sub-segments of the linear ordering A—B—C—D:

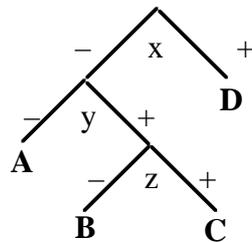
[18]

(1)



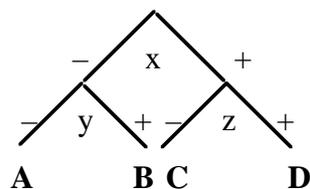
$[-x] \equiv \{A\ B\ C\}$   
 $[-y] \equiv \{A\ B\}$

(2)



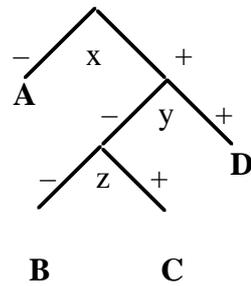
$[-x] \equiv \{A\ B\ C\}$   
 $[+y] \equiv \{B\ C\}$

(3)



$[-x] \equiv \{A\ B\}$   
 $[+x] \equiv \{C\ D\}$

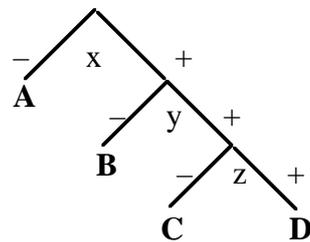
(4)



$$[+x] \equiv \{B C D\}$$

$$[-y] \equiv \{B C\}$$

(5)



$$[+x] \equiv \{B C D\}$$

$$[+y] \equiv \{C D\}$$

This shows that any set of terms, the natural classes amongst which can be represented as a sub-classification, can also be represented linearly. This is a significant result in itself, in view of the fact that confluents within inflectional systems are so often representable in linear terms. Were cross-classification the norm, one would expect rather that patterns of confluents could *not* in general be representable linearly.

Nevertheless, the linear model is more powerful — has greater generative capacity — than a sub-classification in the sense that it can represent any pattern that can be represented by a sub-classification, and more besides. This is because the linear representation allows for overlaps between natural classes, for instance a situation where term  $y$  conflates sometimes with term  $x$  and sometimes with term  $z$  (representable, obviously, as the linear arrangement  $x-y-z$ ). By contrast, the natural classes produced by sub-classification are either completely non-intersecting or else in a superset-subset relation, i.e. an item cannot belong to two natural classes unless one is a subset of the other. This very difference in generative capacity means that we should prefer the more constrained sub-classifying model, provided it proves observationally adequate. But unfortunately it does not, as much of the data of Chapter 2 shows. In fact, overlaps between natural classes are rather common, and therefore need to be accounted for.

We have come to the conclusions that (1) cross-classification is, in the general case, too powerful a descriptive device, because it defines natural classes which both in number and in type are not actually addressed in real linguistic systems; but (2) sub-classification is, in the general case, too weak a descriptive device, because it cannot define sets of natural classes which are overlapping without being in a superset-subset relation, such sets being amply attested in real linguistic systems.

The conclusion is obvious. Some additional machinery is required, either to weaken the generative capacity of cross-classifications or to strengthen the generative capacity of sub-classifications.

With a cross-classification, the weakening can be done by ‘feature co-occurrence restrictions’ (FCRs), which simply stipulate the unused potential of the classification. This is a standard device in GPSG (Gazdar *et al.* 1985), where FCRs are written as material conditionals or bi-conditionals. In fact there are two distinct types of FCRs from the point of view of our present concerns. One type is illustrated at p.29:

[19] FCR 5: [PAST]  $\supset$  [FIN, –SUBJ]

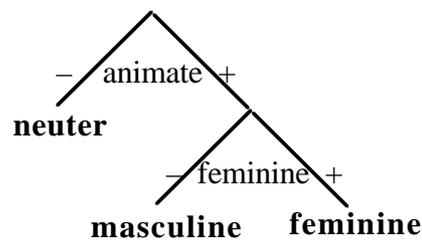
This states that a category can contain a specification for the feature PAST only if that category is additionally finite and not subjunctive. The crucial point is that the left-hand side of the condition mentions a feature, not a specific value for that feature. As a result, the effect of the FCR is to ensure that verbs *in general* are not cross-classified with respect to their pastness: only finite indicative verbs are. That is, finite indicative verbs are sub-classified with respect to pastness.

FCRs of this form, with a feature rather than a feature specification in their left-hand side, can be used to give an apparent cross-classification the characteristics of a sub-classification. For example, consider defining a system of three genders by means of cross-classifying features. Clearly at least two features will be required, but left to their own devices, these two features would actually define four genders. An FCR can come to the rescue to turn this apparent cross-classification into a sub-classification:

[20]

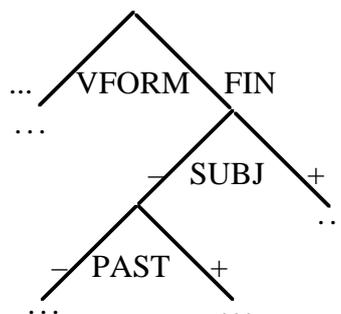
<b>Features:</b>	[±animate]	
	[±feminine]	
<b>FCR:</b>	[feminine] $\supset$ [+animate]	
<b>Defined Items:</b>	[-animate]	‘neuter’
	[+animate, -feminine]	‘masculine’
	[+animate, +feminine]	‘feminine’

The same displayed as a tree:



FCRs are able to introduce some of the characteristics of a sub-classification into a cross-classification, but they do not necessarily thereby turn it — or even any part of it — into a sub-classification. The reason is that the right-hand side of an FCR can contain complex feature specifications which are themselves cross-classifying. In the example [19], it is quite likely that the subjunctive mood is restricted to finite verbs by another FCR, so that the result is a true sub-classification along the following lines:

[21]



But on the same page, an FCR is given which restricts the VFORM feature (of which FIN is a value) to verbs. Verbs themselves are defined in cross-classifying terms as [+V, -N], and therefore could not be represented as a node of a purely sub-classifying tree. Thus while the use of FCRs of this form provides some of the characteristics of a sub-classification, it is not nearly so stringent as strict sub-classification (binary or otherwise) itself.

Moreover, FCRs as used in GPSG are even more powerful than this. The reason is that they are able to specify, in their left-hand side, not only a particular feature but a particular *value* of a feature. This is able to effect restrictions on the co-occurrence of features which cannot in any case be paralleled in a sub-classification. To see the utility of FCRs of this form, consider again the definition of a three-gender system in [20]. Note that what the FCR excludes is any value for [feminine] in the presence of [-animate]. This is what makes it a strict sub-classification. But now let us suppose (as is the case in Latin, Russian and other languages, as seen in the preceding chapter), that for some purposes the masculine and neuter genders also constitute a natural class, while the feminine and neuter genders do not. This state of affairs can be modelled by changing the FCR to read as follows:

[22]

FCR: [+feminine]  $\supset$  [+animate]

There is no longer a directly equivalent tree. The possibilities can be graphically represented, however, in a box diagram somewhat as follows:

[23]

-feminine		+feminine
-animate	+animate	
'n'	'm'	'f'

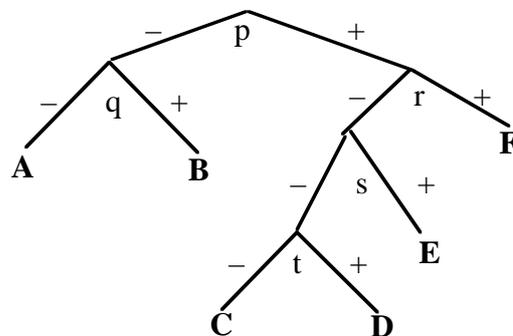
FCRs, then, are a powerful device which allows the cross-classificatory potential of a set of features to be restricted in virtually any manner desired. For this reason alone, it is worth inquiring whether some less powerful device may not be adequate to the task of effecting just those restrictions on cross-classification which real linguistic data require. Then again, one might feel that given the fundamentally non-linear character of the

natural classes defined by a cross-classification, the whole notion of cross-classification itself is on the wrong track. Sub-classification, by contrast, has the appealing property that linearizability does not need to be imposed by way of ad hoc restrictions, since it is a property of the representation itself. From this point I will therefore concentrate on sub-classification.

### 3.4.2 Sub-Classification and Re-Marking

From the point of view of a sub-classification, what is required is some device to increase its generative capacity by relaxing its strictly sub-classificatory characteristics, thus allowing a larger set of natural classes to be defined. In considering how this might be achieved, it is worth noting that a sub-classification contains a great deal of redundant information: for each node  $[\alpha F]$ , all nodes dominated by  $[-\alpha F]$  represent distinctions which are unavailable to  $[\alpha F]$ ; and this applies not only to  $[\alpha F]$  itself, but to every node that is traversed in moving from the root of the tree to  $[\alpha F]$ . For example, consider the terminal node labelled E in the following abstract sub-classification:

[24]

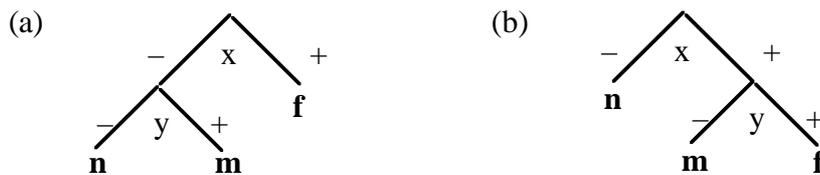


The distinctions encoded as  $[\pm q]$  and  $[\pm t]$  are redundant with respect to E, and therefore, in an obvious sense, 'wasted' on it. So would be the distinctions encoded by any further branches on the tree unless these were dominated by E itself. A hypothesis worth exploring, then, is that actual linguistic systems do in fact allow access to some of the redundant information in the tree so as to enrich the featural description of some nodes. This will make a natural class of each node 'transmitting' and each node 'receiving' a particular quantum of redundant information. I will call the class of such procedures 're-marking'.

By definition, every form of re-marking increases the number of natural classes definable over a given sub-classification. The choice of a particular re-marking algorithm is therefore an empirical question: that scheme of re-marking is best which increases the number of natural classes to as near as possible the exact number that is actually required to state the linguistically significant generalizations.

We can begin with our familiar three-gender example. The problem was that we need to make a natural class comprising the masculine and feminine genders, and another natural class comprising the masculine and neuter genders, but without creating a natural class of the feminine and neuter genders. The only possible sub-classifications of the three terms that directly capture either natural class are the following, using, for the moment, arbitrary tokens for the actual features:

[25]



The problem with [25a] is that whereas it characterizes the natural class of neuter and masculine as  $[-x]$ , it cannot characterize a natural class consisting of the masculine and feminine genders. Example [25b] fails in the converse way. The former would be ‘fixed’ if we could transmit the feature specification  $[+y]$ , which is redundant with respect to  $[+x]$ , to the node  $[+x]$ : we would thus ‘re-mark’  $[+x]$  as  $[+x +y]$ , and the masculine-feminine natural class could be characterized as  $[+y]$ . The latter would be ‘fixed’ if we could transmit the feature specification  $[-y]$ , which is redundant with respect to  $[-x]$ , to the node  $[-x]$ : we would thus ‘re-mark’  $[-x]$  as  $[-x -y]$ , and the masculine-neuter natural class could be characterized as  $[-y]$ .

Obviously there are many possible schemes of re-marking: a priori, one could entertain any scheme that does not produce contradiction, i.e. a single node re-marked so as to be both  $[-F]$  and  $[+F]$  for some feature  $F$ . This merely involves the restriction that re-marking only passes information upwards in the tree, and that the two specifications for any feature are not both transmitted to the same node. One could add additional restrictions, e.g. on the sign of either the receiving or transmitting node, on the distance between

transmitting and receiving nodes, on the absolute distance of either from the root node, etc. Each particular scheme considered would generate a different set of natural classes.

However there is one scheme that is particularly interesting for present purposes, and it is a generalization of the procedure used in both [25a] and [25b]. What is interesting about it is that it generates *exactly the same set of natural classes* as does a linear ordering. It is therefore, in an obvious sense, weakly equivalent to a linear ordering. I call this particular re-marking algorithm ‘counter-marking’, for reasons that will become clear shortly. A formal statement of it is as follows:

[26]

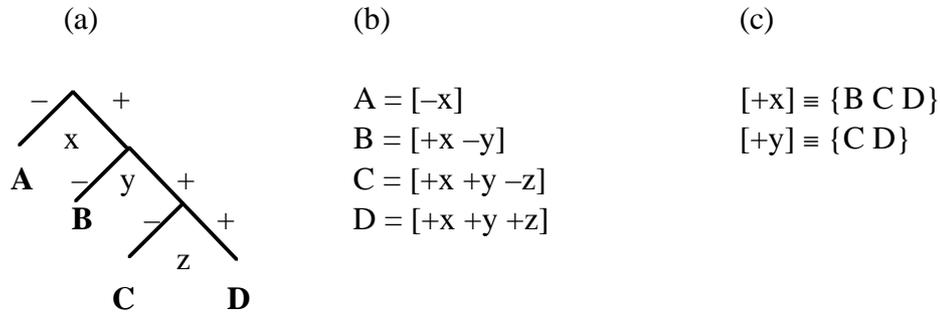
**Counter-Marking:**

To each node  $[\alpha F]$  in a sub-classification of terms, add every specification  $[\alpha G_i]$  such that  $[\alpha G_i]$  is dominated by  $[-\alpha F]$ , where  $\alpha = +$  or  $-$ .

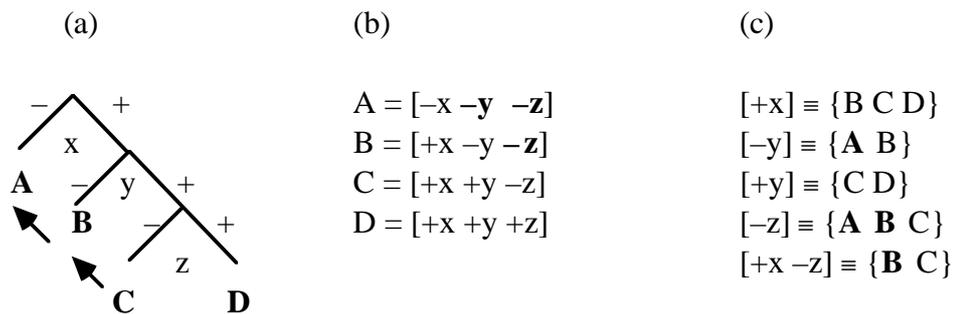
Stated informally, counter-marking gives every node access to some of the redundant information that would otherwise be inaccessible to it because dominated by its oppositely marked sister. Furthermore, it is information of the same sign only that gets transmitted. So a negatively specified node gets all the negative specifications dominated by its positively marked sister, and a positively marked node gets all the positive specifications dominated by its negatively marked sister. Hence the term ‘counter-marking’.

A set of examples will demonstrate how counter-marking works. I will present a series of trees representing sub-classifications of various configurations. For each such tree I will list the feature specifications of each node, as well as the natural classes of more than one node. Immediately underneath each example tree is its counter-marked counterpart (with transmission of feature specifications indicated by arrows) with its list of feature specifications and natural classes. Specifications and classes added to the representation by dint of counter-marking are highlighted in boldface.

First, a right-branching tree [27a], which specifies an inflectional dimension consisting of four terms A, B, C, and D. These are distinguished by means of three features  $[\pm x]$ ,  $[\pm y]$  and  $[\pm z]$ . Their specifications are given in [27b], and the natural classes made available are given in [27c].

[27] **Right-branching without counter-marking**

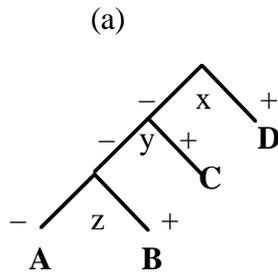
Counter-marking propagates the features of all the negative nodes dominated by positive nodes to their negatively marked (aunt's)\* aunts:

[28] **Right-branching with counter-marking**

Note that the additional natural classes  $\{A B C\}$ ,  $\{A B\}$  and  $\{B C\}$  fill out the complement available to exactly that which would be available in a linear ordering  $A-B-C-D$ .

With a left-branching tree, positive features propagate to their positively marked (aunt's)\* aunts:

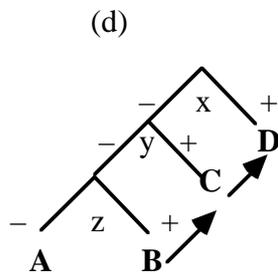
[29] **Left-branching without counter-marking**



- (b)
- A = [-x -y -z]
  - B = [-x -y +z]
  - C = [-x +y]
  - D = [+x]

- (c)
- [-x] ≡ {A B C}
  - [-y] ≡ {A B}

**Left-branching with counter-marking**



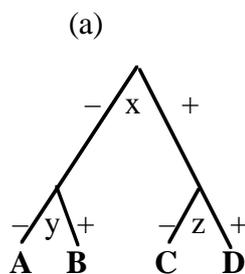
- (e)
- A = [-x -y -z]
  - B = [-x -y +z]
  - C = [-x +y +z]
  - D = [+x +y +z]

- (f)
- [-x] ≡ {A B C}
  - [-y] ≡ {A B}
  - [+y] ≡ {C D}
  - [+z] ≡ {B C D}
  - [+z -x] ≡ {B C}

Again the result is to add to the set of natural classes otherwise available precisely those necessary to make the set identical to the set of contiguous sub-segments of the ordering A—B—C—D.

In a balanced tree, both negative and positive features are transmitted, though in opposite directions:

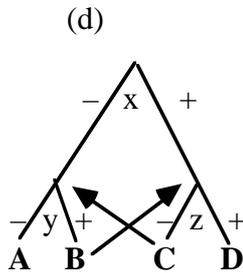
[30] **Balanced tree without counter-marking**



- (b)
- A = [-x -y]
  - B = [-x +y]
  - C = [+x -z]
  - D = [+x +z]

- (c)
- [-x] ≡ {A B}
  - [+x] ≡ {C D}

**Balanced tree with counter-marking**



(e)

$$A = [-x -y -z]$$

$$B = [-x +y -z]$$

$$C = [+x +y -z]$$

$$D = [+x +y +z]$$

(f)

$$[-x] \equiv \{A B\}$$

$$[+x] \equiv \{C D\}$$

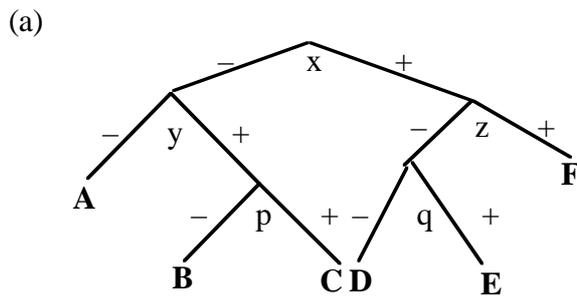
$$[+y] \equiv \{B C D\}$$

$$[-z] \equiv \{A B C\}$$

$$[-z +y] \equiv \{B C\}$$

With a greater number of terms, and therefore greater depth on the assumption of binary branching, counter-marking has even more impressive effects in increasing the stock of natural classes that can be referred to, as always to match exactly those that are available in a linearization of those same terms:

[31] **Tree of Depth 3 without counter-marking**



(b)

$$A = [-x -y]$$

$$B = [-x +y -p]$$

$$C = [-x +y +p]$$

$$D = [+x -z -q]$$

$$E = [+x -z +q]$$

$$F = [+x +z]$$

(c)

$$[-x] \equiv \{A B C\}$$

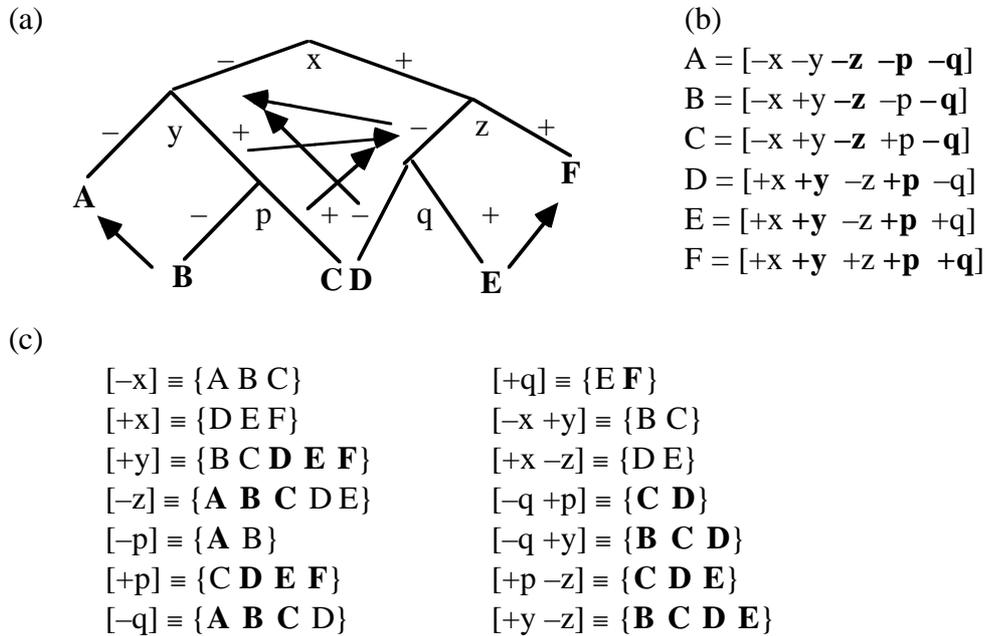
$$[+x] \equiv \{D E F\}$$

$$[+y] \equiv \{B C\}$$

$$[-z] \equiv \{D E\}$$

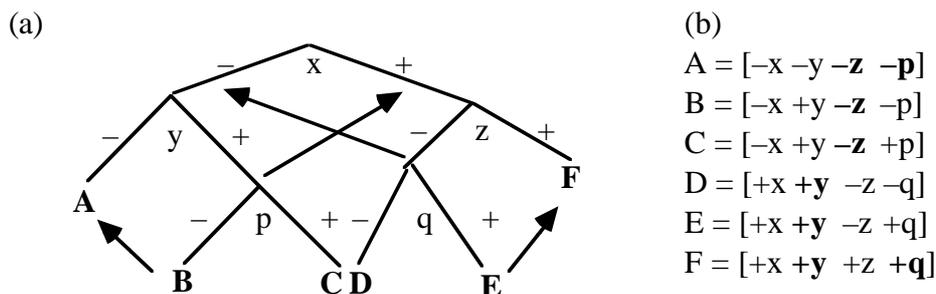
To apply counter-marking, we can begin with the sub-trees dominated by  $[-x]$  and  $[+x]$ . The terminal  $[-y]$  then receives the negative specifications dominated by  $[+y]$ , i.e.  $[-p]$ . Conversely, the terminal  $[+z]$  receives the positive specifications dominated by  $[-z]$ , i.e.  $[+q]$ . We then proceed upwards, assigning to the non-terminal  $[-x]$  the negative specifications dominated by  $[+x]$ , i.e.  $[-z]$  and  $[-q]$ ; conversely we assign to the node  $[+x]$  the positive specifications dominated by  $[-x]$ , i.e.  $[+y]$  and  $[+p]$ . The result, again, is a tree that makes natural classes of all sub-segments of the linear ordering  $A-B-C-D-E-F$ , and no others.

## [32] Tree of Depth 3 with counter-marking



Incidentally, this example of a tree of depth greater than two also demonstrates that counter-marking was correctly stated in [26] as an unbounded, global, relation between a node and all similarly-marked nodes c-commanded by it. It is obviously not a cyclic local relation between aunts and nieces, for if it were, the specifications  $[-p]$  and  $[+q]$  would not be able to percolate to  $[+x]$  and  $[-x]$  respectively, since there would be no appropriately configured intermediate ‘landing sites’ for them. As a result, the natural classes comprising  $\{A B C D\}$ ,  $\{A B\}$ ,  $\{C D E F\}$ ,  $\{C D E\}$  and  $\{C D\}$  would no longer be definable. In the following, the ‘lost’ specifications are given in their necessarily altered forms in italics:

## [33] Tree of Depth 3 with cyclic local counter-marking



(c)

$[-x] \equiv \{A B C\}$	$[+q] \equiv \{E F\}$
$[+x] \equiv \{D E F\}$	$[-x +y] \equiv \{B C\}$
$[+y] \equiv \{B C D E F\}$	$[+x -z] \equiv \{D E\}$
$[-z] \equiv \{A B C D E\}$	$[-q ] \equiv \{D\}$
$[-p] \equiv \{B\}$	$[-q +y] \equiv \{B C D\}$
$[+p] \equiv \{C\}$	$[+p ] \equiv \{C\}$
$[-q] \equiv \{D\}$	$[+y -z] \equiv \{B C D E\}$

I have shown that there exists a well-defined procedure of re-marking which, the evidence strongly suggests (though a formal proof awaits further research), has the interesting property that it produces a classification that defines exactly the same classes as a linear ordering does contiguous segments. In that sense it is weakly equivalent to a linear ordering. However the two representations are far from strongly equivalent, precisely because *any* sub-classification of a set of terms which is augmented by counter-marking produces exactly the same linearization. In other words the counter-marked sub-classification contains all the information that a linear representation does, and a good deal more besides.

If the purpose of either representation is simply to define the natural classes over which rules or principles of grammar operate, then it would appear that this extra information is otiose. Is not the counter-marked sub-classification simply a baroquely, and arbitrarily, annotated equivalent of the linear representation? There are two approaches to this difficulty, both of which I shall pursue. One is to argue that the extra information is indeed used in the grammar, and therefore must be represented somewhere in any case. The other is to consider somewhat more constrained schemes of re-marking which do not have the property of weak equivalence with a linear representation, but which nevertheless provide an adequate subset of the natural classes definable over a linear representation.

First there is the possibility that the extra information is actually used. Clearly the usage of this information would have to be somewhat more subtle than the mere availability to the grammar of natural classes that can be referred to, for the extra information adds nothing to this. But consider that one difference between a linear representation and any particular sub-classifying equivalent is that in the former all natural classes are, in every sense, equal. There is no formal difference between one sub-segment of the ordering and another: any sub-segment is defined simply as its offset from the origin and its length.

By contrast, the various weakly equivalent sub-classifications define different ‘strengths’ of cohesion amongst the members of natural classes. An important consideration is that some natural classes are defined by fewer features than others, and are therefore simpler in an obvious way (in the same way that, in phonology, the class of stops is simpler than the class of voiceless stops). Another consideration is that the features themselves — the node labels — are in a hierarchic relations amongst themselves, so that some features are in an obvious sense more important or basic than others. And again, the fact that nodes come to acquire feature specifications in two different ways — by inheritance in the way of straightforward sub-classification, and by re-marking — may lead to a ranking of natural classes as ‘simple’ (defined by the sub-classification itself) or ‘derived’ (defined only by dint of re-marking). It is then conceivable that these differences in strength of affiliation are reflected somehow in the grammar: it could be, for instance, that natural classes that are defined by fewer features, by features closer to the root node, and by non-derived features are referred to more frequently or by more central or important principles.

But before it becomes profitable to investigate such effects, it is necessary to constrain the scheme of re-marking somewhat. Recall that this investigation began with the observation that every strict sub-classification defines natural classes which are compatible with a linear ordering. However the natural classes so produced consisted only of non-overlapping segments of that ordering. The data in Chapter 2 had suggested that overlapping segments of a linear ordering are quite frequently implicated as natural classes, and therefore it was concluded that the sub-classification had to be re-marked in some way so as to increase, by force as it were, but in some principled manner, the featural content of various nodes, so as to produce the required extra natural classes. Of all the possible re-marking algorithms, counter-marking had the property of producing a representation that is weakly, though not strongly, equivalent to a linear representation.

Especially given the rather large amount of additional information that the counter-marked sub-classification represents as compared with the weakly equivalent linear representation, we are now in a position to see if some less thoroughgoing method of re-marking might not suffice. Such a method would not produce *all* the natural classes that can be defined over a linear ordering of the same number of terms, but if appropriately designed it may produce enough. We would then have a representation whose weak generative capacity was less than the linear model (because it does not define all the natural classes that the latter does), but whose strong generative capacity was greater (because it provides alternative

representations of those reduced sets of natural classes that it does define).

### 3.4.3 Un-Marking

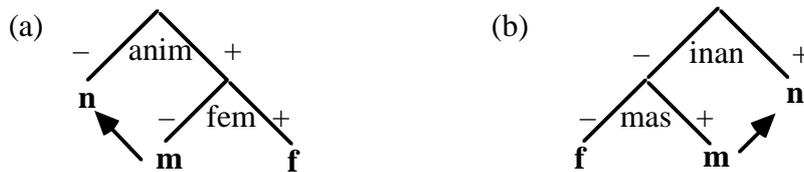
One possible constraint on the operation of re-marking has its basis in considerations of markedness theory. Counter-marking is entirely symmetrical. It copies negative to negative and positive to positive feature specifications. It is therefore treating the distinction made by any feature  $[\pm x]$  as itself symmetrical, i.e. equipollent. However, when using strictly binary features, we have the opportunity to regard them instead as privative, i.e. systematically asymmetrical. As detailed at further length in 3.3.2, the interpretation of a privative feature  $[\pm x]$  is not that items marked  $[-x]$  lack whatever property  $x$  encodes whereas items marked  $[+x]$  have this property; rather, items marked  $[+x]$  are positively stated to have property  $x$ , whereas items marked  $[-x]$  are merely unspecified with regard to this property.

Now let us imagine that in a particular sub-classification,  $[\pm x]$  is dominated by  $[+w]$ . This  $[+w]$  encodes the fact that the items it dominates are positively specified to have the property  $w$ , whereas its sister  $[-w]$  is merely unspecified as to this property. Then it seems reasonable to imagine that items that are unspecified for the property  $w$  are also unspecified for the property  $x$ . This is the negative-to-negative operation of counter-marking.

By contrast, imagine that  $[\pm x]$  is dominated by  $[-w]$ . If counter-marking is to copy the positive value  $[+x]$  to the positive value  $[+w]$ , we are implying that because an item is positively stated to have property  $w$ , then it is also positively stated to have the property  $x$ ; only if the item were unspecified as to  $w$  could it have the chance of remaining unspecified as to  $x$ . This seems inherently less plausible.

But to show this it is necessary to move away from abstract configurations and towards actual linguistic examples. An appropriate one is the example with which this discussion began, a three-gender system in which the masculine gender forms a natural class with both the feminine and neuter genders. Two of the four possible sub-classifications are those in [34], with counter-marking indicated (the other two differ in grouping the masculine and neuter genders together in the first instance; the considerations are, *ceteris paribus*, the same):

[34]



It is relatively easy to see how in [34a], the propagation by counter-marking of the feature  $[-\text{fem}(\text{inine})]$  to the neuter gender makes intuitive sense: the fact that  $[\pm\text{fem}]$  is restricted, as per the sub-classification, to items marked  $[\text{+anim}]$  can be glossed as “the question of femininity has no bearing on inanimates”; the addition by counter-marking to  $[-\text{anim}]$  of the specification  $[-\text{fem}]$  changes the sense only to “inanimates cannot possibly be feminine”. This seems reasonable.

By contrast, the propagation in [34b] of the positive feature  $[\text{+mas}(\text{culine})]$  to the neuter gender borders on the bizarre. Without this application of counter-marking, the fact that the sub-classification restricts  $[\pm\text{mas}]$  to items marked  $[-\text{inan}(\text{imate})]$  can be glossed as “the question of masculinity has no bearing on inanimates”. But with counter-marking, the gloss becomes something like “inanimates cannot possibly fail to be masculine”. And so in general with the propagation of positive to positive feature specifications.

Given the difficulty of giving a coherent interpretation to positive-to-positive feature transmission, the obvious possibility is to restrict re-marking to the propagation of negative values. Because such a scheme of re-marking only increases the negatively-specified feature content of the sub-classification, it can reasonably be called ‘un-marking’. This leaves the question of the sign of the destination node: are both negative and positive nodes unmarked, or only negative ones? Below I will examine the consequences of allowing un-marking to apply to nodes of either sign, but for the moment I adopt the version that allows only negative nodes to be un-marked.

It can be stated as follows:

[35]

**Un-marking:**

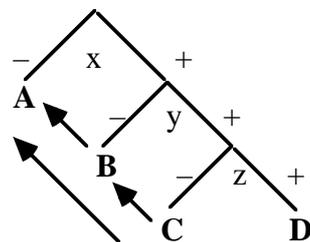
A node marked  $[-F]$  additionally receives the negative value of all nodes dominated by  $[+F]$ .

Employing un-marking rather than counter-marking as the re-marking algorithm has several interesting and desirable consequences.

Because un-marking, unlike counter-marking, works asymmetrically, it is no longer the case that all possible sub-classifications of the same number of terms produce an identical set of natural classes. On the contrary, now every different configuration produces a different set of natural classes. In [34], for instance, only the (a) sub-classification, augmented by un-marking, describes the situation where the masculine gender conflates with either the neuter or the feminine genders. The (b) sub-classification now fails to produce a natural class of masculine and neuter at all.

In general, the situation is as follows. As always, the set of natural classes defined by a sub-classification augmented by any form of re-marking is a superset of the set defined by the sub-classification alone. But, with un-marking, there is only one sub-classificational configuration that defines the maximal linearly orderable superset, and that is a purely right-branching configuration:

[36]



$$[-y] \equiv \{\mathbf{A B}\}$$

$$[-z] \equiv \{\mathbf{A B C}\}$$

$$[+x -z] \equiv \{\mathbf{B C}\}$$

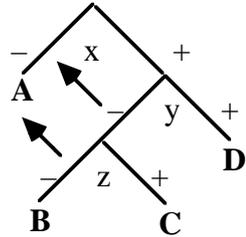
$$[+x] \equiv \{\mathbf{B C D}\}$$

$$[+y] \equiv \{\mathbf{C D}\}$$

Only this purely right-branching configuration is even weakly equivalent to a linear representation. For as the deepest part of the tree moves to the left, natural classes corresponding to segments towards the right of the linear ordering are progressively removed. For instance, the result of branching at  $[-y]$  instead of  $[+y]$  is to remove  $\{\mathbf{C D}\}$

from the set of natural classes:

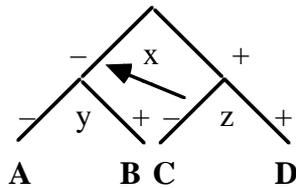
[37]



- $[-y] \equiv \{A B C\}$
- $[-z] \equiv \{A B\}$
- $[+x -y] \equiv \{B C\}$
- $[+x] \equiv \{B C D\}$

If the branch is made at  $[-x]$ , then the longer tail-segment  $\{B C D\}$  is removed:

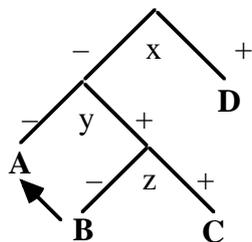
[38]



- $[-x] \equiv \{A B\}$
- $[-z] \equiv \{A B C\}$
- $[+x] \equiv \{C D\}$

If the rightmost branch is again moved leftward to  $[+y]$ , both  $\{C D\}$  and  $\{B C D\}$  are removed:

[39]

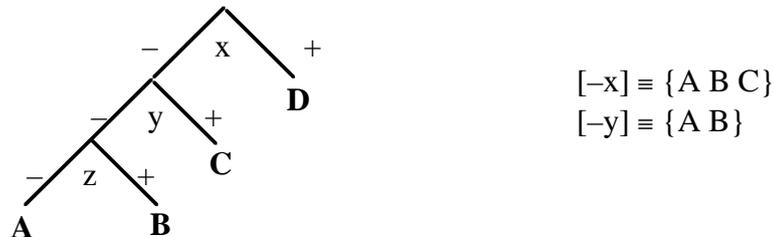


- $[-x] \equiv \{A B C\}$
- $[+y] \equiv \{B C\}$
- $[-z] \equiv \{A B\}$

Finally, shifting the branch further left to  $[-y]$  removes  $\{B C\}$ ,  $\{B C D\}$  and  $\{C D\}$ .

With no un-marking applicable, the set of natural classes defined over the configuration is simply that which is directly defined by the sub-classification itself:

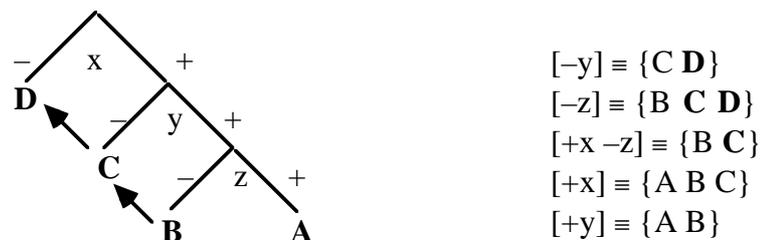
[40]



All this exhibits a systematic asymmetry, in the form of a ‘bias’ towards the left, or unmarked, side of the tree. Different configurations can exclude various segments towards the right of the corresponding linear ordering, but not towards the left. The reader will have noticed that all the configurations define at least the classes  $\{A B C\}$  and  $\{A B\}$ .

As a matter of fact that bias can just as easily be made to work towards the right-hand end, simply by reversing the order of all the terminal labels. This involves, of course, reversing the ‘sense’ of all the features (so that a feature  $[\pm\text{animate}]$  in the left-biased version becomes  $[\pm\text{inanimate}]$  in the right-biased version, and so forth). Unsurprisingly, since it is weakly equivalent to a linear representation, the change makes no difference at all to the natural classes definable over a strictly right-branching configuration. Thus [36] can be reversed with no change in the natural classes defined, by a mere re-labelling of the terminals as  $D-C-B-A$  from left to right:

[41]

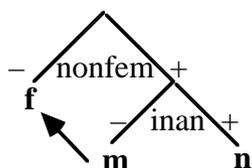


But the same procedure does make a difference to the natural classes definable over the other configurations, since the natural classes ‘lost’ are, in terms of the configurations [37]—[40], {A B}, then {A B C}, then {A B} and {A B C}, and finally {A B}, {A B C} and {B C}.

When dealing with real linguistic data, the conflation facts will in most cases force the decision on us: we must choose the tree that defines the fewest natural classes consistent with the facts. If that tree is anything other than a strictly right-branching one, there is no further alternative. We will thus perhaps rarely or never be faced with the choice between [36] and [41], much less the choice of reverse-labelled right-branching trees of depth greater than three.

But there is a real issue when faced with three-term systems. Consider the three-gender system of [34] again. We do need all the confluations definable over a strictly right-branching tree, and so we are faced with the fact that the same set of confluations would also be produced by reversing the labelling so as to group the masculine and neuter genders together:

[42]



Either there is a genuine choice between this representation and that in [34a] or there is not. If there is not, then both representations are simply redundant equivalents of the linear representation, in which case the latter is to be preferred. But if the two sub-classifying representations are not equivalent, that in turn could be for a number of different reasons. One may wish to maintain, for instance, that the features themselves — the labels on the nodes — are drawn from a universally available set and are not simply arbitrary mnemonics. In that case it may well be that Universal Grammar does not provide redundant complementary features such as [ $\pm$ feminine] and [ $\pm$ nonfeminine], or [ $\pm$ animate] and [ $\pm$ inanimate], and the choice is made for us, presumably on a cross-linguistic basis.

Or it may be that the features are either arbitrary or at least drawn from a universal set

which itself contains some redundancy, in which case the decision as to the appropriate tree representation would have to be made on a language-particular basis. A useful way of exploring these issues is through a case study.

#### 3.4.4 Modern Greek Case

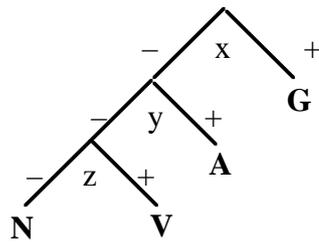
We saw in 2.2.5 that Modern Greek has a system of four cases, exhibiting extensive systematic confluences that are compatible with the linear ordering N—V—A—G and no other. The actual natural classes involved, apart from the trivial collapsing of all case distinctions in indeclinable nouns, are {N V}, {N V A}, {V A} and {V A G}.

The fact that the conflating cases are linearizable suggests that the system is not correctly accounted for by a cross-classification. On the other hand, the fact that the natural classes are not all strictly disjoint or in a subset-superset relation shows that the system cannot be accounted for as a straightforward, non-re-marked sub-classification. This suggests that re-marking is at work, and we now wish to see if a particular scheme of re-marking, viz. un-marking, will produce results that seem justifiable.

Of four terms there are five possible trees, which were set out schematically in [36]—[40]. I will attempt to match each of those configurations to the Greek facts, maintaining, for the moment, the use of arbitrary node labels. We will see that three of the five configurations are completely excluded since they do not produce the requisite natural classes at all. One other is weakly equivalent to a linear representation, and a single tree configuration produces exactly the required natural classes and no others.

In the purely left-branching tree, un-marking is not applicable and as a result two of the necessary natural classes, {V A} and {V A G} cannot be defined at all. Nor can the class {A G}, which is definable over the linear ordering but which does not operate as a natural class for the purpose of confluences:

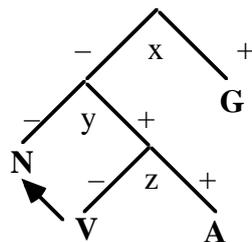
[43]



$[-x] \equiv \{N \ V \ A\}$   
 $[-y] \equiv \{N \ V\}$

By grouping V with A rather than N and allowing un-marking to transmit V's specification to N, we add to the set of natural classes available  $\{V \ A\}$ , but still not  $\{V \ A \ G\}$ , or the unwanted  $\{A \ G\}$ . (As before, additions due to re-marking are singled out in boldface):

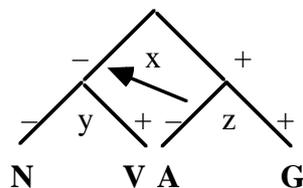
[44]



$[-x] \equiv \{N \ V \ A\}$   
 $[+y] \equiv \{V \ A\}$   
 $[-z] \equiv \{N \ V\}$

A balanced tree fares worst of all, because it cannot define the natural classes  $\{V \ A\}$  or  $\{V \ A \ G\}$ , and in addition it does define the unwanted class  $\{A \ G\}$ :

[45]

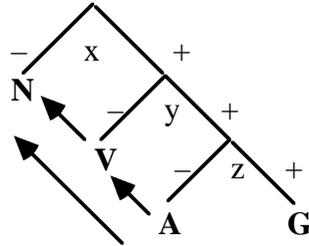


$[-x] \equiv \{N \ V\}$   
 $[-z] \equiv \{N \ V \ A\}$   
 $[+x] \equiv \{A \ G\}$

Of the two trees capable of defining the necessary natural classes at all, on the assumption of un-marking, the purely right-branching tree in addition defines the unwanted class

{A G}:

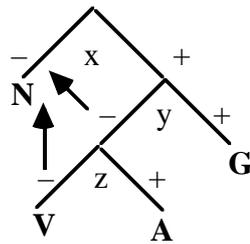
[46]



$[-y] \equiv \{\mathbf{N V}\}$   
 $[-z] \equiv \{\mathbf{N V A}\}$   
 $[+x -z] \equiv \{\mathbf{V A}\}$   
 $[+x] \equiv \{\mathbf{V A G}\}$   
 $[+y] \equiv \{\mathbf{A G}\}$

The single remaining configuration defines all the wanted natural classes and no others:

[47]



$[-y] \equiv \{\mathbf{N V A}\}$   
 $[-z] \equiv \{\mathbf{N V}\}$   
 $[-y +x] \equiv \{\mathbf{V A}\}$   
 $[+x] \equiv \{\mathbf{V A G}\}$

We see that at least in this instance the threatened proliferation of weakly equivalent sub-classifications does not occur. In fact only two are even possible. Of these, one has the advantage of failing to define the unused class {A G}; the other does define this class, and what is worse, does so as a very tight grouping that can be defined by means of one feature.

In fact the tree [47] is very promising in a number of respects. It defines as the ‘simplest’ natural classes, i.e. those addressable by means of a single feature, the two triplets {N V A} and {V A G} and the pair {N V}. The two triplets are undoubtedly the most important case conflations in the language. Recall from [20] of the previous chapter that the NVA conflation occurs in four different form-paradigms in both the singular and plural, and in a further two in the plural only. In fact quite generally it occurs in all feminine and neuter nouns, as well as some masculines. The VAG conflation occurs in

two different masculine form-paradigms, one of these being one of the largest in the language (example [19b] of the previous chapter).

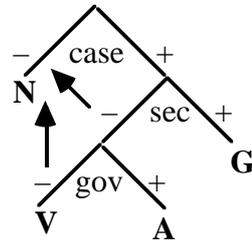
The NV conflation (excluding A) occurs only in the plural of one paradigm, but it is one of the biggest in the language. By contrast, the VA conflation (excluding G) is confined to the singular of certain proper names.

The tree [47] also posits a very strong bond between V and A, and no particular link between A and G. The lack of any AG confluations (excluding V) supports the latter result, and the former result is supported by the fact that were it not for a single form-paradigm ([21a] of Chapter 2), V would always be identical with A in the singular. So there seems to be a reasonable degree of support, of a statistical kind, for this representation and for the extra information it contains over and above that contained in a linear representation. As well, the representation is not even weakly equivalent to a linearization, but in fact excludes precisely the instance of possible conflation that is not attested but which the linearization allows.

We would have greater confidence in the representation if, in addition, we could replace the arbitrary node labels  $x$ ,  $y$  and  $z$  with something more meaningful. This is not difficult to do. Clearly the primary division,  $[\pm x]$ , separates the citation case or ‘non-case’ N from the rest; it could reasonably be renamed  $[\pm \text{case}]$ . The node  $[\pm y]$  separates G from the remaining two cases. In Modern Greek, the genitive case has two basic functions: to indicate an adnominal possessor, and to function as the equivalent of the dative case in languages which have one, i.e. to mark the recipient role of ditransitive predicates. In both functions, the popular alternative is a prepositional phrase (headed by *apó* ‘of, from’ in the possessive function, and by *se* ‘at, to’ in the recipient function). The genitive does not mark the complement of prepositions. Therefore, in almost all syntactic situations the genitive case is optional. And in fact in colloquial Modern Greek the genitive plural in particular is strongly dispreferred. All this suggests that G is a ‘secondary’ case in some sense. We can thus replace  $[\pm y]$  with  $[\pm \text{secondary}]$ .

The vocative case is, as its name suggests, straightforwardly a case of direct address. However it must bear the negative value of some feature which defines the accusative case. The characteristic of the accusative case is that it is always governed by a predicate, whether a verb or a preposition. Therefore  $[\pm z]$  can be replaced with  $[\pm \text{governed}]$ . The relabelled tree and the consequent natural classes are then as follows:

[48]



$[-\text{sec}] \equiv \{\mathbf{N} \ \mathbf{V} \ \mathbf{A}\}$   
 $[-\text{gov}] \equiv \{\mathbf{N} \ \mathbf{V}\}$   
 $[\text{+case} \text{ -sec}] \equiv \{\mathbf{V} \ \mathbf{A}\}$   
 $[\text{+case}] \equiv \{\mathbf{V} \ \mathbf{A} \ \mathbf{G}\}$

Yet there is something unsatisfactory about this. The node labels do not, formally speaking, convey any more information than their arbitrary equivalents. They are mere glosses, contributing nothing (except to the human reader) beyond what the geometric configuration itself defines. They certainly do not ‘characterize’ the cases in any interesting sense: for instance, nothing about the representation [48] tells us that the vocative case is used for direct address. It tells us that it is a ‘case’ (in the sense that it is not the extra-syntactic citation form), that it is not secondary, and that it is not governed. Perhaps from these characteristics, and based on our experience of a range of case systems, we might infer that the case is used for direct address, but this is an extra-formal inference. Similarly, nothing about the characterization of the genitive case tells us that it is used to represent possessors and recipients (it could represent instruments or locations, for instance). And from the fact that the accusative is the only governed case we might infer that it is the case of direct objects and of prepositional complements — but again, this is only an inference.

In fact we can now see that *any* labelling of nodes is, strictly speaking, otiose. At least with respect to the conflation data I have been seeking to account for, it is impossible for two identically configured trees to describe some difference in behaviour merely on account of the differences in their labelling. All that matters is the geometry itself and the assumptions made about which particular scheme of re-marking to apply to it. This information could be presented equally as an unlabelled bracketing. Thus the tree [48] is simply equivalent to the following:

[49]

$$[\mathbf{N} \ [ \ [ \ \mathbf{V} \ \mathbf{A} \ ] \ \mathbf{G} \ ] ]$$

That is, the sub-classification itself encodes only information about grouping based on markedness, and un-marking is a particular hypothesis about how the set of natural classes so defined is extended by the propagation of redundant information.

### 3.4.5 Bi-Directional Un-Marking

In choosing a particular re-marking algorithm, I have focussed on a form of un-marking which works uni-directionally: information is transmitted only leftwards in the tree, from negative to negative nodes. We saw that this has the consequence of defining various subsets of the set of natural classes definable over a linearization of the terms.

Uni-directional un-marking, it will be recalled, was justified on the grounds of plausibility in making use of the redundant information available in a privative sub-classification. It was argued that positive-to-positive feature propagation made little sense given that the negative value of a feature  $[\pm x]$  — glossable as “unspecified with respect to property  $x$ ” in fact subsumes<sup>6</sup> the positive value — glossable as “specified as having property  $x$ ”. Negative-to-negative transmission, by contrast, was argued to have the plausible interpretation that an item unspecified as to property  $x$  is also unspecified as to all properties that it might have been specified for had it been specified as having property  $x$ .

There remains the possibility that we should allow negative to positive feature propagation. This would mean that, in addition to all the feature propagation allowed by uni-directional un-marking, we would also allow a node  $[+x]$  to receive the negative values of all features dominated by  $[-x]$ . This too appears to have some inherent plausibility. If any given positive feature specification is subsumed by its negative counterpart, then, it could be argued, it is subsumed also by the additional feature specifications its negative counterpart acquires as a result of un-marking. That is, if  $[+x]$  is subsumed by  $[-x]$ , then it should be subsumed by the complete complex of information  $[-x -y -z . . .]$  that  $[-x]$  acquires through un-marking.

Assuming that such a scheme of re-marking passes the test of basic plausibility, we need to enquire whether the results are appealing. First, observe that since it widens the scope of re-marking, it will inevitably create a greater set of natural class than does uni-directional un-marking. And given that for any number of terms there exists some sub-classification that when augmented by uni-directional un-marking defines every possible subset of the

set of linearizable natural classes, the extra natural classes defined must be such as to defy linearization. And this is how it turns out.

First, a formal statement of bi-directional un-marking:

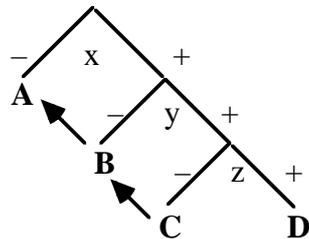
[50]

**Bi-directional Un-marking:**

A node marked  $[\alpha F]$  additionally receives the negative value of all nodes dominated by  $[-\alpha F]$ , where  $\alpha = +$  or  $-$ .

In a purely right-branching tree there is no opportunity for rightward propagation, and therefore the results are the same as with uni-directional un-marking:

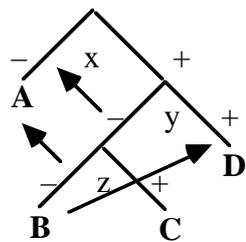
[51]



- $[-y] \equiv \{A B\}$
- $[-z] \equiv \{A B C\}$
- $[+x -z] \equiv \{B C\}$
- $[+x] \equiv \{B C D\}$
- $[+y] \equiv \{C D\}$

As the deepest part of the tree moves to the left, however, bi-directional un-marking gets the chance to create additional, unlinearizable natural classes. Branching at  $[-y]$  instead of  $[+y]$  provides the additional natural classes  $\{A B D\}$  and  $\{B D\}$ :

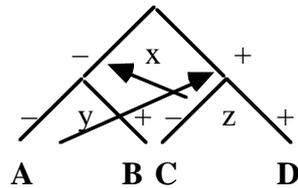
[52]



- $[-y] \equiv \{A B C\}$
- $[-z] \equiv \{A B D\}$
- $[+x -y] \equiv \{B C\}$
- $[+x] \equiv \{B C D\}$
- $[-z -y] \equiv \{A B\}$
- $[-z +x] \equiv \{B D\}$

The balanced tree yields the additional classes  $\{A C D\}$  and  $\{A C\}$ :

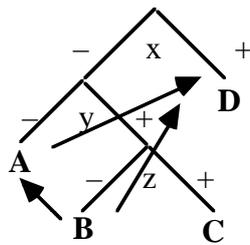
[53]



- $[-x] \equiv \{A B\}$
- $[-z] \equiv \{A B C\}$
- $[+x] \equiv \{C D\}$
- $[-y] = \{A C D\}$
- $[-y -z] = \{A C\}$

Branching at  $[+y]$  produces the additional  $\{A B D\}$  and  $\{A D\}$ :

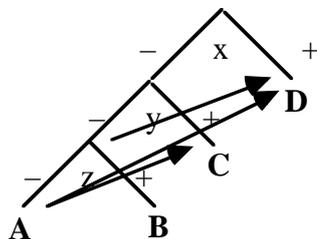
[54]



- $[-x] \equiv \{A B C\}$
- $[+y] \equiv \{B C\}$
- $[-z] \equiv \{A B D\}$
- $[-y -z] \equiv \{A D\}$
- $[-z -x] \equiv \{A B\}$

And a purely left-branching tree produces additional classes  $\{A B D\}$ ,  $\{A C D\}$ ,  $\{A C\}$  and  $\{A B\}$ :

[55]



- $[-x] \equiv \{A B C\}$
- $[-y] \equiv \{A B D\}$
- $[-z] \equiv \{A C D\}$
- $[-y -z] \equiv \{A D\}$
- $[-x -z] \equiv \{A C\}$
- $[-x -y] \equiv \{A B\}$

The question, then, is whether these extra unlinearizable natural classes are in fact needed. Clearly, to the extent that linearization is possible they are not. With regard to the data of Chapter 2, for instance, the crucial evidence would be those somewhat rare cases

in which contradictory orderings seemed to be indicated. One such example was German, where we saw in 2.2.6 that in addition to the order N—A—G—D which accounts for the bulk of the data, a different order N—A—D—G seemed to be required to account for the confluations between A and D within three personal pronouns. As it happens, however, bi-directional un-marking fails to create the appropriate natural classes in any case.

### 3.4.6 German Case

We saw in 2.2.6 that German, with four cases N, A, G and D, exhibited the following systematic confluations:

[56]

NAG	all plurals except personal pronouns
NA	feminine pronominal singular, neuter weak nouns
AGD	masculine weak nouns
GD	feminine pronominal singular

Comparing these with the natural classes made available by all possible sub-classifications of four terms supplemented by uni-directional un-marking (exx. [36]—[40]), we see that the only compatible configuration is the purely right-branching one; this ‘wastes’ only the definable but unattested conflation \*AG.

We saw also that three forms of personal pronouns (*uns*, *euch*, *sich*) conflate A and D. We want to see if there is some configuration that adds {A D} to the complement of definable natural classes. Examples [51]—[55] give the results of applying bi-directional un-marking to all possible four-term trees, but since the terms are labelled abstractly as A, B, C, D we need to translate from the German case labels, as follows:

[57]

German:	N A G D
Examples:	A B C D

We therefore need to find a configuration that, in terms of the examples, supplies the following natural classes at least:

[58]

ABC  
AB  
BCD  
CD  
BD

However there is none. The right-branching example [51] adds no extra natural classes. Example [52] adds {B D} as required, but lacks {C D}. Example [53] lacks {B D} and in addition {B C D}. Example [54] lacks {B C D} and {C D}. And example [55] lacks {B C D}, {C D} and {B D}.

It seems, therefore, that whatever it is about the German case system that causes a (slight) problem for linearization, it is not remedied by the availability of the extra natural classes due to allowing un-marking to apply bi-directionally. And what is worse, with bi-directional un-marking every configuration apart from the purely right-branching one (in which un-marking perforce applies uni-directionally) creates further non-linearizable natural classes that are *not* addressed in the German case system.

I conclude, therefore, that the extra generative capacity afforded by bi-directional un-marking as compared with uni-directional un-marking is unwarranted, because (a) it creates natural classes which are not addressed, and (b) it does not create the extra natural classes which are addressed. I will therefore assume that un-marking is correctly stated in uni-directional form. (Of course, the problem of the accusative-dative confluents in German remains.)

What remains is to apply sub-classification with uni-directional un-marking to some more of the data that provided evidence for linear representations. It will be clear by now that for every such data set, there is available a solution along these lines: if nothing else, the purely right-branching solution that defines exactly the same set of natural classes as the linear ordering does. But we can see if, for any given data, some other configuration is available which more exactly characterizes the natural classes that are addressed.

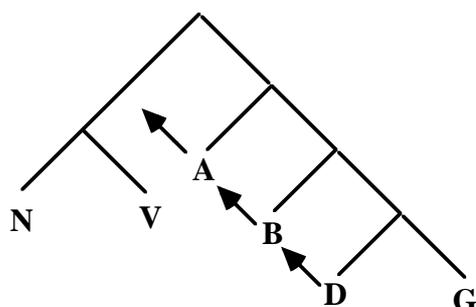
### 3.4.7 Latin Case

Recall from 2.2.8 that Latin shows various confluents over segments of the ordering

NVABDG. As always, this is compatible with a purely right-branching tree, but we would prefer a configuration that excludes as many as possible of those natural classes that are not implicated in conflations.

One candidate comes immediately to mind. The vocative case conflates frequently (in fact usually) with the nominative. It often conflates also with the accusative, but only when the accusative itself conflates with the nominative. That is, we need the natural classes  $\{N V\}$  and  $\{N V A\}$  but not  $\{V A\}$ . Apart from this, we need no natural class including  $V$  that does not also include  $N$ , i.e.  $\{V A B D G\}$ ,  $\{V A B D\}$  or  $\{V A B\}$ . This suggests the following minimal modification to a right-branching tree:

[59]

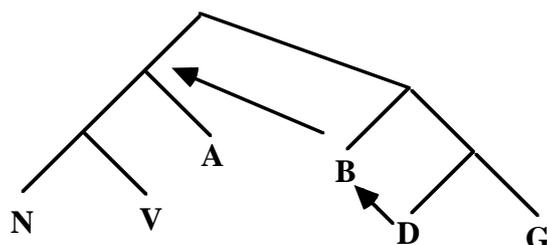


Further improvements are not immediately obvious. We require conflations of  $BD$  and of  $DG$  but not of  $BG$ . This implies one of the bracketings  $[B [D G]]$  and  $[G [D B]]$ , either of which achieves the desired results, but in addition inevitably defines an unwanted natural class  $\{B D G\}$ . The choice of  $[B [D G]]$  is essentially forced by the fact that fourth-declension neuter nouns conflate, in the singular, all cases but  $G$ .

The placement of  $A$  on the right-hand side of the tree, where it can get un-marked by  $B$ , is required to define a natural class  $\{A B\}$ . Recall from 2.2.8, though, that this is required only for three personal pronouns. For this reason, we might be willing to countenance a slightly different configuration for nouns (etc.) and personal pronouns. This is the easier to do when we conceive of the configuration as expressing relations of grouping and markedness: it is not difficult to imagine that the genitive case of personal pronouns, in particular, might stand in a different relation to the whole paradigm when there exists a special item — a possessive determiner — which carries out its major function.

Assuming that something like this is the correct analysis, and that we can therefore exclude the natural class {A B} from the paradigm of nouns, we can set up a slightly more balanced configuration:

[60]



Now the left-hand side of the tree defines the natural classes {N V} and {N V A} as required. The right-hand side defines {B D}, {D G} and the unwanted {B D G}. The tree as a whole defines {N V A B D}, a natural class implicated in the singular of fourth-declension neuter nouns. It also, inevitably, defines {N V A B}, which is not addressed in classical Latin, but which represents the earlier situation when the aforesaid fourth-declension neuters maintained a distinct dative singular in *-uī*, as against *-ū* for NVAB.

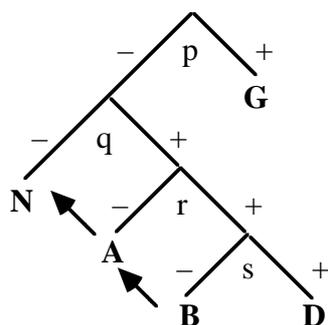
This is a result considerably superior to what is offered by the linear approach. The configuration defines only two unaddressed natural classes, {N V A B} and {B D G}. The linear representation and its right-branching sub-classificatory equivalent, however, additionally define {V A}, {V A B}, {V A B D}, {V A B D G}, {A B}, {A B D} and {A B D G}. And of course any cross-classification of six terms, which must define no less than 18 natural classes, fares far worse still.

Most of the nodes, in addition, can be glossed straightforwardly. The major division is between the traditional ‘direct’ and ‘oblique’ cases. Within the direct cases, the major division is between the cases that can function extra-syntactically (as citation form and as form of address), and the quintessentially syntactic accusative. The vocative is correctly seen as a marked variant of the nominative<sup>7</sup>. It is a little less clear what gloss should be placed on the division between the ablative on the one hand and the dative and genitive on the other. Certainly the ablative case often functions, as does the accusative, to mark

the complement of prepositions, a function neither of the other two cases has. The ablative has a rather wide variety of functions, marking instruments, manners, circumstances, the reference of comparisons, and others besides. By contrast the dative is virtually restricted to marking recipients, and the genitive rarely marks adjuncts or arguments of a predicate at all (it marks a variety of roles adnominally, of course). The configuration therefore reflects the fact that the ablative case is the unmarked oblique case in Latin.

There remains the problem of the personal pronouns. I pointed out above that the genitive case stands in a somewhat different relationship with the others in pronouns than it does in nouns. Actually, the lack of isomorphism between the declension of the personal pronouns and the rest of Latin declension goes deeper than that. Latin is a pro-drop language, which means that the nominative case of personal pronouns performs a substantially different function from other nominatives: its main use is to express (typically contrastive) emphasis. This implies that the nominative is not as closely linked to the accusative as a ‘direct’ case as it is in noun declensions. The idea of a first-person vocative makes no sense, and given that the second-person pronouns do not have a distinct vocative, one may as well eliminate the vocative from the paradigmatic repertoire. There is, unlike with nouns, conflation of the accusative and ablative cases, and, again unlike nouns, no conflation of genitive and dative cases. All this suggests the following configuration for the personal pronouns:

[61]



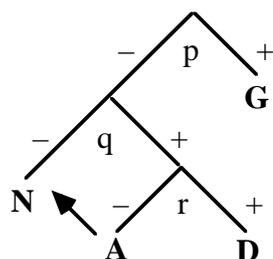
This defines all the natural classes required for the personal pronouns, i.e. {N A} (1pl and 2pl), {A B} (1sg, 2sg, reflexive) and {B D} (1pl, 2pl). It also defines three unaddressed natural classes of more than two members —  $[-p] \equiv \{N A B D\}$ ,  $[-s] \equiv$

{N A B}, and [+q] ≡ {A B D}. Since {N A B D}, while not participating in confluations, is at any rate the natural class of ‘true’ personal pronoun forms, the presence of the other two unaddressed natural classes is perhaps not so embarrassing given the very small number of items involved.

Either way, the features can be glossed straightforwardly: [±p] separates the true pronominal forms from the ‘interloper’ G, [±q] separates the contrastive/emphatic pronoun from the rest, and [±r] separates the direct-case pronouns from the rest.

Another situation demanding a similar solution is the German ordering-conflict problem (3.4.6). The situation is much the same: the genitive case is marginal in the personal-pronoun paradigm, suggesting that the correct configuration is as follows:

[62]

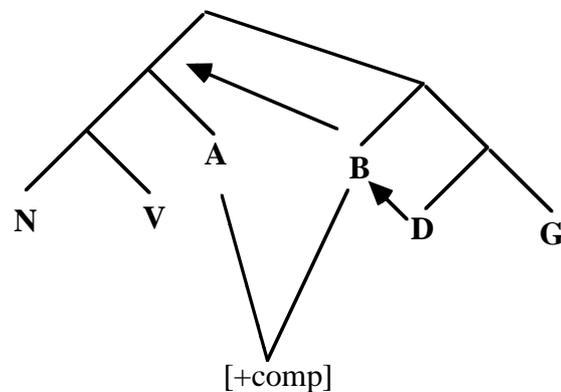


This contrasts with the right-branching configuration [N [A [G D] ] ] appropriate for German nouns, adjectives and determiners, and defines the natural class {A D} needed to cover the items *uns*, *euch* and *sich*. The natural class {N A} covers the neuter third-singular form *es* and the feminine/plural third-person form *sie*<sup>8</sup>. As opposed to the general declension, the feminine personal pronoun does not conflate D and G: *ihr* versus *ihrer* (cf. determiners like *der* = feminine singular D and G). The top-level feature can be glossed very much as in Latin: [±p] separates the true pronouns from the rest. The interpretation of the other features is the same as the corresponding features in the right-branching configuration. This is appropriate, since German is not a pro-drop language, and therefore the nominative case of pronouns stands in the same relationship to the other case-forms as does the nominative case of nouns.

Before leaving the topic of the Latin personal pronouns, there is one other possibility to consider. If we allow sub-classifying configurations to be augmented, exceptionally,

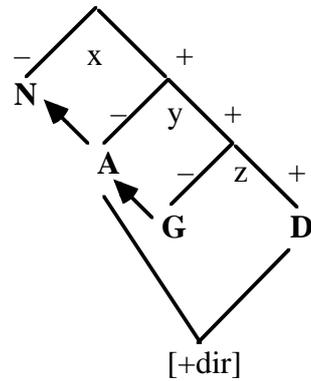
with a limited amount of cross-classification, then it would be possible to maintain the configuration in [60], supplementing it only with a cross-classifying feature that makes a natural class of the accusative and ablative cases. Since the main thing the accusative and ablative cases have in common is that they express the complement of prepositions, they could share a feature value such as [+comp]. It is difficult to display graphically a mixture of sub-classification and cross-classification, but something like the following suggests the strategy:

[63]



For German, the corresponding solution would see a cross-classifying feature that picks out the accusative and dative cases. Since in German a small number of prepositions governs the genitive case, the feature would have to be labelled differently from Latin. For the sake of argument, something like [+directed] would suffice:

[64]



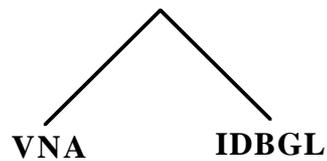
I prefer not to pursue such an approach, however, since it is inherently unconstrained: it is, in principle, capable of overcoming all the restrictions (in particular, the restriction to linearizability) that are effected by the sub-classifying representation. The latter, by contrast, forces us to face the fact that the problems for linearizability in both Latin and German are concentrated in the personal pronouns, and suggests to us that perhaps the reason for this is that the case functions are grouped and marked somewhat differently in personal pronouns than they are in other declined items. This, presumably, has its basis either in the rather different pragmatic functions of personal pronouns vis-à-vis nouns (nominative pronouns versus nominative nouns in Latin), or in relevant system-internal facts such as the availability of a possessive determiner to carry out most of the functions of the genitive case. In other words, the sub-classifying approach forces us to go some way towards providing an *explanation* for the exceptional behaviour of personal pronouns.

### 3.4.8 Sanskrit Case

For Sanskrit (2.2.12) we require natural classes  $\{N A\}$ ,  $\{N V\}$ ,  $\{G L\}$ ,  $\{I D B\}$ ,  $\{D B\}$  and  $\{G B\}$ . Again, a right-branching configuration with terminals in the order VNAIDBGL or VNALGBDI will define all the appropriate natural classes, but we can do somewhat better.

First, note that there is no natural class overlap between the direct cases VNA and the rest. This makes possible a configuration such as:

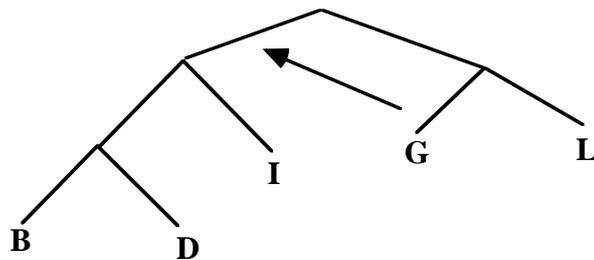
[65]



There are conflations of NV, NA and VNA, but not of VA. Note that, unlike the situation in Latin, it is possible for V to differ from NA. Therefore the left branch can be further developed as [V [N A] ].

The right branch is something of a problem. Were it not for the conflation BG, matters would be straightforward. The following configuration would account for the conflations IDB, DB and GL, defining as unaddressed natural classes only {B D I G L} and {B D I G}:

[66]



(Reversing the markedness of G and L would make no difference except that one of the unwanted natural classes would then be {B D I L} instead of {B D I G}. Reversing the markedness of B and D would likewise make no difference to this part of the tree, but would create unaddressed conflations involving VNA and D instead of VNA and B. Similarly, reversing the markedness at the root of this sub-tree, thus placing GL to the left of BDI, would affect only the definition of unaddressed natural classes: these would then include VNAG, VNAGL, etc.)

In fact there is no configuration other than the right-branching one which defines a natural class {B G} as well {B D}, {B D I} and {G L}. This leaves us three analytical options: (1) the right-branching configuration; (2) a configuration like [66] with a cross-classifying feature that makes a natural class of B and G; (3) a configuration like [66] with no additional machinery — in effect, denial that the BG conflation is non-accidental at all.

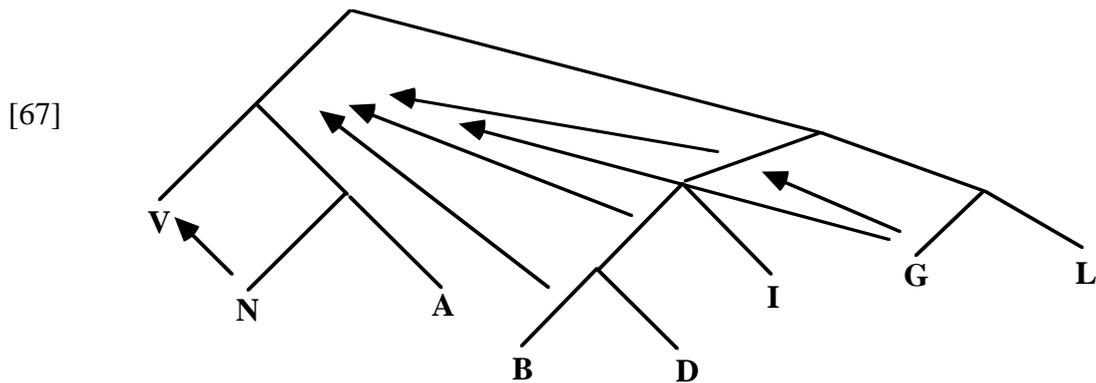
The first option is no worse than the linear representation (and better when regard is had to the sub-configuration involving VNA). However it does define a distressing number of unaddressed natural classes, i.e. {I D}, {I D B G}, {D B G L} and {G L}, as well as the union of each of these and {V N A}.

The second option involves finding an appropriate cross-classifying feature. This is more difficult than it seems. A reasonable candidate would seem to be something like [+source], since the ablative case in Sanskrit encodes the source thematic role, and the genitive in its adnominal possessive function could be thought of as the source of that which is possessed. This is rather abstractly notional, however, since in its adnominal function the genitive can encode virtually any thematic role. Worse still, in classical Sanskrit the genitive frequently does duty for the dative in encoding a verb's recipient role — a notion much more closely akin to the goal role than the source role. In fact it is difficult to find any notional property which is shared by the ablative and genitive cases to the exclusion of the others. And finally, there are the meta-theoretical concerns expressed above about the wisdom of combining sub-classification and cross-classification in a single representation.

The third option is to deny systematic status to the GB conflation. This might seem surprising, given that it occurs in so many Sanskrit word-forms. However, as stressed in Chapter 2, the mere number of forms or form-paradigms exhibiting a particular conflation is not evidence of its systematicity. What we need, to be convinced that mere accidental homonymy is not involved, is for the same set of categories to be addressed by more than one item. In the present instance, we could hardly deny that GB conflation is systematic if there were several different affixes representing G or B. But this condition is not met. There is only one suffix involved, *-as*, and it occurs only in the declension of nouns and adjectives whose stem ends in a consonant or high vowel; other form-paradigms, including those of pronouns and of *a*-stems, employ distinct suffixes *-at* (ablative) and *-sya* (genitive). And in the plural, everywhere except in the first- and second-person

pronouns, B conflates with D, not G. It is therefore not inconceivable that the form *-as* represents two accidentally homonymous suffixes, synchronically speaking<sup>9</sup>.

If this is accepted, one possible configuration is as follows:

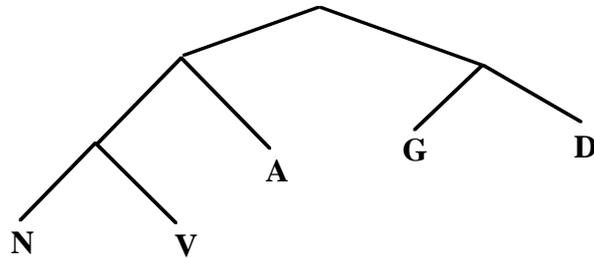


There is a curious aspect to this configuration. With the single exception of {V N}, all the natural classes defined by dint of un-marking are unaddressed in the language. This brings up the possibility that, if we could explain {V N} in some other way (and assuming the accidental status of {B G} is accepted), we could describe Sanskrit declension as a pure sub-classification without un-marking.

Imagine, for the moment, that this is so. One obvious consequence is that we would have to accept that un-marking is an option available to language, perhaps a ‘parameter’ in current terminology. It is not difficult to accept that this may be so, and in fact it would explain all those systems which are compatible with linearization but which show no evidence of the overlapping natural classes that motivated the notion of un-marking. One such system, it will be recalled from 2.2.7, was the case system of Ancient Greek.

To recapitulate, Ancient Greek showed confluations involving the natural classes {N V A}, {N V} and {G D}. The evidence for {V A} and/or {V D} confluations was weak (they are more likely to be phonological ‘accidents’), and so the system was described as being compatible with linear ordering but as not providing strong support for it. We can now see that all the undoubted natural classes in the system, and no others, can be represented as a sub-classification of the following configuration, *without* un-marking:

[68]



(If correct, this means that in the development from this system to the modern one [2.2.5], a great deal more has gone on than the mere take-over by the genitive case of the functions of the dative: the configuration has been changed entirely, and un-marking has been introduced.)

Another consequence of accepting the existence of sub-classifications without un-marking is that the evidence from confluences for a particular scheme of markedness disappears: as far as confluences go, the tree becomes unordered. In [68] it would make no difference to the set of natural classes defined if any pair of sister nodes were swapped. This is not to suggest that there are no markedness relations amongst the various items — whether based on the strict Prague School notion of markedness or on the looser statistically based variety — but it does suggest that the markedness potential of the system is not being fully exploited. Every feature is being treated *as if* equipollent. Un-marking can then be seen as a method of more fully exploiting the semiotic potential of a system where the features are in fact privative and therefore fundamentally asymmetrical.

To return to Sanskrit, the single problem with a representation as sub-classification without un-marking is the formation of the vocative case. There are several options here. We could use the evidence of this formation to argue that un-marking is going on after all, and the fact that the natural classes {V N A I}, {V N A I B} etc. are unaddressed is merely ‘accidental’. This is not attractive. We could also maintain that the option of un-marking is not an all-or-nothing affair, so that un-marking does operate on the left-hand side of the configuration in order to produce the natural class {V N}, but does not operate between the left and right halves so as to produce {V N A I} etc. It is not, after all, far-fetched to imagine that un-marking might be introduced into a linguistic system gradually.

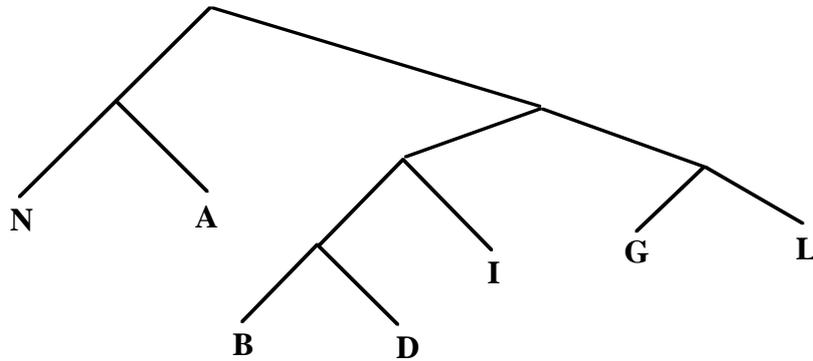
Nevertheless, it would be more appealing to imagine that un-marking is an all-or-nothing option. On this assumption, if the child learner gets evidence (by way of overlapping natural classes) that un-marking is operating in the language, s/he will be prepared to countenance any natural class that is defined by dint of un-marking. For this, stronger, assumption to work for the Sanskrit data, we need to argue either (1) that the VN confluents are accidental and not systematic; or (2) that V is not a term of the same system as N at all.

As for option (1), it is ruled out by the fact that, as a rule without exception, V is always segmentally identical to N in the plural, regardless of the particular affix used.

Option (2) is given plausibility by the radically different method of formation of V as opposed to the other cases. Case inflection in Sanskrit generally is carried out by means of suffixes and a certain amount of stem-alternation, largely triggered by a mobile accent (plus suppletion in the case of some pronouns). The vocative case in the singular, however, is formed quite differently: as a general rule it is the unadorned stem, and it is further differentiated from the inflected forms by being accentless unless initial in the clause, in which case it receives invariable initial accent. This is in complete contrast to the situation in, say, Modern Greek, where from a formal point of view the vocative is an inflected case like any other. Interestingly, Panini and the Hindu grammarians generally did not regard the vocative as a case (their inventory of cases ran only to seven), but as a special form of the nominative used in a particular pragmatic function.

If an argument along these lines is accepted, so that the vocative case is seen as a special quasi-derivational form standing outside the case system proper, then the Sanskrit cases can be seen as a pure sub-classification without un-marking, in the following configuration which defines exactly the set of natural classes addressed and no others:

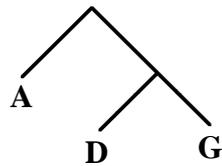
[69]



(Again, the markedness relations between sister nodes, if any, are irrelevant to the definition of natural classes.)

Before leaving the subject of Sanskrit case, I remind the reader of the enclitic pronouns that exhibit conflation involving the natural classes {A D G} and {D G}. As pointed out in 2.1.12, however, the enclitics occur only in these three cases, so that obviously they have their own configuration, in fact a drastically reduced version of [69]:

[70]



Again, no un-marking is implicated.

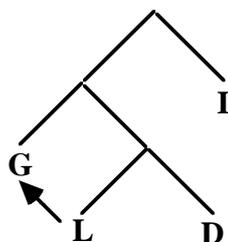
### 3.4.9 Russian Case

We saw in 2.2.9 that the Russian case system exhibits extensive conflations compatible only with the linear ordering NAGLDI. The natural classes implicated in conflations were {N A}, {A G}, {A G L}, {G L}, {G L D}, {G L D I} and {L D}. The linear

ordering, however, and therefore the equivalent right-branching sub-classification with un-marking, defines the additional unaddressed natural classes {N A G L D}, {A G L D I}, {N A G L}, {A G L D}, {N A G}, {L D I} and {D I}. We wish to see if a different configuration, with or without un-marking, can come closer characterizing just the addressed natural classes.

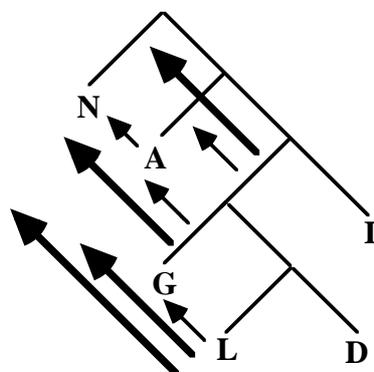
Concentrating for the time being on the configuration involving G, L, D and I, the choice is clear, and in fact uniquely determined. The following configuration, with un-marking, defines all the needed natural classes and no others:

[71]



This successfully eliminates the unaddressed {L D I} and {D I}. However further improvements are impossible to reconcile with the need to make natural classes of {N A}, {A G} and {A G L}. The only configuration that achieves this is the following:

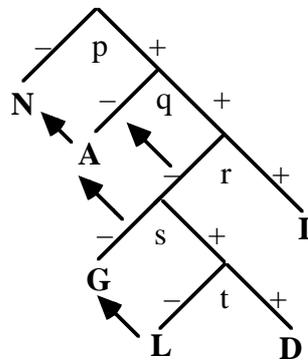
[72]



Unfortunately, this immediately re-introduces all the unwanted natural classes except for

{L D I} and {L D}. Intuitively, the problem here is in the global operation of un-marking, indicated above by means of thicker arrows: in a sense un-marking is propagating features ‘too far’. One could propose various restrictions on this promiscuous propagation. For instance, if un-marking propagated features only as far as the nearest c-commanding terminal, the result would be [73], which eliminates all the unaddressed natural classes, and fails to define only one addressed class, {A G L}:

[73]



This, if a coherent construct, would define natural classes {N A} but not {N A G}, {N A G L} or {N A G L D}; and {A G} but not {A G L}. In fact the only unaddressed natural classes that would be defined under this proposal are {A G L D}, i.e. [-r], and {A G L D I}, i.e. [+p]. This is obviously a very significant improvement.

As for the addressed, but undefinable, natural class {A G L}, it is worth noting that this is confined to the plural of the first- and second-person pronouns (*nas* and *vas*) — by now a familiar situation — so that it is conceivable that an argument could be made for a separate configuration for these.

But I will not pursue that course here. The reason is that there is something inherently implausible in a scheme of un-marking which is neither global nor cyclically local. Consider that in the configuration [73], the proposed scheme of un-marking would make natural classes of {N A} and of {A G} but not of {N A G}, of {A G} and {G L} but not of {A G L}, and so forth. The result is a framework which defines objects which appear to be sets, but which are not subject to fundamental set-theoretic operations like

union. And in any case, the adoption of such a scheme would destroy the effectiveness of the configuration [60] in accounting for the Latin conflation of NVABD.

It seems therefore that we must accept configuration [72] with global un-marking, and its consequences, namely five unaddressed natural classes. At any rate, this is no worse than the linear model, and in fact an improvement on it in excluding two unaddressed natural classes. And it is better than a cross-classification such as Jakobson's, which defines 11 unaddressed natural classes (i.e.  $2^3$  terms gives 18 defined classes — 7 addressed classes = 11 unaddressed classes).

Actually, this highlights a more general characteristic of the scheme of un-marking as so far developed. Uni-directional un-marking, by propagating features only 'leftwards' towards less highly marked nodes, displays a bias towards defining natural classes that include less marked elements. The natural classes removed by progressively more left-heavy configurations come from the right of the tree. In fact there is no configuration that does not define natural classes including the first term.

Yet it is one's impression that conflations tend to involve relatively marked terms. It is a commonplace, for instance, that gender distinctions tend to get neutralized in the plural, and that person distinctions tend to get neutralized in the presumed more marked first and second persons. The data of Chapter 2 shows abundant evidence of these effects, from the drastic simplification of the case system in the dual number in both Greek and Sanskrit to the elimination of gender distinctions in the plural in both German and Russian. It includes also the elimination of all oblique-case distinctions in the feminine singular of Russian adjectives, the virtual elimination of the vocative as a distinct case in the plural in all the examples having a vocative, and the universal conflation of ablative and dative cases in the plural in both Latin and Sanskrit. The phenomenon is too widespread and well-known to require arguing for.

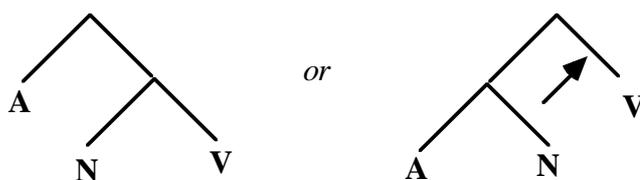
However, it would be a mistake to confuse this phenomenon with the issue of natural classes amongst terms of a single inflectional dimension. In all the examples, the paradigmatic environment for conflation contains an accumulation of markedness *in more than one dimension*, which the system deals with by conflating distinctions in one of the dimensions. The issue of interactions between inflectional dimensions, although highlighted by the geometric hypothesis, is essentially left as an area for further research.

When this separate issue is laid aside, we see that in fact virtually every system that we have considered that conflates terms towards the right of its configuration (equivalently, towards the end of its ordering) also conflates the first two terms, possibly as well as others towards the left (beginning). So did all the three-term systems considered in Chapter 2 except for Arabic. And it is not necessarily true that terms towards the right are particularly pre-disposed to conflation. In Latin, the genitive case stubbornly maintains its separate identity (2.2.8). In Russian, the instrumental case conflates only in the event that all the oblique cases conflate: it too tends to maintain its identity as against G, L and D (2.2.9). In German, it is precisely the dative case, rightmost in its configuration, which is the only case that ever has a distinct form in plural nouns (2.2.6). In modern spoken French, it is precisely the presumably most highly marked categories of first-person and second-person plural that are invariably distinct from other forms. And so on.

But imagine that, against this sort of evidence, we still wish to bias the re-marking scheme more towards the right, so that it is more prolific in defining natural classes involving marked terms. The obvious solution is simply to reverse the operation of un-marking, so that it propagates positive to positive features ('super-marking' might be an appropriate term for this operation). Then the situation would be that for any given linearization there is at least a purely left-branching tree which defines the same natural classes, and in addition a number of progressively more right-heavy trees which define sets of natural classes progressively excluding sets involving the least marked terms.

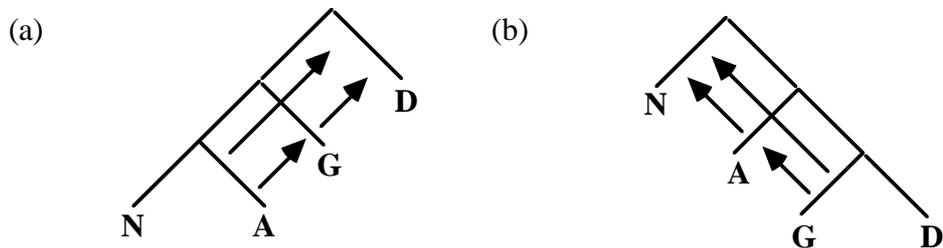
One problem with this is that in several instances it would not even work without having to make some counter-intuitive assumptions about markedness. In Latin, for instance, the only sub-configurations that would define  $\{N V\}$  and  $\{N V A\}$  but not  $\{V A\}$  have A as their least marked term:

[74]

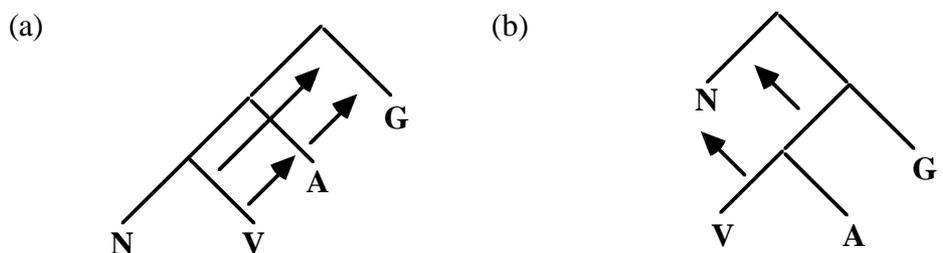


In general, the need to define natural classes of the first  $n$  (typically  $n = 2$  or  $3$ ) elements means that fairly heavily left-branching trees will be required, so that in most cases the sub-classification with super-marking is no better, and often worse, than its un-marking equivalent (better or worse in the sense of defining as near as possible the exact set of natural classes addressed). Thus for German case the only possible super-marked configuration [75a] is equivalent to its right-branching un-marked counterpart [75b] in generative capacity, and for Modern Greek case the only possible super-marked configuration [76a], again the purely left-branching, is actually more powerful than the un-marked configuration [76b] which defines exactly the right natural classes, i.e. all but {A G}:

[75]



[76]



It seems, then, that super-marking offers no advantages over un-marking. This is actually

a welcome fact, since it is an unintuitive process that resists any sort of comprehensible gloss. It envisages that an item that is positively stated to have a property  $x$  is also positively stated to have a property  $y$ , where  $y$  is a property that otherwise can be positively specified to be present only if  $x$  is *not* stated to be present. This was the reason (apart from its bland prolificness in defining natural classes) that we earlier rejected counter-marking, viz. the simultaneous application of un-marking and super-marking. Super-marking alone makes even less sense.

### 3.4.10 Un-Marking and Impoverishment

To this point I have argued that the linearizable character of sets of conflating items suggests that the underlying organization is one of sub-classification, not cross-classification. But I have also argued that the existence of linearizable but overlapping natural classes suggests that some principle is at work which creates additional natural classes beyond those defined by the sub-classification itself. I have looked at a number of such re-marking schemes and suggested that one particular family of schemes, un-marking, gives results always at least as good as the linear model and frequently better. With somewhat less enthusiasm I have also argued for some further particulars about the operation of un-marking, e.g. that it operates globally and not cyclic-locally.

The fundamental assumption behind any re-marking approach to the phenomena, however, is that confluents consist in the reference by items, rules or principles of the grammar to natural classes of terms as defined in one way or the other. For instance, I have assumed that an affix which marks the dative and ablative cases addresses, in its lexical entry or in the rule which introduces it, the feature specification that defines dative and ablative as a natural class.

There is another approach, however, which envisages that in certain circumstances feature representations are simplified by *omitting* some part of their content. A version of such a scheme is advanced by Noyer (1992) building on work in Distributed Morphology, particularly Halle & Marantz (1993). Noyer calls his version of this general feature-deleting strategy ‘impoverishment’.

The basic concept of impoverishment is clear enough. In a feature representation which contains too many terms, or too many marked terms — which, in short, is overloaded

with information in some sense — some of the features are simply deleted. Assuming such an approach works, further investigation hinges on establishing some kind of ordering or hierarchization of the features so that it is predictable (to some degree) which features get thrown overboard when the boat is too full, as it were.

In some cases it is fairly clear what this ordering or hierarchization must be. For instance, the fact that German and Russian remove or reduce gender distinctions in the plural (rather than removing number distinctions in the presence of gender, or some specific gender) implies that number is higher in this ordering than case. Similarly, the fact that case distinctions are reduced in the dual number in Greek and Sanskrit (rather than the number distinctions being reduced in the presence of some case or cases) implies that number is also higher than case. And the fact that gender distinctions are for the most part reduced from three to two in the oblique cases in Sanskrit, Greek, Latin, German, Russian etc. (rather than the case distinctions being reduced in the presence of some gender or genders) implies that case is higher in the ordering than gender. By transitivity, then, we can establish the following ‘hierarchy’ (actually, just ordering) of the three categories:

[77]

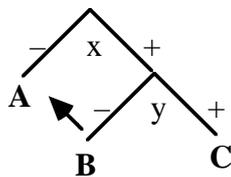
number < case < gender

I believe that, attractive though it is, there are great problems with this approach, not just cross-linguistically but within a single language. As an obvious example, all of the languages cited as reducing gender distinctions (specifically, that between masculine and neuter) in the oblique cases, also do quite the opposite when they reduce case distinctions (specifically, between nominative and accusative) in a particular gender, viz. neuter. This implies contradictory orderings, or equal ordering, for case and gender in each of those languages, reducing the appeal of the hypothesis considerably. A universal ordering seems even harder to maintain: in opposite fashion to the reduction of case distinctions in the dual and/or plural numbers as we see in Sanskrit, etc., in Finnish we find number distinctions lost in the comitative case (Holmberg & Nikanne 1993).

But here we must consider whether something like impoverishment might not work in accounting for confluences within a single inflectional dimension. In fact the representations argued for so far embody one type of impoverishment directly: since reference to natural

classes requires fewer features than reference to individual terms, a conflation can be thought of as the removal from a feature specification of those features which distinguish the conflating terms. For instance, in the following configuration, the two definable two-member classes  $\{A\ B\}$  and  $\{B\ C\}$  can be thought of as the removal of any specification for  $[x]$  or  $[y]$  respectively: the resulting plain  $[-y]$  or  $[+x]$  then define  $\{A\ B\}$  or  $\{B\ C\}$  respectively. Similarly, the removal of any specification for  $[x]$  or  $[y]$  defines  $\{A\ B\ C\}$ :

[78]



A stronger hypothesis based on impoverishment, however, would see impoverishment as a *substitute* for un-marking. But the existence of overlapping natural classes shows that this is impossible. If impoverishment were the only source of conflations in configuration [78], then the only conflations possible would be of BC (represented by B) and of ABC (represented by A). In general, overlapping natural classes would be undefinable, a fatal flaw in view of the fact that they occur abundantly in the data.

A weaker, but still probably too strong, application of the impoverishment idea would insist that all conflations are actually neutralizations, i.e. reversions to the less marked term. This would assert that in the case of conflations the grammar does not address the defining natural class, but simply the less marked term itself. For instance, a conflation of B and C in [78] would be the same as B itself, and a conflation of A and B would be the same as A itself. We would then need a principle that allows us to select term B in a context which appears to demand C, and to select term A in a context which appears to demand B. The obvious principle is that we select the most richly specified term which is compatible with the environment, along the lines of under-specification in Distributed Morphology (Halle & Marantz 1993). So in the first instance we would be forced to select B, defined as  $[+x]$ , because there exists no term C defined as  $[+x\ +y]$  which is furthermore compatible with the environment (e.g. plural or whatever). And in the second instance we would be forced to select A, defined as  $[-y]$ , because there is no compatible term more richly specified as  $[+x\ -y]$ . Let us assume a strategy along these

lines.

One problem with testing this hypothesis is that often there is little or no evidence about whether the exponence of a conflating category is or is not the same as the exponence of its less marked member. This will be the case if, for example, the exponence is portmanteau and the conflation is invariable. In Latin the conflation of ablative and dative cases in the plural is invariable. Therefore there is no evidence, except perhaps of a historical sort, of whether the realizations *-īs*, *-Vbus* and *-bīs* are ‘really’ ablative or ‘really’ dative.

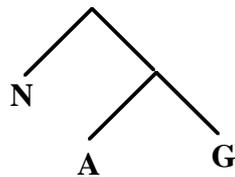
In other instances evidence, at least of a suggestive sort, is at hand. Following Carstairs (1987), we can say that the exponence of categories A and B by means which look like the exponence of A alone constitutes a ‘take-over’ of B by A. The current hypothesis, then, predicts that take-overs involving any two terms are always in the same direction. If, in one system, there is clear evidence of take-over of B by A, we do not expect to find evidence also of take-over of A by B.

Unfortunately for the hypothesis, there are several instances when the evidence at least suggests that take-over operates bi-directionally, and one instance in the data of Chapter 2 where the evidence appears to be conclusive.

First, the clear instance. We saw in 2.2.2 that the three cases nominative, accusative and genitive in Classical Arabic are marked in the singular of nunating nouns by *-u*, *-a* and *-i* respectively. We saw also that non-nunating nouns in the absolute state, nouns in the dual, and ‘sound’ plurals exhibited confluations of the accusative and genitive cases. Of these, non-nunating nouns in the absolute state mark the two cases with *-a*, i.e. the characteristic of the accusative. Sound plurals involve a lengthening of the characteristic vowel, plus the addition of *-na* in certain circumstances. As expected, the nominative has *-ū(na)* and the genitive has *-ī(na)*. But the accusative also has *-ī(na)*, with the characteristic of the accusative. Clearly then, the absolute state of non-nunating nouns shows take-over of the genitive by the accusative, whereas sound plurals show take-over of the accusative by the genitive. (The situation in the dual forms is a little less clear, since the nominative has *-ā(ni)* and the accusative/genitive has *-ai(ni)*. The latter formation could be interpreted in various ways, e.g. as *-a-* ‘dual’ + case characteristic, showing take-over of the accusative by the genitive, or as a mixture of the accusative and genitive characteristics. Under either analysis the nominative in *-ā* remains mysterious.)

Surprisingly, though, this evidence is not a knock-out blow against the notion that take-over always operates in favour of the less marked member. The reason is that Classical Arabic shows no conflation of the nominative with either of the other two cases, which suggests that the case system can be represented as a pure sub-classification without un-marking:

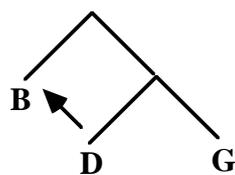
[79]



Recall that sub-classifications without un-marking give no evidence, as far as conflations are concerned, for any markedness ranking between sister nodes. They treat the oppositions as if equipollent. Therefore the hypothesis that take-over must operate in favour of the less marked node is inapplicable. A priori we would imagine that in such a situation either (1) take-over is impossible, or (2) take-over can operate in either direction. Evidently the latter is the correct formulation.

We must therefore concentrate on systems where un-marking clearly does operate, so that we have evidence for a particular markedness ranking between conflating nodes. Latin provides such a system. Recall that the following sub-configuration was indicated in order to account for the conflations of B and D on the one hand and of D and G on the other:

[80]



If the hypothesis of conflation as neutralization is correct, and if the exponence of that

conflation looks clearly like the exponence of one of the conflating terms alone, then we would expect that a BD conflation would look like B alone, and a DG conflation would look like D alone. Since in the plural the BD conflation occurs invariably, and a DG conflation not at all, our evidence must come from the singular paradigms. The exponence of these three cases, arranged by traditional declension, is as follows (the arrows indicate the hypothesized direction of take-over):

[81]

	<b>I</b>	<b>II</b>	<b>IVmf</b>	<b>IVn</b>	<b>V</b>
<b>B</b>	-ā	-ō ↓	-ū	-ū ↓	-ē
<b>D</b>	-ae ↓	-ō ↓	-ūī	-ū ↓	-ēī ↓
<b>G</b>	-ae ↓	-ī	-ūs	-ūs	-ēī ↓

The patterns in the third declension are slightly more complicated, since an originally straightforward distinction between *i*-stems and consonant-stems was disturbed by various processes tending to re-interpret the distinction as one between nouns and adjectives. Nevertheless, the earlier pattern is clear enough:

[82]

	<b>III-i</b>	<b>III-c</b>
<b>B</b>	-ī	-e
<b>D</b>	-ī	-ī
<b>G</b>	-is	-is

The characteristic of a ‘typically’ ablative desinence is obviously a long vowel. Furthermore in at least the second, fourth and fifth declensions, the particular vowel is obviously characteristic of the form-class, in the sense that it is present in all or most desinences<sup>10</sup>. This is true to some extent of the second declension also, except that (by dint of a quite general phonological process in Latin), the expected characteristic *-o-* is replaced by *-u-* before a consonant, hence *-us* and *-um*. A number of forms do not show the characteristic vowel, i.e. the dative-ablative plural *-īs* of the first and second declensions, the genitive singular and non-neuter nominative-vocative plural *-ī* of the second declension, the non-neuter vocative singular *-e* of the second declension, and the non-oblique neuter plural *-a* of the second declension (cf. *-ua* in fourth declension neuters, and *-ia* in third declension neuter *i*-stems).

In the earlier system as represented in [82], this pattern also applies to the third-declension *i*-stems, which featured *-i-* in various other forms such as *-im*, *-īs*, *-ia* and *-ium*, contrasting respectively with *-em*, *-ēs*, *-a* and *-um* in the consonant-stems. Thus the ablative *-ī* of these stems can be seen as the ‘typical’ formation for that case. The third-declension consonant-stems, having no characteristic vowel to lengthen, employ an alternative formation in (short) *-e*.

The characteristic of a ‘typically’ dative desinence is equally clearly a long vocalic sequence consisting of or ending in a mid-to-high front vowel. The desinences of the second declension and of the neuters of the fourth declension therefore look like take-overs by the ablative, as predicted. In the third-declension *i*-stems, the *-ī* of the dative is ambiguous as between a typically dative and a typically ablative ending: either could lead to *-ī*. Therefore we cannot tell if the BD conflation is a phonological accident or a take-over by one or the other. The situation is, at any rate, at least compatible with the hypothesis.

However, the historical development of the third declension poses some problems. The development began, presumably, with a confusion of *i*-stems and consonant stems, based at least in part on the loss of the characteristic *-i-* in the nominative singular of many historical *i*-stems, hence *mōns* < *\*monts* < *\*montis* ‘mountain’ and the like. The resulting re-arrangements were complex and never came to a completely settled conclusion, but the overall trend was for a distinction to emerge between nouns and adjectives (see Carstairs-McCarthy 1988a for a more detailed analysis). Nouns which were not obviously *i*-stems tended to take the consonant-stem ending *-e*, thus reintroducing, in the case of the historical *i*-stems, a distinction between the ablative and dative cases. Adjectives, by contrast, generalized the *-ī* desinence to the ablative: *this is take-over of the ablative by the dative*, against the predictions of the hypothesis.

The situation looks better for the hypothesis with the DG conflations. There is an obvious pattern where the genitive, if it does not ‘look’ like a dative (i.e. featuring *-i*), is characterized by *-s*. Indeed the earlier genitive desinence in the first declension was *-ās*, hence *pater familiās* ‘father (= head) of the household’. This was replaced by *-ae*, which looks like a take-over by the dative. Similarly the conflation in the fifth declension could be analysed synchronically as a take-over by the dative (though historically it is not). A worrying element, however, is the second-declension genitive desinence *-ī*, which ‘looks’ dative but cannot be synchronically a take-over. Apart from being a wrinkle in the analysis in its own right, this desinence could also have been an analogical

starting point for the extension of an *i*-based desinence to the genitive in other declensions, thus undermining the case for take-over by the dative. Still, this does not knock out the hypothesis.

The non-oblique cases of neuters provide another test. These invariably conflate N and A (as well as V, which I shall ignore). The hypothesis predicts, then, that the results, if they ‘look’ specifically nominative or accusative, will consistently look like one or the other. In fact the situation is mixed.

In the second declension, the non-oblique neuter ending in the singular is *-um*. This looks accusative. It is the non-neuter accusative singular desinence in the same declension, and desinences with a final *-m* quite exceptionlessly mark the accusative singular of non-neuter nouns. Apart from this, only the presumably irrelevant genitive plural is characterized by final *-m* in all declensions.

In the third declension, however, the non-oblique neuter singular ending is zero, which is characteristic of the *nominative* of certain non-neuters (principally those whose stem ends in a sonorant). The remaining non-neuters take *-s* in the nominative, and this is also the desinence of non-oblique neuter participles (e.g. *amāns* ‘loving’) and comparative adjectives (e.g. *fortius* ‘stronger’).

In the plural, neuters invariably take some desinence ending in *-a* in the non-oblique cases. This is unlike any non-neuter plural non-oblique ending, but (for what it is worth) identical to the nominative singular ending of first declension nouns. It is also broadly similar to two other non-neuter plural nominative desinences that lack consonants: *-ae* and *-ī*. And it contrasts with non-neuters which invariably take a desinence ending in *-s* in the accusative plural.

Even when there is no direct evidence of bi-directional take-over, the hypothesis of conflation-as-neutralization can force some surprising assumptions with regard to markedness. Consider the case of the dual endings of Ancient Greek verbs. These show a conflation between the second and third-person forms which is clearly a take-over of the third person by the second. The desinences involved are as follows:

[83]

	<b>Primary</b>	<b>Secondary</b>
<b>2</b>	-ton	-ton
<b>3</b>	-ton	-te:n

It would be surprising cross-linguistically if in Greek the second person were less marked than the third. And in fact it is in the second and first persons of the plural — not the third — that the distinction of primary and secondary forms fails to get maintained, which suggests (on the information-complexity grounds alluded to above) that the second and first persons are marked with respect to the third, as one would expect.

A final example concerns case in Finnish. The distinction between the singular and plural numbers is neutralized in the comitative case (the form can be interpreted as singular or plural) — but quite clearly in favour of the plural (Holmberg & Nikanne 1993). The relevant form features the *-i-* which unambiguously marks all the oblique cases in the plural, and none in the singular.

All this suggests that the validity of the hypothesis of conflation-as-neutralization is at best doubtful. In many instances there is simply no evidence as to which of the conflating terms is privileged in getting ‘its’ exponence as the exponence of the whole conflation, since the exponence is not typical of any of the conflating categories separately. Other instances support the hypothesis weakly (GD confluations in Latin), partially (BD confluations in Latin) or not at all (NA confluations in Latin). And in yet other instances we would be forced, in order to maintain the hypothesis, to make some very surprising assumptions as to the relative markedness of categories (2-3 confluations in Greek, singular-plural confluations in Finnish). I conclude, therefore, that on the available evidence, the theory of confluations as natural classes defined by a sub-classifying configuration, possibly augmented by un-marking, is preferable.

### **3.5 Summary: Sub-Classification, Meaning and Markedness**

In this chapter I have set out to develop a form of linguistic representation based on classification that accounts for the sorts of data that can be used as evidence for a geometric approach, based on topological properties. Whereas in a linear approach, systematic confluations can occur between terms that are spatially contiguous, in the

feature-based approach I have been developing, systematic conflations implicate natural classes, i.e. sets of terms which can be characterized by means of one or more shared feature specifications. This, of course, is quite standard practice in feature-theoretic phonology, syntax and morphology. Indeed the ability of feature representations to capture ‘generalizations’, i.e. natural classes, is one of the fundamental arguments for their utility.

However, I have taken seriously the evidence for linear representations, as adduced in the preceding chapter, and this has had profound consequences on the details of the feature representations employed. In particular, the fact that the terms of the systems concerned are linearizable in such a way as to bring all the natural classes implicated in conflations into adjacency was seen to argue that the features employed must be organized by way of sub-classification rather than cross-classification. This is because the natural classes defined by a sub-classification can always be linearized in this way, whereas the natural classes defined by cross-classifying features in general cannot.

Placing a set of features into a sub-classification has other consequences, however. If features freely cross-classify, their value or contrastive value must lie entirely in the features themselves. The use of a feature in itself achieves the necessary partitioning into mutually exclusive, and jointly exhaustive, sets. But it is the label on the feature, such as [voiced] or [plural] or [goal], which is intended to characterize the basis of this partitioning, generally in acoustico-physiological terms (in phonology) or in notional terms (in syntax or morphology). Features so construed then indicate whether or not the item specified by the feature partakes or does not partake (or is or is not specified to partake) of some acoustico-physiological property, or of some ‘meaning’. Natural classes, then, are sets of items that share some property or some element of meaning.

Features that define the various branches and sub-branches of a sub-classification, however, need not have such extra-linguistic reference. For the value that makes a particular feature distinct from all other features may lie entirely in the relation of that feature to other features in the sub-classification. The feature, in other words, can be defined entirely in terms of its place in the configuration. For the purposes of referring to a category or set of categories, in a lexical item or a grammatical rule or process, all that is required is the ‘address’ of the dominating node within the sub-classification. And for this, any arbitrary scheme of addressing would do. The nodes may as well simply be numbered in top-down left-to-right order, or according to any other method that guarantees

each node of the tree a separate address.

On this view, the natural classes implicated in conflation have an aspect quite different from what they would have if defined by freely cross-classifying features. For there is no reason to assert that natural classes have a common ‘meaning’ — they may or may not. It is sufficient for joint membership of a natural class that they stand in an appropriate relationship in the sub-classifying configuration. The question then becomes, what sub-configurations define such ‘appropriate’ relationships?

We have seen that some systems can be modelled as a pure sub-classification, i.e. one in which the only type of sub-configuration that needs to be addressed is the complete sub-tree dominated by a particular node. Amongst case systems, Ancient Greek and Arabic were two examples, and, if it is accepted that certain relationships between N and V, and between B and G were adequately explained away, Sanskrit was another.

Many other systems, however, display patterns of conflation which cannot be represented as complete sub-trees of a single sub-classification. For these it was proposed that some form of ‘re-marking’, whereby additional natural classes are defined, is indicated. Considerations of several possible schemes of re-marking led to a focus on one particular scheme, uni-directional un-marking, which appears to be able to define something fairly close to the appropriate set of natural classes addressed in many systems. This scheme has the important property of systematic asymmetry, whereby, of each pair of sister nodes, one is ‘privileged’ in the sense that it is able to enter into a relationship ‘appropriate’ for defining a natural class with a wider range of other nodes than is its sister.

It seemed reasonable to equate this privileged sister in all cases with the unmarked member of a privative opposition in a Prague School sense. However, there is an important difference from the classical Prague School practice in this regard, for that practice involved exclusively the use of contentful, freely cross-classifying features. And the theory behind that practice stated that in a privative opposition, the marked member is positively stated to have some property — an acoustico-physiological property, or some notional element of ‘meaning’ — which the unmarked member is not positively stated to have. By contrast the un-marking sub-classifications proposed here seem to be based on a relative ranking of ‘pure’ markedness. But does this make sense? What can pure markedness mean?

To answer this question, one must be very explicit about what the representations are for. I have made it quite clear that the particular configurations advanced, including the decision as to whether un-marking was indicated or not, were made entirely on the basis of the natural classes implicated in confluences. In particular, it was never claimed that the representations embodied any notional characterization of the items represented. That is, one could never tell, merely from looking at the configuration, that a certain terminal node represents a case used in direct address, or that a certain verbal form is used to express events in past time, gnomic truths, and counterfactual conditionals, or that a certain pronominal form is used for contrastive emphasis. All the representations claim to do is to show how the various terms represented group themselves for the purpose of defining natural classes. It is obvious that this information has to be represented somehow in any event.

By contrast, representations using freely cross-classifying features are often thought to embody a notional characterization, if not indeed a definition, of the items being represented. This claim is nowadays more taken for granted than actually defended, but it is made explicit and vigorously defended in various writings of Jakobson, as summarized in 3.2.2. However, as noted there, the notional characterizations are quite vague and certainly do not establish necessary and sufficient conditions for the use of the items.

Therefore it is not necessarily a fatal weakness of the representations advocated in this chapter that they do not suffice to define the necessary and sufficient conditions for the use of a particular grammatical category. For neither do representations that invoke features with suggestive names such as [ $\pm$ source] or [ $\pm$ ascriptive]. And the latter run the danger that they appear to claim, tendentiously as it happens, that what they have to say about the category is the end of the matter. Whether anonymous sub-classifying ‘features’ (i.e. branching nodes) or labelled cross-classifying features are used to extract generalizations out of the linguistic system, in either case a great deal more will need to be said about the ‘meanings’ of grammatical categories. The sub-classifying approach is merely less pretentious in this regard.

There may even be positive advantage in this more circumscribed approach to grammatical ‘meaning’. The reason for this is the likely existence of ‘pure morphology’, or what Aronoff (1994) calls ‘morphology by itself’ or the ‘morphomic level’. The characteristic of rules or processes at the morphomic level is that they pick out sets of forms which cannot be ascribed any common ‘meaning’, any common syntactic function, or any

common feature of phonological form. They form a category, as it were, merely because the morphology says so. They therefore could not be picked out as a category by any contentful feature or combination of features. The motivations for positing a ‘pure morphology’, and the mappings between syntax/semantics and morphology that this move entails, are discussed further in the next chapter.

However, assuming such a pure morphology exists, then it is obviously an advantage to be able to address linguistic items and classes of items without regard to notional criteria, and this advantage is embodied in a representation by way of anonymous sub-classification. However, this does not mean that the items and classes of items defined by a sub-classification are simply meaningless. It merely means that notional criteria were not employed in arriving at any particular configuration, and that the items and classes of items so defined cannot necessarily be exhaustively characterized in notional terms. After all, the claim that the organization of morphology is not necessarily isomorphic with semantic, syntactic, or phonological organization is not the same as a claim that they are completely unrelated.

In fact most of the branching nodes in the sub-classifications advocated in this chapter can be glossed quite straightforwardly, if informally. For instance, notions like direct versus oblique, adverbial versus adnominal, central versus peripheral, etc. seem to be implicated over and over again in the sub-classifications representing case systems. On the other hand, no claim was made that all branchings can be glossed so directly, or that a unique gloss is always obvious, or that the glosses are drawn from some universal set of features. They are, in fact, to be treated as glosses and not as definitions.

What, then, can we make of a form of organization based on ‘pure markedness’? Obviously there can only be a relation of markedness with respect to some criterion or criteria. Given the central role of inflectional morphology in the linguistic system as a whole, and therefore the fact that it must have connections with semantics, syntax, phonology and the lexicon, a reasonable surmise is that the ‘pure’ markedness ranking seen in an asymmetrical sub-classification is something like a *distillation* of the overall markedness of the items concerned with respect to all these domains. Depending on what assumptions one makes about the organization of these other domains, such a markedness ranking may even be precisely quantifiable — or it may not. It would be quite beyond the scope of this enterprise to inquire into the matter. However, it seems quite plausible that the central inflectional organization of a language may be structured in a way that is

completely precise in its own terms, but has come to reflect (over time, perhaps) the overall markedness of its members in the linguistic system as a whole — and nothing else. The ‘pure’ morphology, in other words, does not especially privilege syntactic or semantic or phonological features or properties, but does its best to juggle the requirements of all of them. And having achieved an organization based on an overall ranking with respect to these varied considerations, there is no need for any other so far as addressability by morphological processes is concerned.

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<sup>1</sup>This comment applies also to the ‘paradigm trees’ of Williams (1981, 1994), which look superficially like the approach that will be developed in this chapter. The terminals of Williams’ trees are syntactic features pure and simple, and therefore subject to the criticisms which I will level against all such approaches presently.

<sup>2</sup>Curiously, however, Schenker makes little use of it, even though homonymy patterns figure so heavily. These are characterized by circular diagrams and not by the feature system.

<sup>3</sup>In the realm of gender, it is true that several examples of the previous chapter suggested that masculine should be placed in between neuter and feminine, rather than first as one might have expected. However it is arguable that in three-gender systems it is the neuter rather than masculine gender which is maximally unmarked. In Latin, German, and Russian, for instance, it is the neuter gender that is used in impersonal constructions, i.e. in the absence of an overt or implied controller.

<sup>4</sup>In the terminology employed here, a property of a morpho-syntactic category.

<sup>5</sup>It is interesting to note that practitioners in GPSG, and indeed many other frameworks, have found no need to posit natural classes of items within a single inflectional dimension, and therefore no need to cross-classify that dimension. This might be taken to imply that schemes of cross-classification, which are posited to account for morphological regularities, are thoroughly undermotivated in syntax itself.

<sup>6</sup>Note the terminology: I say that a negative feature *subsumes* its positive counterpart, and conversely that a positive feature *is subsumed by* its negative counterpart.

<sup>7</sup>Actually there is no justification, in terms of natural classes defined, for [N V] rather than [V N].

<sup>8</sup>German, unlike Latin, has true third-person pronouns.

<sup>9</sup>I am aware, of course, that this is not the case historically. I confess also that there is a difficulty in certain alternative formations of the BGsg affix, in particular *-āyās* as in *jarāyās* ‘old age’, *-es* as in *susakes* ‘good friend’, and *-us* as in *naptus* ‘grandson’ (Müller 1870, §§166, 232, 235 respectively — note that Müller writes an *-h* with subscripted dot where I have *-s*). Though a case could be made that the *-āy-* of *-āyās* represents part of an alternative stem rather than part of the suffix, it is not easy to explain away *-es* and *-us* either in that manner or as morpho-phonemically conditioned alternants of *-as*.

<sup>10</sup>It is of course the historical ‘stem-vowel’.

## Chapter 4

# Mapping and Other Matters

### 4.1 Introduction

I showed in the previous chapter that all the patterns of homonymy which were modelled in Chapter 2 by way of one-dimensional, i.e. linear, geometric representations could also be modelled as sub-classifications with or without un-marking. I showed that in every instance there exists a sub-classificatory configuration which, with the aid of un-marking, defines exactly the same set of natural classes as the linear representation. In addition, there is in many instances some sub-classificatory configuration which is superior to the linear representation in that it defines something much closer to the actual set of natural classes that is actually implicated in homonymies. In a few instances, a configuration was available which defined exactly the natural classes needed and no more.

In this chapter I address some of the implications of the classifications proposed in Chapter 3. One of the issues held over from that chapter concerns the classificatory equivalent of McCreight & Chvany's (1991) multi-dimensional representations. Some of these can and others cannot be reduced to linear representations. I deal first with an example of a multi-dimensional representation that can be so reduced, primarily because the sub-classifying equivalent highlights very clearly the degree to which morpho-syntactic and morphological representations can differ.

This leads to an examination of the need for some scheme of mapping between the syntax and the morphology, of the independent evidence for it, and of some suggestions for how this might occur. I then apply some of these ideas to a sub-classificatory representation, and show that some rather complicated mapping arrangements mediated by the sub-classification are nothing less than descriptive adequacy requires.

I then examine more closely the proposal that the mapping between syntax and phonological realizations should rather be by way of 'rules of referral', and argue that the sub-classification of morphological categories is a more constrained and therefore superior mechanism.

Finally, I address briefly some of the issues raised by multi-dimensional representations, and the applicability to them of disjunctively ordered realizations. I do not, however, address the issue whether there is a sub-classificatory equivalent of such representations, this being a difficult issue which awaits and deserves further research.

## 4.2 Reducible Multi-Dimensional Representations

It was seen in 2.3.6 that in German, as an exceptionless rule, the distinction between the three genders is neutralized in the plural. This makes it possible to model the plural number as merely another term in the same dimension in which gender is modelled. Thus, instead of a two dimension representation such as [1a], all the facts (as far as morphological homonymies are concerned) can be modelled as the linear representation [1b]:

[1]

(a)

	<b>m</b>	<b>n</b>	<b>f</b>
<b>sg</b>			
<b>pl</b>			

(b)

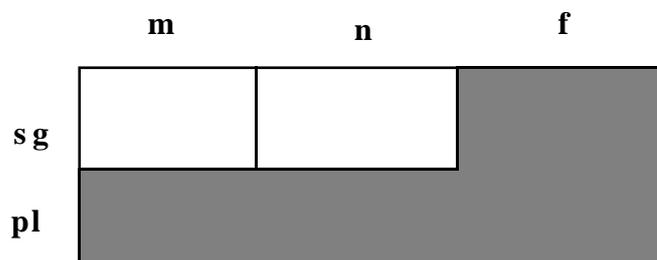
<b>m</b>	<b>n</b>	<b>f</b>	<b>p</b>

It might seem as if representation [1b] is merely shorthand for the more accurate representation [1a]. After all, the two-dimensional representation corresponds to our intuitive notion of a grammatical category (represented by a spatial dimension) in a way that the linear representation does not. And the homonymy facts can be represented just as easily in either way. For instance, the homonymy in three cases of the pronominal declensions between the forms of the feminine singular and those of the plural can be represented in either format:

[2]

**Context for homonymies of N, A and G in pronominal declension**

(a)



(b)

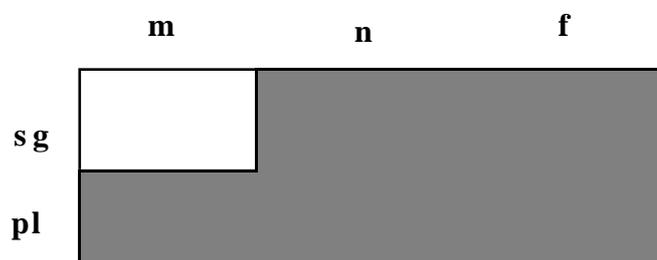


Similarly with the context for the generalization that the nominative and accusative cases are always identical:

[3]

**Context for the constraint that N = A**

(a)



(b)



However, the linear representations are superior because they express directly the fact that the neutralization of genders in the plural is absolutely exceptionless — they make any distinction of gender in the plural impossible to represent. By contrast, the two-dimensional representations allow for the representation of unaddressed natural classes such as the following:

[4]

**An impossible but representable natural class**

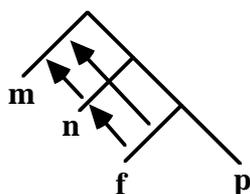
	<b>m</b>	<b>n</b>	<b>f</b>
<b>sg</b>			
<b>pl</b>			

That is, the two-dimensional representation indicates that it is *possible* to make a natural class of all the genders in the plural (possibly including some terms from the singular as well), but it does not *require* it.

In this regard it is instructive to compare the situation in Russian. In that language there is likewise a neutralization of gender distinctions in the plural, and it is *almost* invariable — but not quite. The numerals ‘two’, ‘both’ and ‘one and a half’ all distinguish a masculine/neuter form (respectively *dva*, *óba*, *poltorá*) from a feminine form (respectively *dv’é*, *ób’é*, *poltorí*). Of these, an argument could be made that, on the basis of both morphology and syntactic distribution, the relevant forms of ‘two’ are not truly plural (the gender distinction is made only in the nominative and accusative cases, and in these cases the numeral is accompanied by a genitive singular of the noun being counted). But *óba* at least is quite clearly plural in both morphology and syntax, and it maintains the distinction between the feminine and the other two genders throughout all its cases (Unbegaun 1957:138). In addition, there is no special affinity between the plural and any gender in the singular in Russian, as there is between the plural and the feminine singular in German.

These considerations suggest that for German the linear representation of gender-cum-number is in fact the correct one, in geometrical terms. And as with all linear representations, there is at least one sub-classificatory equivalent, viz. the right-branching configuration with un-marking:

[5]

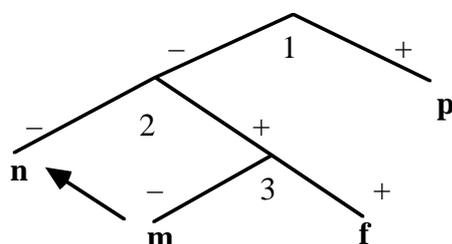


In fact, however, the natural class {n f p} is implicated only in the statement of the

constraint about the identity of the nominative and accusative cases. This could, perhaps, be regarded as a lexical redundancy rule over all the various stems and affixes involved in the marking of these two cases, rather than as a natural class that needs to be addressed in the lexical entry of any particular stem or affix. If we confine the requirements on the representation to the definition of natural classes addressed in this way, then we need no longer define {n f p} or {n f} as natural classes. This brings up several additional possibilities.

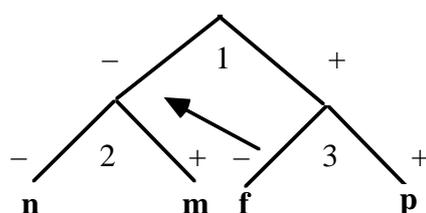
Recall from 2.3.6 that outside of the pronominal declension, there is no particular affinity between the feminine and the plural. There is a close affinity between the masculine and neuter genders (strong nouns take the same endings in the genitive and dative cases, and the weak declension is confined to masculines and neuters), and a close affinity between all the genders in the singular (zero affixation for the nominative and accusative cases at least, according to one of the analyses presented). There is also a weak connection between the feminine and masculine genders (use of the plural formation in umlaut + *e*, however analysed: hence *Gast* ~ *Gäste* ‘guest(s)’ m. and *Nacht* ~ *Nächte* ‘night(s)’ f; neuters never form the plural in this way). This suggests the following configuration for the non-pronominal declension:

[6]



In the pronominal declension, by contrast, the feminine shows affinities only with the plural, and with neither non-feminine gender of the singular. This suggests a balanced tree:

[7]



Note that the operation of un-marking in [7] makes a natural class of all the singular genders, even though this is not necessary to account for homonymies within the pronominal declension. The result is that the singular can be addressed in this as in representation [6] for the non-pronominal declension, *though in different ways*. This raises two interrelated

questions: (1) where has the category of number gone? and (2) how do principles and rules of grammar, other than conflating items, refer to the category of number?

## 4.3 Mapping

### 4.3.1 Introduction

In answer to the first question, we may note that the differing representations of the ‘same’ set of terms that are seen here have already been foreshadowed in the previous chapter, where I argued for different representations of the cases in German and in Latin for nouns and for pronouns. The different representations were forced by the differing observed patterns of case-homonymies in the two parts of speech. But I suggested that the representations have a certain naturalness in that they reflect the different functional roles of the various cases. So in both German and Latin, I argued that the genitive case has a more peripheral role in the pronouns than it does in nouns, because of the existence of possessive determiners which perform most of its functions. Similarly, I argued that the nominative case of Latin pronouns has a different functional role from the nominative case of nouns, since Latin is a pro-drop language and therefore the nominative pronouns carry a nuance of contrastive emphasis which nominative nouns do not.

Similar considerations apply here. The non-pronominal declension applies to nouns (as well as to adjectives in ‘weak’ position). For nouns the distinction between singular and plural bears a highly salient referential value, whereas the distinctions of gender in the singular, being largely arbitrary, are less salient referentially. Configuration [6] then reflects the fact that the major split in the declension is between the singular and the plural.

The situation in the pronominal declension is quite different. This form of declension applies to determiners, to adjectives in the absence of a preceding inflected determiner, and to personal pronouns. In the case of the determiners and adjectives, the distinction between singular and plural is merely a matter of agreement, and so plausibly not very salient referentially. In the case of the pronouns, the distinction of number is clearly highly salient, but is for the most part embodied in a suppletive stem rather than in the inflection itself. And the suppletive stem for the nominative and accusative plural of the masculine and neuter third-person pronouns is none other than the same stem that is used in the feminine singular.

So the different representations seem reasonable on pragmatic grounds, as did the differing representations of the cases in German and Latin. And in any event they, or something like them, are necessary to account for the homonymy facts. This leaves us, though, with the question of addressing the singular or plural numbers *as numbers*.

It is clear, for instance, that there are rules of the grammar which need to address the distinction between singular and plural forms without regard to gender. Most obviously, this is necessary for subject-verb agreement, which has regard to person and number but not gender. There are actually two questions involved here: (1) how to address the numbers at all, and (2) how to do so in a uniform way.

Question (1) is answered by the fact that the singular and plural numbers in either configuration constitute a natural class of items. In representation [6], the singular terms are picked out as [-1] and the plural as [+1]. In representation [7], the singular terms are picked out as [-3] and the plural as [+3]. Thus it is not a problem to identify the singular or plural terms, as required, in either configuration.

But this raises the issue of question (2). It would be absurd to imagine that the rules of subject-verb agreement make reference to a disjunction of specifications, one per sub-classifying configuration, that just happen to pick out a particular number. The difficulty hardly needs labouring, but it is worthwhile to point out that, if such a scheme were operative, then there would be no reason not to expect agreement rules to pick out one such category in one configuration and a different one in another. For instance, a certain agreement morpheme might be used if the subject was *either* a plural pronoun *or* a masculine-or-neuter singular noun. Clearly this would be no worse, from a formal point of view, than the disjunction that would be required to pick out the plural in both configurations. Rather, the rules need to pick out the singular or plural as a category regardless of the particular sub-classification involved.

The same point applies to the different sub-classifications postulated for case in nouns and pronouns. Again, it would be absurd to imagine that case-assignment rules would mention a disjunction of feature specifications that just happens to pick out the dative case in a number of different configurations. Rather, syntactic rules need to ‘see’ the dative case as a single coherent entity.

In general, the problem is that the representations of purely morphological phenomena that I have been developing are in no way isomorphic to representations of the syntactic functions which the forms concerned are called on to undertake. This must lead to one of two conclusions: either the representations are fundamentally wrong, and morphological organization is isomorphic to syntactic organization, or morphological and syntactic organization are indeed not isomorphic, so that there needs to be some mapping function between the two.

Accepting the first conclusion would entail either ignoring or explaining away the evidence

I have adduced for an organization of morphological categories which is linearizable and therefore susceptible of being represented as a sub-classification with or without un-marking, or alternatively assuming that the morphological aspects of syntax are organized in the same way.

I think the first option is ruled out a priori — the evidence of systematic homonymies of a linearizable character is simply too extensive to ignore. But so equally, in the languages I have considered (which may well constitute a linguistic type as far as this is concerned) is the lack of evidence for any substantial amount of systematic homonymy which is *not* linearizable. This implies either that the terms concerned are not organized by means of cross-classifying features, or that if they are, for some mysterious reason the potential for addressing definable natural classes is vastly underused by the morphology — and in a very specific way, namely so as to exclude precisely the unlinearizable natural classes. The latter is a most unattractive option, and so I assume that the evidence points to an organization at the morphological level which is either linear-geometric or by way of sub-classification.

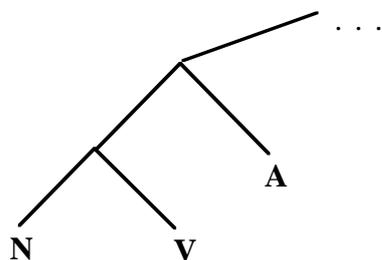
This leaves the possibility that the syntactic features which interface with the morphology are similarly organized, as a set of anonymous sub-classifications not even fully respecting the notion of an inflectional category. But I have already pointed out that this is impossible to reconcile with the fact that apparently unitary syntactic rules, such as those of agreement or case assignment, would then have to refer to arbitrary disjunctions of specifications in any instance where the relevant ‘categories’ are addressed differently in different parts of speech (e.g. nouns and pronouns) or in functionally different content-paradigms (e.g. pronominal and other declensions).

Perhaps, though, this problem is simply an artefact of my postulation of the possibility of such different sub-classifications of the same terms. If we could dispense with that possibility, and so be assured that there is, for instance, only one organization of the cases and only one organization of the genders-cum-numbers in a language like German, then at least there would be a uniform way for syntactic rules to refer to the dative case, the feminine gender, or the plural number. For instance, a syntactic rule assigning dative case in some particular environment could then refer to [CASE +x -y +z] or [CASE +1 -2 +3] or some such.

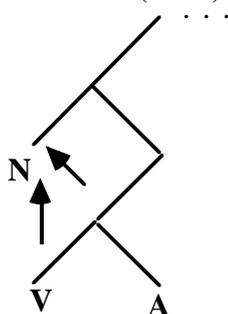
But assume this is correct. The immediate result is that all hope of finding universals in this domain is instantly banished. For there is no reason to think that the ‘same’ case or gender, etc., has a universal characterization in terms of sub-classificatory configuration motivated primarily or entirely by the pattern of systematic homonymies. Quite the contrary. For example, even amongst languages which have the three cases traditionally labelled nominative, vocative and accusative, we have seen that the homonymy facts require different configurations:

[8]

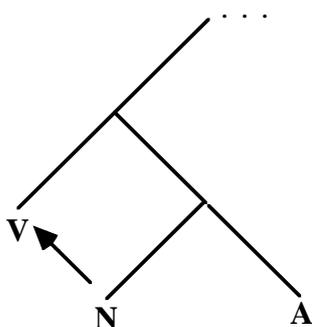
(a) Ancient Greek (3.4.8)



(b) Modern Greek (3.4.4)



(c) Sanskrit (one analysis: 3.4.8)



If something like this, then, is the only characterization of the nominative, vocative and accusative cases in each of these languages, the whole notion of a cross-linguistic category such as ‘the accusative case’ disappears. And whatever may be the dangers of equating morpho-syntactic categories across languages, I think it is obvious that this is too high a price to pay to avert it.

There remains the possibility that the various morpho-syntactic categories are fully specified in the syntax in whatever way is appropriate in that domain (perhaps even in a universal way), and that *in addition* there exists a sub-classificatory superstructure that is addressed in the process of selecting appropriate lexical items (or interpretive rules) to expound those

categories. Something like this is apparently assumed by McCreight & Chvany (1991) when they suggest that the set of morpho-syntactic features may be universal, but the particular geometric grids onto which they are mapped are language-specific.

To see how this might work with a sub-classification, let us look at the German case system again. The four cases could be represented in syntactic rules as follows, using for the sake of argument the presumably universal features [ $\pm$ oblique] and [ $\pm$ goal]:

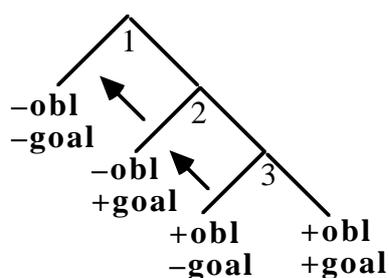
[9]

	<b>oblique</b>	<b>goal</b>
<b>N</b>	–	–
<b>A</b>	–	+
<b>G</b>	+	–
<b>D</b>	+	+

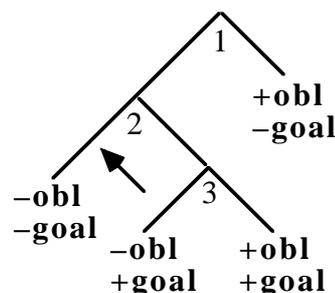
Since these features do not define various natural classes that are required for expressing homonymies (in particular NAG and AGD), we postulate that additionally there is a sub-classification of the terms defined by these features. In fact we can, based on preceding observations, postulate two such sub-classifications:

[10]

(a) **Noun Case**



(b) **Pronoun Case**



On this view, there is a strict division of labour between syntax and morphology, mediated by representations such as these. The syntax ‘sees’ only the terminal features; the morphology ‘sees’ only the nodes of the tree. For instance, let us say that the syntax requires a noun, which is plural, to be in the accusative case in some particular context. This specifies a syntactic representation [ $-obl$   $+goal$ ] (amongst other things). At the same time, the lexicon provides a suffix *-e* which is marked [Noun Case:  $-3$ ], i.e. NAG (amongst other things, including its plurality). From [10a] we see that the complete morphological specification at the terminal labelled [ $-obl$   $+goal$ ] is [Noun Case:  $+1$   $-2$   $-3$ ]. This is compatible with the morphological specification for *-e*, i.e. [Noun Case:  $-3$ ], so that suffix is selected.

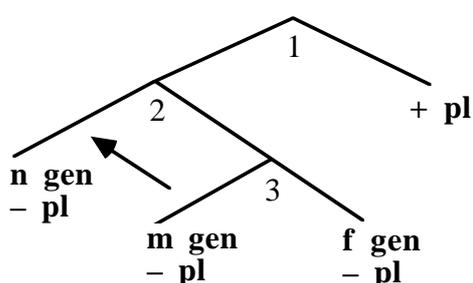
Now let us imagine that the plural item for which accusative case was specified was a

pronoun. There is no difference in the syntactic specification: [-obl +goal]. However this time we look at representation [10b], for pronouns, and find that the terminal node labelled [-obl +goal] is morphologically specified as [Pronoun Case: -1 +2 -3]. We have a lexical entry *sie* which is specified as [Pronoun Case: -3], i.e. NA, so that is selected.

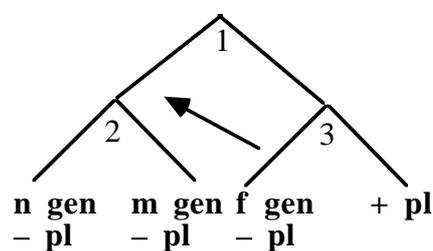
Of course the lexical entry for *sie* would also specify that it is feminine or plural, a specification that could not be characterized as a natural class in terms of separate features for gender and number. To see how this part of the mapping works, we need to assume some syntactic features relevant to gender and number. The number feature would presumably be [ $\pm$ plural]. I know of no syntactic reason to group any genders together as a natural class, so I will assume a three-valued feature [n/m/f gender]. (Nothing hinges on this decision, but it does demonstrate neatly how disjoint the requirements of syntax and morphology can be in the matter of natural classes.) The separate sub-classifications of gender/number for nominal and pronominal declension ([6] and [7] respectively) are repeated here with mapping shown:

[11]

(a) Nominal ‘Gender’



(b) Pronominal ‘Gender’



Now, when the syntactic rule which I have been assuming applies, requiring a *plural* accusative pronoun, we find that the terminal labelled [+pl] is associated with the morphological specifications [Nominal ‘Gender’: +1] and [Pronominal ‘Gender’: +1 +3]. The lexical entry for *sie* contains, in addition to its case specification, the specification [Pronominal ‘Gender’: +1], i.e. feminine or plural. This is compatible and will therefore be selected.

In fact I will argue that the mapping from syntax ultimately to phonology is even more indirect than this and that the terminals of morphological sub-classifications are not, in the general case, marked with syntactic features at all. But first it is necessary to establish that any such mapping is required at all, quite independently of my proposals.

### 4.3.2 Independent Evidence for Mapping

There is obviously a burden of proof to be discharged by anyone positing grammatical

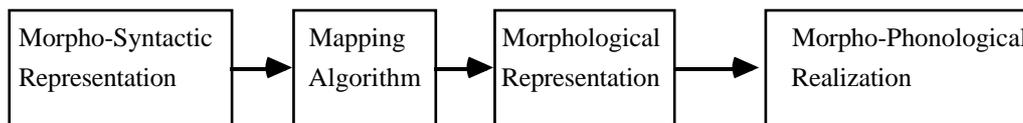
levels and interfaces additional to what is commonly accepted as the minimum. Various recently proposed models of inflectional morphology, including ones as diverse in their theoretical assumptions as the affix-based model of Lieber (1992) and the morpheme-free model of Anderson (1992), purport to manage with little or no mediation between syntactic and morphological representations.

In Lieber's model, affixes are combined with stems and other affixes in accordance with their sub-categorization frames and some presumably universal principles of X-bar theory. Each affix and each stem is additionally associated in the lexicon with its specific feature-content. That feature-content 'percolates' from daughter to mother nodes in accordance with the principles of Head and Backup Percolation and the requirements of the 'categorical signature' for the relevant part of speech, so that ultimately some of it reaches the node dominating the whole word form ( $X^0$ ). The feature-content associated with this node is then what the syntax 'sees' and refers to without further ado in rules and principles of case assignment, concord, and so forth. Apart from the constraints imposed by the categorical signature, and by principles supplying default values for features which have not come by a value in any other way, there is no specifically morphological component at all, on this view.

Anderson's model differs from this in quite essential ways. On this view, the syntax generates bundles of features associated with  $X^0$  (rather than checking for their appropriateness)<sup>1</sup>. A separate component then 'spells out' the features in phonological terms, by adding phonological material (affixation) or modifying existing phonological material (ablaut, etc.). Crucially, however, it is the syntactic features that get directly spelled out: there is no modification or mapping of these features into a separate level of representation which purportedly reflects purely morphological regularities directly<sup>2</sup>.

However, it has become apparent that some degree of non-trivial mapping between syntax and morphology is indeed required. Three areas where this seems indicated are (1) the assignment of stems to inflection classes; (2) the 're-adjustment' of syntactically motivated categories such as case and number to fit the requirements of the morphology; and (3) the association of morpho-syntactic property bundles with particular stems. In the following discussion it needs to be borne in mind that these phenomena have largely been studied by scholars who assume a 'weakly lexicalist' or 'separationist' framework where inflection occurs 'after' syntax. This means that the mappings and re-adjustments proposed have a directional character, generically along the following lines, though the precise proposals of course differ:

[12]



Since my purpose here is not to argue for or against the split-morphology hypothesis, but rather for the need for non-trivial mapping between syntax and inflectional morphology, I will assume without argument that the relevant issues could if necessary be translated into strongly lexicalist terms.

### 4.3.3 Inflection Classes

One of the striking features of languages exhibiting extensive allomorphy in the affixes that realize inflectional categories is the degree to which the stems of the language fall into a relatively small set of ‘inflection classes’ characterized by co-variance in the choice amongst those allomorphs. Clearly this need not be so a priori, since it is perfectly conceivable that each stem would make an independent selection of the allomorph for each bundle of morpho-syntactic properties realized by a single affix in its paradigm.

Consider a hypothetical language where each of three bundles of morpho-syntactic properties is associated with a choice of three alternative realizations:

[13]

1.    a b c
2.    d e f
3.    g h i

If each stem were free to make an independent choice of allomorph for each of the three morpho-syntactic property bundles, the stems would fall into 27 classes according to their repertoire of allomorphs, beginning with 1 = {a d g}, 2 = {a d h}, 3 = {a d i}, 4 = {a e g}, etc. In general, for a fixed number  $a$  of allomorphs distributed between  $p$  properties, the number of such classes is  $a^p$ , a veritable combinatorial explosion as the number of allomorphs and of properties increases.

However, as demonstrated in a series of publications by Carstairs(-McCarthy) (1987, 1988, 1991), this a priori maximum is so far from being reached in natural languages that it is rather the *minimum* number of classes required to make use of each allomorph that is ever attested, or at least something close to it. This is the essence of Carstairs’ Paradigm Economy Principle (PE): the number of inflection classes, defined as a set of stems showing

co-variance of inflectional allomorphs, is equal to the maximum number of allomorphs associated with any one morpho-syntactic property bundle. PE predicts, therefore, that the number of inflection classes in the language [13] would be 3 rather than 27.

Whether PE is a principle of universal grammar or a result of constraints on learning, as suggested by Noyer (1994), it obviously provides the child learner with a strong inferential bias in mastering a language's inflectional system. That is, once the child has an exemplar of each of the highly limited number of inflection classes, s/he can assign any newly encountered stems to an inflection class on the basis, in most cases, of something considerably less than an example of every morpho-syntactic feature bundle, and thereby predict the exponence of as-yet unencountered morpho-syntactic feature bundles.

Further work by Carstairs-McCarthy (1994), moreover, suggests that, given some additional assumptions, PE in fact follows from a severe constraint on the amount of allomorphy associated with any particular property bundle: his No Blur Principle (NB) predicts that every allomorph will in fact be uniquely associated with an inflection class, or else be a single default realization unassociated with any particular inflection class. That is, NB predicts that there can be at most one allomorph associated with each property bundle that is not also an unequivocal 'marker' of inflection class. The inferential bias available to the child is therefore very strong: if the child is lucky enough to encounter a new stem associated with a class-marking allomorph, the rest of the paradigm is available at once; and even if the newly encountered form should be associated with the default allomorph for its property bundle, the choice of inflection class is immediately limited to that subset of inflection classes which are associated with the default allomorph for that property bundle.

It is true that both PE and NB, in order to be made to work, have to be accompanied by a very careful definition of 'inflection class' (Carstairs' 'macro-paradigm') which abstracts away from all variation that correlates with identifiable syntactic, semantic, phonological and stylistic factors (so as to reduce the number of inflection classes), and in addition all allomorphy in stems as opposed to affixes. It is also possible, as Noyer (1994) suggests, that PE and/or NB may be violable in 'tiny systems', such as the conjugation of English verbs or the declension of Modern Irish nouns (though even here, Noyer suggests, there is diachronic pressure to make the relevant systems conformant). But in any event, the apparent conformity of natural languages to constraints such as PE and NB is a striking demonstration of the importance of the notion 'inflection class'.

Another surprising feature of inflection classes, apart from their limited number in a given language, is the extent to which they tend to correlate with some subset of precisely those syntactic, semantic, stylistic and phonological properties that need to be abstracted away from in their definition. The correlation is never perfect (otherwise there would be no need

to posit inflection classes), but it is frequently strong enough to warrant (overridable) redundancy statements in the grammar, corresponding to language learners' and users' evident bias in inflection class assignment, as witnessed, for instance, in the direction of historical change and in the inflection-class assignment of loanwords. These redundancy rules, then, constitute a form of mapping from syntactic to more purely morphological forms of organization.

As an example, in Halle's (1990) treatment of Latin declension, stems are assigned to inflection classes in a post-syntactic 're-adjustment' module, which contains rules like the following:

[14]

- (a) [+fem] → [Class 1]
- (b) [-fem] → [Class 2]

The first assigns the noun stem *port-* 'door', which is syntactically feminine, to inflection class 1, and the noun stems *amīc-* 'friend', which is syntactically masculine, and *dōn-* 'gift', which is syntactically neuter, to inflection class 2. It is these inflection classes that are then referred to in the rules introducing affixes, for instance the following for the nominative singular<sup>3</sup>:

[15]

- (a) [sing] + [nom] → a / [Class 1] + \_\_\_\_
- (b) → um / [Class 2, +neut] + \_\_\_\_
- (c) → us / [Class 2] + \_\_\_\_

Crucially, the rules introducing affixes cannot be stated directly in terms of gender because the correlation expressed in [14] is not invariable. It expresses the default (and overwhelmingly common) situation, but it is possible for a masculine noun to belong to Class 1, e.g. *naut-* 'sailor', and for a feminine noun to belong to Class 2, e.g. *fīc-* 'fig tree'. Halle assumes that this information is specified in the lexical entries for the nouns concerned, overriding the rule in [14b], which is a 'feature-filling', not a 'feature-changing' rule (Kiparsky 1982).

Since these rules can be overridden by inherent lexical features of the noun stem itself, they appear to function much like lexical redundancy rules: the information they encode could be specified in full in the lexical entry of each noun. But even this is not necessarily true as it applies to adjectives. A minority of adjectives decline similarly to Class 3 nouns (not shown here) and must presumably be lexically specified as such. However, adjectives of the majority type get their inflection class *solely* from the rules in [14]. Thus *māgn-* 'big' is declined like a Class 1 noun in the feminine gender, but like a Class 2 noun in the masculine and neuter genders. Clearly neither Class 1 nor Class 2 could be specified in the

lexical entry for *māgn*<sup>4</sup>.

Similar redundancy rules are posited for inflection-class assignment in Russian, though the respective roles of Class 1 and Class 2 are reversed:

[16]

- (a) [-fem] → [Class 1]
- (b) [+fem] → [Class 2]

(These rules play a crucial role in a very surprising example of mixed surface cases in a single NP, as we shall see in the next section.) Again, rule [16a] is overridden in the lexical entries for various stems such *d'ad'* 'uncle' and *Miš'* 'Mike', which are syntactically masculine and referentially male, but decline in accordance with the overwhelmingly feminine pattern.

Aronoff (1994) develops Halle's analysis of Russian further, adding 'reversed' implications, whereby gender is predicted on the basis of inflection class. Thus in Russian the overwhelming majority of feminine nouns belong to Class 2. Nonetheless, a small number of monomorphemic nouns and an indefinite number produced by productive derivation belong to a separate Class 3. Interestingly, all Class 3 nouns with only the sole exception of *put'* 'way' are feminine. Therefore the following implication, overridden only in the lexical entry of *put'*, arises:

[17]

- [Class 3] → [+fem]

Though Aronoff concedes that rules like this look 'peculiar', he argues that they are in fact the norm in the Papua New Guinea language Arapesh (*op.cit.* 89ff)<sup>5</sup>.

What these investigations establish is (1) that there is a notion 'inflection class' which is a feature of purely morphological organization; (2) that while inflection classes are distinct from syntactic notions such as gender, there is a high degree of correlation between them; and therefore (3) that this correlation needs to be established by some form of mapping intermediate between syntax and morphology.

#### 4.3.4 Feature-changing Re-Adjustments

In addition to postulating feature-filling re-adjustment rules, Halle (1990) suggests that *feature-changing* rules are required in some cases. To account for the invariable syncretism

of the nominative and accusative cases in Latin and Russian neuter nouns and adjectives, for instance, he postulates a feature-changing re-adjustment rule which actually changes the syntactic specification [acc] to [nom] in neuter contexts. This then eliminates the need for any spell-out rules referring to accusative neuters. Such a rule must operate outside the syntax (and in fact after it) so that case assignment works correctly in environments such as conjunct NPs consisting of neuter and non-neuter members (otherwise syntactically accusative masculines and feminines conjoined with neuters might also appear, incorrectly, as morphological nominatives).

He makes more extensive use of such feature-changing re-adjustment rules in accounting for certain facts about the realization of case in Russian. Recall from 2.2.9 that the accusative case frequently conflates with either the nominative or the accusative depending on the animacy of the referent (genitive for animates, nominative for inanimates). Specifically, this operates in all plural contexts and in the singular of Class 1 nouns as well. Halle therefore proposes the following re-adjustment rule:

[18]

$$[\text{acc}] \longrightarrow \left\{ \begin{array}{l} [\text{gen}] / [+animate] \\ \\ [\text{nom}] / [-animate] \end{array} \right\} + \left\{ \begin{array}{l} \text{Pl} \\ \\ \text{Sg} \end{array} \right\} + \text{_____}$$

Cond.: If Sg, stem must be Class 1

The assignment of stems to inflectional classes is done by rules much like those of Latin (except that Class 1 correlated with non-feminine gender, and Class 2 with feminine gender, in Russian). As with Latin, the correlation between gender and inflection class is not perfect, so that some stems must be lexically specified for their class. Also as in Latin, adjectives (and specifiers) are assigned to an inflection class by rule rather than inherently: non-feminine adjectives to Class 1, feminine adjectives to Class 2. (However, the affixes in each class for adjectives and specifiers are different from those which attach to nouns of that class.) I can give the relevant part of the inflection-class assignment rule as follows (based on Halle's prose account):

[19]

- (a) [-fem] → [Class 1]
- (b) [+fem] → [Class 2]

These rule relate syntactic representations with surface realizations as follows. We assume

that a syntactic rule of concord has spread the head noun's case, number, gender and animacy features to each of its adjectives and specifiers. On this basis inflection-class assignment by [16] takes place, followed (vacuously if need be) by case re-adjustment by [18]. Finally the re-adjusted case features, along with the number and gender features, are realized by affixes:

[20]

	[–animate]	[+animate]
<i>Singular</i> —	‘this old town’ (m.)	‘this old proletarian’ (m.)
<b>Final Syntactic Representation:</b>	et- star- gorod- ASg ASg ASg	et- star- prol’etarij- ASg ASg ASg
By [16]:	1 1 1	1 1 1
By [18]:	<u>NSg</u> <u>NSg</u> <u>NSg</u>	<u>GSg</u> <u>GSg</u> <u>GSg</u>
<b>Realization:</b>	et-ot star-ij gorod-∅	et-ovo star-ovo prol’etarij-a
<i>Plural</i> —	‘these old towns’	‘these old proletarians’
<b>Final Syntactic Representation:</b>	et- star- gorod- API API API	et- star- prol’etarij- API API API
By [16]:	1 1 1	1 1 1
By [18]:	<u>NPl</u> <u>NPl</u> <u>NPl</u>	<u>GPl</u> <u>GPl</u> <u>GPl</u>
<b>Realization:</b>	et’-i star-ije gorod-a	et’-ix star-ix prol’etarij-ev

Class 2 items are not subject to the re-adjustment rule in the singular. Otherwise, all is as with Class 1:

[21]

	[–animate]	[+animate]
<i>Singular</i> —	‘this old work’ (f.)	‘this old woman’ (f.)
<b>Final Syntactic Representation:</b>	et- star- rabot- ASg ASg ASg	et- star- ženščin- ASg ASg ASg
By [16]:	2 2 2	2 2 2
By [18]:	ASg ASg ASg	ASg ASg ASg
<b>Realization:</b>	et-u star-uju rabot-u	et-u star-uju ženščin-u
<i>Plural</i> —	‘these old works’	‘these old women’
<b>Final Syntactic Representation:</b>	et- star- rabot- API API API	et- star- ženščin-- API API API
By [16]:	2 2 2	2 2 2
By [18]:	<u>NPI</u> <u>NPI</u> <u>NPI</u>	<u>GPI</u> <u>GPI</u> <u>GPI</u>
<b>Realization:</b>	et´-i star-ije rabot-i	et´-ix star-ix ženščin-Ø

Things get interesting when the head noun is masculine but exceptionally belongs to Class 2, e.g. *v´el´mož-* ‘nobleman’. Such a noun has [Class 2] specified in its lexical entry, and therefore the (feature-filling) class assignment rule fails to apply to it. But the rule does apply to its accompanying adjectives and specifiers, since these are assigned to a class solely by rule. The result is a mixture of cases at the surface level:

[22]

*Singular* — ‘this old nobleman’ (masculine, animate)

Final Syntactic

Representation: et- star- v’el’mož-  
ASg ASg ASg  
2

By [16]: 1 1 2

By [18]: GSg GSg ASg

Realization: et-ovo star-ovo v’el’mož-u

Even more intricate mismatches between syntax and morphology (“astonishingly opaque”: p.169) occur in NPs featuring a numeral. The actual data are indeed too complicated to reproduce here, but Halle accounts for them with only a further two (albeit complex) re-adjustment rules. One rule “turns all Nominatives to the right of the numeral into Genitives” in numeral phrases in the direct cases. This applies only to plural numeral phrases, which it will be recalled have had any accusatives turned into nominatives already by [18]. The rule is:

[23]

$$\text{nom} \rightarrow \text{gen} / \text{NP}[\dots [\text{Numeral}] + \text{NUMBER} + \{\text{N}, \text{A}\} + \dots + \text{Pl} \text{ \_\_\_\_ } \dots]$$

Perhaps more surprisingly, a second rule changes plural nouns to singular in numeral phrases involving certain ‘adjectival’ numerals. These are numerals which are categorially adjectives, whereas other numerals are categorially nouns (in fact Class 3 feminine inanimates, and furthermore *singularia tantum*). The rule is given as follows:

[24]

$$\text{Pl} \rightarrow \text{Sg} / \text{NP}[\dots [\text{Numeral}]_{\text{Adj}} + \text{Pl} + \text{N} + \dots [\text{NOUN}] + \text{\_\_\_\_\_\_}]$$

The combined effect of these re-adjustment rules can be seen in a derivation of the phrase ‘three old towns’ in a syntactically accusative context. ‘Three’ is one of the adjective-numerals, and so subject to [24] in addition to [23]:

[25]

Final Syntactic Representation:	${}_{\text{NPl}}$	$[\text{tr}'\text{-}]_{\text{Num}}$	$[\text{star-}]_{\text{A}}$	$[\text{gorod-}]_{\text{N}}$	$]_{\text{NP}}$
		API	API	API	
By [18]:		NPl	<u>NPl</u>	<u>NPl</u>	
By [23]:		NPl	<u>GPl</u>	<u>GPl</u>	
By [24]:		NPl	GPl	<u>GSg</u>	
Realization:		tr'-i	star-ix	gorod-a	

The Russian data demonstrate, again, a need for a non-trivial interface module to account for the mismatches between syntactic and morphological requirements. Whether Halle's particular formulation of this interface is the right one is another matter. In particular, Halle uses a mutational strategy that changes morpho-syntactic features into *other morpho-syntactic features*, but does so by subterfuge as it were, after the syntax can no longer 'see' them. I will deal with this aspect of the analysis further below.

### 4.3.5 Purely Morphological Elements

#### 4.3.5.1 The English Past Participle

One of Aronoff's (1994) arguments for 'pure morphology' centres on the patent morphological identity of forms which cannot have any consistent syntactic or semantic characterization. One of these is the English passive or perfect participle<sup>6</sup>.

It is well known that every non-modal English verb has a form commonly called the 'past participle'. This coincides with the finite past tense marked by /-d/ in the majority of regular verbs. In a substantial number of irregular verbs, however, the past participle is formed differently, with a range of suffixes *-t*, *-n* or zero, the latter two possibly accompanied by ablaut of the stem. We can therefore think in terms of a function, call it  $F_{en}$ , from verb stems (or verb lexemes) to past-participle forms: for every non-modal verb,  $F_{en}$  supplies a morpho-phonological realization of its past participle.

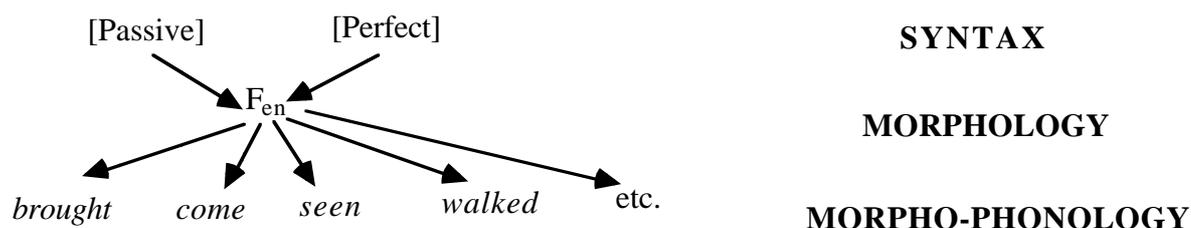
The question is, what is the input to this function? In English, past participles provide a non-finite form of a predicate with passive syntax and semantics corresponding to transitive verbs. The exact characterization of the relation between active and passive forms of the 'same' predicate has long been a lively area of research in linguistics, with different analysts proposing a lexical transformation (e.g. Bresnan 1982b), a mapping function from argument structures to arrays of grammatical functions (Bresnan & Kanerva 1989, Bresnan 1990),

and various syntactic transformations (e.g. Chomsky 1965, 1981, Baker 1988). One feature common to all these analyses is that they attempt to characterize the passive in universal terms. Whatever mechanism is advanced as being responsible for this particular valency alternation is assumed to be available in universal grammar.

On the other hand the past participle in English is also used in the construction of a ‘perfect’ series of tenses, invariably in the company of some form of the verb *have*. This construction is rather common in Western European languages, though the details vary, with some of these languages requiring a construction with a copular verb in various circumstances. A similar construction has developed in Modern Greek, except that there the verb *έχο* ‘have’ is used not with any identifiable past or passive participle, but rather with a special form that happens to be homonymous with a finite third-person singular active form: thus *έχο γράφι* ‘I have written’ (cf. passive participle *γρამένος*). The construction is not, as far as I am aware, found elsewhere, suggesting that it is an areal feature<sup>7</sup>.

Even if the abstract category ‘perfect tense’ is universal, as ‘passive voice’ is assumed to be, it is not particularly common for the two to coincide morphologically. This suggests that they are in fact quite distinct semantico-syntactic categories, even though they happen to have merged to some extent in various European languages. Assuming, with Aronoff, that this is so, we are led to the conclusion that the input to  $F_{en}$  in English (and French, German, etc.) is a disjunction of the separate syntactic entities Passive and Perfect:

[26]



Aronoff points out that it is vital that “the phonological realizations of  $F_{en}$  must ignore any distinction between Passive and Perfect as syntactic entities, for otherwise we would not be able to account for the complete morphological coincidence of the two constructions” (p.25). The evidence for the purely morphological level, then, crucially hinges on the non-identity in syntax of the categories Passive and Perfect. It may be possible to mount an argument for their identity in syntax, at least parochially in English and for some other languages. Alternatively, it may be possible to mount an argument for semantic identity at some level, so that the input to  $F_{en}$  would be some single conceptual structure that characterizes just the Passive and the Perfect as a single entity. As Aronoff points out, though, this seems implausible in light of the fact that a detailed analysis of the semantics of the Perfect, viz. Klein (1992), makes no connection with the passive.

At any rate, it is most unlikely that any argument for syntactic or semantic identity could be mounted in respect of the next set of data, relating to the ‘third stem’ in Latin.

#### 4.3.5.2 The ‘Third Stem’ in Latin

Most Latin verbs have a form traditionally called the past participle, the passive participle, or the past passive participle (henceforth PPP; data from Aronoff 1994 Chapter 2):

[27]

Infinitive	PPP	Gloss
amāre	amātus	‘love’
monēre	monitus	‘warn’
regere	rēctus	‘rule’
audire	auditus	‘hear’

The PPP is used as an attributive and predicative adjective, and also, in conjunction with forms of the verb *esse* ‘to be’, in the periphrastic expression of the passive perfective aspect. It contrasts with an imperfective<sup>8</sup> active participle [28a] and a future active participle [28a].

[28]

(a)	(b)
amāns	amātūrus
monēns	monitūrus
regēns	rēctūrus
audiēns	audītūrus

The PPP is inflected as an ordinary adjective, for number, gender and case. We can therefore pick off the perfectly regular noun/adjective desinence *-us* etc. and isolate a stem, e.g. *amāt-*, *monit-*, *rēct-*, *audīt-*. It might appear as if this stem can be characterized notionally as passive, or perfective, or a combination of both, and therefore that it should be formally distinguished from other stems by means of a contentful feature such as [+passive] and/or [+perfective]. However, as Aronoff demonstrates, this is even more clearly impossible than in the English case. The reason is that stems of this type are used in a variety of inflectional and derivational formations, not all of them sharing the properties of passiveness or perfectivity.

Following Aronoff, let us refer to these stems as ‘third stems’. Apart from the PPP, the third stem is also used in the formation of the *future active* participle [29a]. It is used also

in the formation of the supine [29b], a defective deverbal noun whose most characteristic uses are to express the (future, active) purpose after a verb of motion, and as a kind of specifier of adjectives. The third stem is used also in the formation of agent nouns in *-or* [29c] and two abstract nominals in *-iō(n)* [29d] and *-ūr-* [29e]. It is also used in the formation of derived desiderative verbs [29f], intensive verbs [29g] and iterative verbs [29h].

[29]

(a)	amātūrus	‘about to love’
(b)	spectātum	‘in order to see’
(c)	victor	‘winner’
(d)	conventiō	‘meeting’
(e)	scriptūra	‘writing’
(f)	partūrīre	‘to be in labor’ (i.e. to want to give birth)
(g)	tractāre	‘to drag’
(h)	scriptitāre	‘to write often’

Clearly this stem cannot itself carry a feature such as [+passive]. Note in particular the supine [29b], which differs from the PPP only in the inflectional class of the derived word. The supine is clearly an active form, and refers to a future purpose. Nor can the stem itself carry a feature such as [+perfective], given its employment in iterative verbs [29h] and nouns of habitual agency [29c].

The examples given so far all show a formation with a suffix *-t-*. We might, then, examine the possibility that we really have a set of homonymous affixes here, and therefore not a single stem at all:

[30]

t <sub>1</sub>	past, passive
t <sub>2</sub>	purposive, active
t <sub>3</sub>	intensive
	etc.

However, the facts of irregular allomorphy make this solution impossible. The reason is that many verbs have a third stem which is, to varying degrees up to and including total suppletion, idiosyncratic:

[31]

laudā-re	laudāt-	laudāt-ūr-	‘praise’
monē-re	monit-	monit-ūr-	‘warn’
dēlē-re	dēlēt-	dēlēt-ūr-	‘destroy’

haerē-re	haes-	haes-ūr-	‘stick’
preme-re	press-	press-ūr-	‘press’
fer-re	lāt-	lāt-ūr-	‘bear’

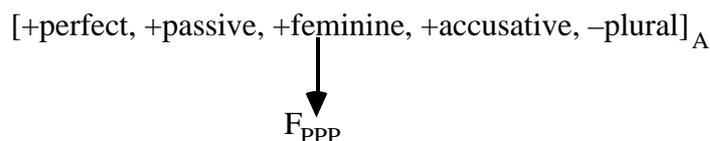
There are only about half a dozen exceptions to the co-variance of the stem used in the PPP and that used in the future active participle (Aronoff, *op.cit.* 177 n9). In all the other instances, we must be dealing with a single morpheme. And in addition to these future active participles based on the same irregularly formed third stem that is used in the PPP, there are numerous members of the other categories — agent nominals, abstract nominals, and desiderative, intensive and iterative verbs — also formed on the same irregular stem.

Aronoff concludes, therefore, that there is a unitary morphological category ‘third stem’ implicated in various grammatical processes, which is not capable of being characterized either semantically or phonologically. It is a purely morphological category. Let us call the function which derives third stems from some more basic stem or from a ‘lexeme’ (abstracting away as usual from the issues involved in that decision)  $F_3$ . As opposed to the situation with English  $F_{en}$ , it appears that  $F_3$  does not take even a disjunction of morpho-syntactic categories directly as input. Rather,  $F_3$  is itself used only by other mapping functions.

I will restrict myself here to three of those functions, namely those that generate perfect passive participles, supines, and future active infinitives.

As noted above, the perfect passive participle consists of the output of  $F_3$  followed by the usual desinences of first/second declension adjectives. It is clear that neither the notions ‘passive’ nor ‘perfect’ are inherently associated with  $F_3$  itself. Equally clearly, they cannot be associated with the adjectival desinences, which merely signal gender, number and case. Let us call the function that derives the perfect passive participle  $F_{PPP}$ . The input to  $F_{PPP}$  must be a verb (stem or lexeme) and the relevant agreement specifications supplied by the syntax:

[32]



The function might then be defined, semi-formally, as follows:

[33]

$$F_{PPP}(\text{Verb}, \text{Gender}, \text{Number}, \text{Case}) = [F_3(\text{Verb}), \text{Gender}, \text{Number}, \text{Case}]_A$$

$F_3$  then supplies an appropriate stem, e.g. *amāt-*, *rēct-* etc. Assuming a rule of inflection class assignment like [14], this will then operate to assign the form to an inflection class based on its gender, i.e. Class 1 if feminine or Class 2 if non-feminine. The appropriate suffix for the given case and number combination can then be supplied directly, deriving a form such as *amātam* ‘loved f.sg.acc’. Note in particular that apart from triggering the mapping onto  $F_{PPP}$ , the features of passiveness and perfectivity play no role in the morphology at all.

The derivation of the supine works similarly. The supine looks morphologically like a fourth-declension noun, judging from its two forms, the accusative in *-um* and the ‘ablative’ in *-ū*. The latter suffix is characteristic of fourth-declension masculine and neuter ablatives, but also of neuter datives, so that the supine could reasonably be taken as a fourth-declension neuter noun, and the case of supine specifiers as datives (I assume the latter for exposition’s sake). At any rate, its case must be specified by the syntax. I assume, then, a function  $F_{SUP}$  whose input is a verb (stem or lexeme) and a case specification, at least.  $F_{SUP}$  can be defined as follows:

[34]

$$F_{SUP}(\text{Verb}, \text{Case}) = [F_3(\text{Verb}), \text{Case}, \text{singular}, \text{neuter}, \text{class 4}]_N$$

Again,  $F_3$  supplies an appropriate stem. This time, however, the inflection class of the result is specified in the definition itself, which will result in desinences *-um* or *-ū* as appropriate.

The future active participle is a little more complicated, in that there is additional material between  $F_3$  and the agreement desinences. The material is invariably *-ūr-*, but it is difficult to associate this stretch of phonology with any notion of futurity or activeness, since it is also used in the formation of abstract nominals such as *scriptūra* in [29e]. We can accommodate this by positing another ‘helper’ function  $F_{ur}$ , which simply adds *-ūr-* to the third stem of the verb stem given as input:

[35]

$$F_{ur}(\text{Verb}) = [F_3(\text{verb}) + \bar{u}r]$$

Assuming such a function, the future active participle mapping function  $F_{FAP}$  is identical to  $F_{PPP}$ , except in calling  $F_{ur}$  (which itself calls  $F_3$ ) rather than  $F_3$  directly:

[36]

$$F_{ppp}(\text{Verb, Gender, Number, Case}) = [F_{ur}(\text{Verb}), \text{Gender, Number, Case}]_A$$

Functions like  $F_3$  and the rest are what Aronoff (1994) calls ‘morphemes’, the terminological innovation serving to highlight the fact that they are purely morphological constructs. He says of them (p. 25):

Let us call the level of such purely morphological functions *morphomic* and the functions themselves *morphomes*. What is novel about this level, and what warrants giving it a special name, is that it embodies an empirical claim: the mapping from morphosyntax to phonological realization is not direct but passes through an intermediate level. Note that not all mappings from morphosyntax to morphology are necessarily so indirect [as  $F_{en}$ ]. It is possible to have a singleton morphosyntactic set mapped onto a singleton morphomic set, which itself is mapped onto a singleton morphophonological set, although such direct mappings are less common than one would like to believe. It is possible to have cases intermediate in complexity between the two extremes. All of these mappings technically involve morphemes, but it is morphemes like  $F_{en}$  that truly earn their name. (italics in original)

For present purposes I do not commit myself to all of Aronoff’s assumptions, such as the notion of a ‘lexeme’ entailed by the separationist hypothesis, the direction of mapping, or the particular details of how this is achieved. I am merely concerned to show that some such mapping is necessary in the general case, and therefore that we should not expect that morphological categories such as ‘case’, ‘gender’ or ‘number’ are necessarily isomorphic with their syntactic counterparts. The leading idea is simply that between the levels of morpho-syntactic category and morpho-phonological exponence, there must be a purely morphological level consisting of ‘morphemes’ or morphological categories.

#### 4.3.6 Mapping onto a sub-classification

With this in hand, let us return to the mapping from German gender and number specifications onto the sub-classifications proposed in [6] and [7]. We can now see that the terminals of the morphological sub-classification should not in the general case be morpho-syntactic distinctive features, but rather ‘morphemes’. In the present instance the mapping of gender/number specifications onto morphemes is presumably as trivial as [37], but this need not be so in the general case.

[37]

[–animate, –feminine, –plural]  $\longrightarrow F_n$

[+animate, –feminine, –plural]  $\longrightarrow F_m$

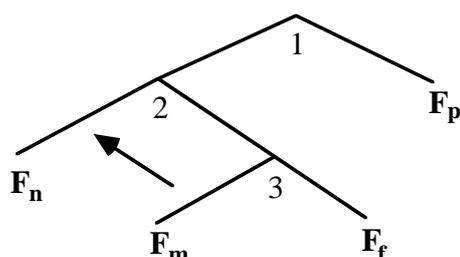
[+animate, +feminine, +plural]  $\rightarrow F_f$

[+plural]  $\rightarrow F_p$

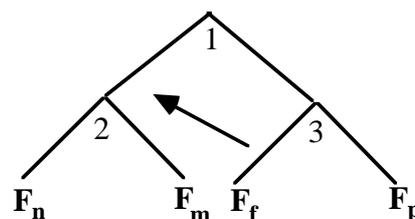
The sub-classifications now look like this:

[38]

(a) Nominal ‘Gender’



(b) Pronominal ‘Gender’



It is now clear that the purpose of the sub-classification is to define *natural classes of morphemes* with respect to their morpho-phonological realization. The terminals in this representation are therefore not quite the same thing as Aronovian mapping functions, since the latter perform a single-step mapping from morpho-syntax to morpho-phonology. In this representation that single-step mapping is itself split into two steps: the terminals provide the interface between morpho-syntax and the morphomic level, while the mapping from the morphomic to the morpho-phonemic level is associated with *sets* of terminals (minimally one) which are licensed to act as a group either because of common dominance or through the operation of un-marking. That is, while a morpho-syntactic specification such as [+feminine, –plural] gets mapped onto the morpheme  $F_f$ , the mapping to a form like *sie* (feminine singular or common plural pronoun) goes not by way of the terminal marked  $F_f$  itself, but by way of the dominating node marked [3] in [38b].

In the present instance this looks like more work than is necessary, particularly since the mapping from [+feminine, –plural] to  $F_f$  is itself trivial. However the following example will demonstrate that such a two-stage mapping is required in the general case, and therefore must be available even if minimally used.

#### 4.3.6.1 English Tense Stems

Recall from 2.2.4 that the three tense stems of English (and German) irregular verbs systematically showed homonymies between PRS and PSP, or between PST and PSP, or between all three, but never between PRS and PST. We are now in a position to equate PSP with  $F_{en}$  of [26], and in like fashion we can think of PRS and PST also as mapping functions  $F_0$  and  $F_{ed}$  respectively. The mapping from morpho-syntactic properties of

passiveness or perfectivity<sup>9</sup> to  $F_{en}$  was argued for above at 4.3.5.1. It would not matter if the mappings to  $F_0$  and  $F_{ed}$  were absolutely trivial, along the lines of [37], although as it happens  $F_{ed}$  at least seems to be implicated in various counter-factual and ‘subjunctive’ constructions that are not past, e.g. *if he knew he would tell you*.

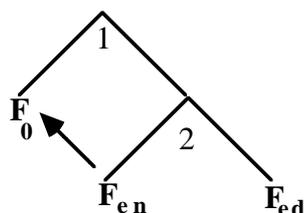
[39]

[+past]  $\rightarrow F_{ed}$

[-past]  $\rightarrow F_0$

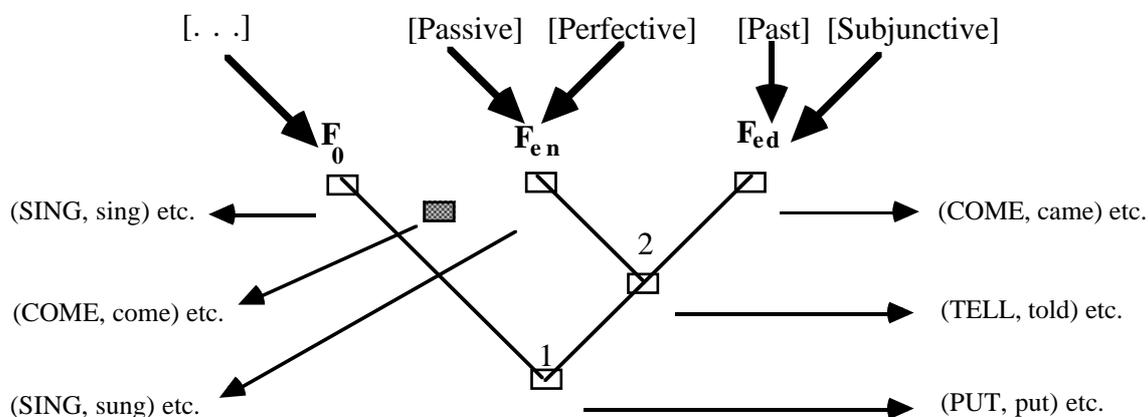
Now the patterns of homonymy suggest a sub-classification of the three functions along the following lines:

[40]



Given this representation, the morpho-phonological realizations of the different tense stems are associated with sets of terminals, in particular the sets  $\{F_0 F_{en}\}$ ,  $\{F_{en} F_{ed}\}$  and  $\{F_0 F_{en} F_{ed}\}$ , as well as the three one-membered sets. Putting this together and providing some examples from the morpho-syntactic and morpho-phonological sides (and inverting the tree for convenience), we see in [41] the necessity for a two-stage mapping:

[41]



In [41], the little square boxes represent sets of terminals that form a natural class, including trivial one-membered classes. The clear boxes represent natural classes directly definable over the sub-classification, while the shaded box represents the natural class  $\{F_0 F_{en}\}$  due

to un-marking. Thick arrows represent the mapping from morpho-syntax to pure morphology, while thin arrows represent the mapping from pure morphology to morpho-phonology, mediated by the sub-classification. The morpho-phonological level is represented, for the sake of example, as ordered pairs consisting of a lexeme and the orthographic version of the appropriate stem.

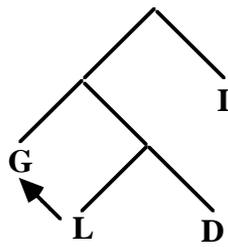
It is apparent that none of the richness of the representation could be dispensed with in a grammar that aspires to more than observational adequacy. The possibly discontinuous mapping between morpho-syntactic features and morphological terminals has already been argued for in 4.3.5 and the references cited there, while the need to postulate natural classes of morphological terminals that are addressed in the mapping to morpho-phonology was demonstrated for this particular data in 2.2.4 and in more general terms throughout Chapter 2.

#### 4.3.6.2 The Russian Instrumental Case

In like manner, it is possible to view the terminals of all the sub-classifications of cases developed in the previous chapter as morphemes, natural classes of which are implicated in the mapping to morpho-phonology. Since the mapping from morpho-syntactic features of case to these morphemes is itself possibly (though not necessarily) discontinuous, the Jakobsonian notion of a single *Gesamtbedeutung* or ‘general meaning’ of each case becomes dispensable. The model predicts the possibility of multiple functions being mapped onto a single morphological case, a possibility that frees the syntactic description from the necessity of recognizing all examples of a particular morphological case as *the same syntactic object*.

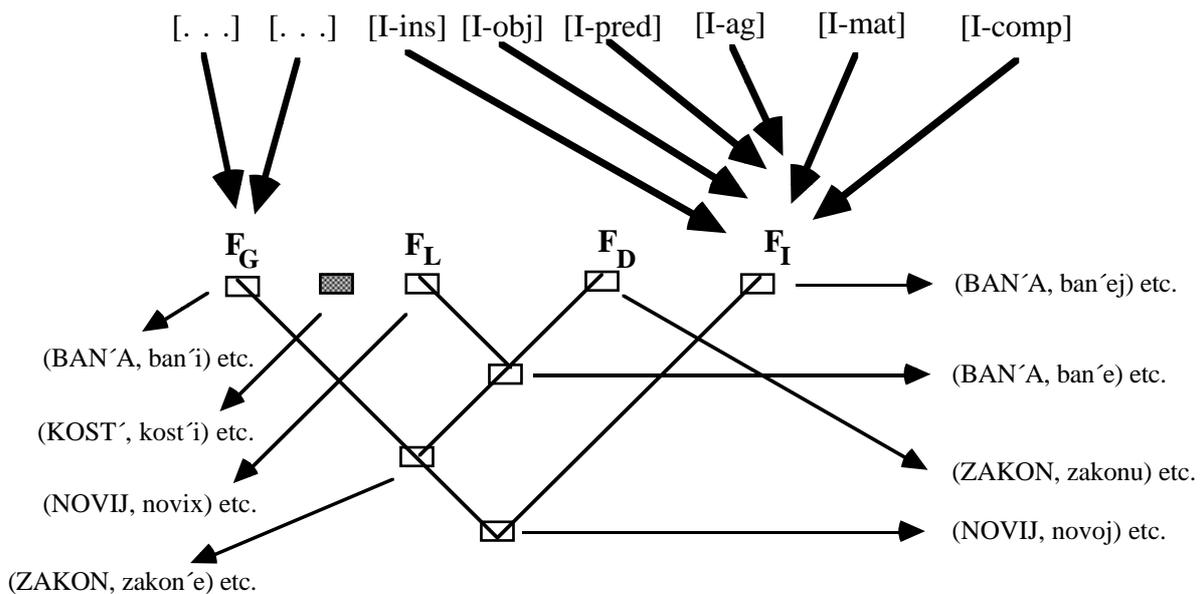
This is just as well, for if the arguments of Wierzbicka (1980) are cogent (3.2.2), *Gesamtbedeutungen* are illusory and the search for them is doomed to failure. Of course the lack of a unified semantic characterization does not necessarily mean that these are not single *syntactic* objects, but it does undermine any motivation to merely assume this. Let us assume, then, that the instrumental case is not a unitary syntactic notion, in the absence of evidence to the contrary. Then the morphological instrumental case must be linked to a variety of syntactic entities. On the other side it is also linked to a variety of morpho-phonological realizations, some of these conflating with the realization of other cases. We can represent a small part of the mapping involving the Russian instrumental in a diagram similar to [41]. Recall from 3.4.9 that the sub-classification of Russian cases contained a sub-tree of the following configuration:

[42]



Again I invert the tree for typographical convenience, and abbreviate a few of Wierzbicka's functions of the instrumental case as [I-ins(trument)], [I-obj(ect)], [I-pred(icate)], [I-ag(ent)], [I-mat(ter)] and [I-comp(arison)]. The case labels can be conceived as mapping functions  $F_G$ ,  $F_L$ ,  $F_D$  and  $F_I$ . Again, the shaded box represents the set  $\{F_G F_L\}$  defined by dint of un-marking. The realizational examples are *ban'a* 'bath', *zakon* 'law', *kost'* 'bone' and *novij* 'new'.

[43]



Regarding the morphological cases as discontinuous functions from multiple syntactic objects to morpho-phonological realizations, and organizing these functions (rather than the syntactic objects) as natural classes for the purposes of realization, also undermines much of the motivation for recognizing natural classes of syntactic cases. We saw in 3.2.3, for example, that Neidle's (1982) assumption of cross-classifying syntactic features was vastly under-motivated by the uses she actually made of them.

#### 4.4 Sub-Classification and Referral

We saw in 4.3.4 that Halle (1990) proposes to treat certain case mismatches between syntax and morphology in both Russian and Latin by means of feature-changing re-adjustments which change the syntactically motivated feature to the morphologically motivated one. In particular, he proposes to rewrite the feature [+acc] to [+nom] in the context of neuter gender in Latin, and to rewrite the feature [+acc] to [+nom] or [+gen] in certain contexts referring to animacy, number and inflection class in Russian. In addition, a series of changes of case and number are postulated to account for the distribution of morphological cases in NPs containing a numeral.

This treatment, though differing in important details, is in line with the practice particularly associated with Zwicky (1985a, 1985b, 1990, 1991)<sup>10</sup> of capturing systematic homonymies by means of ‘rules of referral’. Essentially, a rule of referral simply states that the exponence of some morpho-syntactic property bundle  $x$  is the same as that of some other morpho-syntactic property bundle  $y$ ; for example, the realization of the property bundle [CASE:accusative GENDER:neuter] can be stipulated to be the same as the realization of [CASE:nominative GENDER:neuter]. The grammar then no longer requires a realization rule for neuter accusatives (and in fact would have no use for one), and the homonymy between neuter nominatives and accusatives is captured without any reference to natural classes either of morpho-syntactic or of purely morphological features.

The interesting characteristic of referral rules is that they, like the sub-classifications advocated here, attempt to account for systematic homonymies without burdening the syntax with under-motivated cross-classificatory representations of what are possibly, at a syntactic level, indivisible properties. However, unlike Aronoff’s ‘morphemes’, referral rules do not entail any level consisting of specifically morphological objects. Rather, the job of referral rules is to translate one morpho-syntactic into another morpho-syntactic representation, prior to the application of morpho-phonological rules of exponence.

However, there are two major problems with the use of referral rules: (1) they are grossly unconstrained; and (2) they are inherently directional.

That referral rules are a grossly unconstrained grammatical device is obvious from the fact that they are apparently able to change any morpho-syntactic representation into any other, as Zwicky (1985b) makes clear: “[T]his type of rule must be allowed considerable latitude; apparently, more than one feature can be referred, and referral can be across paradigms as well as within paradigms” (p. 434). Insofar as they are an attempt to account for systematic homonymies, then, their use embodies the claim that systematic homonymies are not subject

to any constraints whatsoever. It has been the whole aim of this thesis to convince the reader otherwise, so no more need be said on that account.

In their most obvious form, referral rules are clearly directional. For instance, Zwicky (1985b) suggests an analysis of the homonymy between the ablative and the dative in the plural of Latin nouns, adjectives, determiners and pronouns (2.2.8) by means of a rule that ‘refers’ the realization of the ablative case to that of the dative. Only the dative case is, in the plural, given its own realization statement. This means that for all intents and purposes the morpho-syntactic representation containing a specification for ablative plural is changed into one containing a specification for dative plural. But no reason is offered for this choice of directionality, and as suggested in 3.4.10, systematic homonymies often have a form that gives no evidence of being associated particularly with one of the homonymizing properties rather than another. Furthermore, when the form is reminiscent of one otherwise associated with the realization of just one of the homonymizing properties, the direction of such take-over is variable.

Aronoff (1994), while being prepared to adopt the general mechanism, worries about this aspect of directionality, and suggests that in place of statements of the form  $\text{Acc} \rightarrow \text{Nom}$  one should instead use statements of the form  $\text{Acc} = \text{Nom}$  to formulate at least some referrals. However, as he notes (pp.83-4):

The problem with this rule is that I don’t quite know what its status is. The simplest way to interpret it is as a metarule governing the spelling out of these particular features, so that it is equivalent to saying something like “Accusative and nominative neuter nominals are always spelled out in the same way, however these properties are realized.” [ . . . ] I will assume that [this metarule] entails that all realization rules spelling out neuter accusative or nominative will be paired with disjunctions of morphosyntactic properties of the following form, regardless of class, and that such disjunctions are generally permitted by the theory of realization pairs:

(21) [N, Neut, Acc or Nom]

In other words, the “metarule” is merely disguising the fact that the grammar has to resort to a disjunction, because it cannot characterize the nominative and accusative cases as a natural class.

Despite all this, referrals seem to have considerable appeal when the homonymy they capture is not merely systematic, but actually exceptionless for a certain bundle of morpho-syntactic features. The Latin neutralization of the nominative and accusative cases is after all a good instance of this, because there is a rather wide range of formal markings involved, according to inflection class: *-um*, *-ū*, *-e*, *-s*,  $\emptyset$  in the singular, *-a*, *-ia*, *-ua* in the plural. A

referral allows one to say not merely that each of these individually neutralizes the nominative-accusative distinction (so allowing for the possibility that in one or more particular inflection classes, the nominative and accusative might be distinct), but more strongly that *any* realization of the neuter accusative must be non-distinct from the realization of the neuter nominative in the same inflection class.

Another example from Latin of such exceptionless neutralization is the non-distinctness of the dative and ablative cases in the plural. This is associated at least with suffixes *-īs* and *-Vbus* (*-ibus*, *-ēbus* and occasionally *-ubus*), and in addition occurs in the idiosyncratic pronoun forms *nōbīs* ‘1 pl’ and *vōbīs* ‘2 pl’. Zwicky (1985b) explicitly draws out the alleged superiority in this case of referral over underspecification:

If we say only that the dative and ablative cases form a natural morphological class, then the generalization is split, at least in two: dative/ablative for declensions 1 and 2 is /i:s/, while for declensions 3-5 it is /Vbus/ (for some V), and nothing connects these two facts. To make the right generalization, we must say directly that the dative and ablative plural are identical [. . .]” (p.433).

Zwicky’s treatment of this homonymy involves the referral rule [44a] and the spell-out rules [44b, c]:

[44]

- (a) [CAT:noun, NUM:pl, CASE:abl] has the same realization as the otherwise identical bundle with the value [CASE:dat] in it.
- (b) [CAT:noun, DECL:1/2, NUM:pl, CASE:dat] is realized by suffixation of /i:s/.
- (c) [CAT:noun, DECL:3/4/5, NUM:pl, CASE:dat] is realized by suffixation of /Vbus/.

In fact, though, the apparently special character of these exceptionless generalizations resides merely in the fact that only morpho-syntactic properties — and not inflection-class membership — constitute the context for the referral, i.e. “all nominative-accusative neuters”, “all dative-ablative plurals”. If a feature representing inflection-class membership is allowed as part of the context for referral, as Zwicky specifically asserts in the quotation above, then all systematic homonymies become exceptionless generalizations of this sort. For instance, the fact that the ablative and dative cases are homonymous also in the singular of the second declension can be expressed in terms entirely parallel to [44a], except for the presence of an inflection-class feature (Zwicky’s DECL feature). The referral and the appropriate realization are as follows:

[45]

- (a) [CAT:noun, DECL:2, CASE:abl] has the same realization as the otherwise identical bundle with the value [CASE:dat] in it.
- (b) [CAT:noun, DECL:2, NUM:sg, CASE:dat] is realized by suffixation of /o:/.

But given this, the fact that the realization of the combined ablative-dative plural is /i:s/ in both the first and second declensions [44b] could also have been captured by referring the realization of the first declension to the second. In this case we would need an additional referral [46a] and a simplified spell-out rule [46b]:

[46]

- (a) [CAT:noun, NUM:pl, CASE:dat, DECL:1] has the same realization as the otherwise identical bundle with the value [DECL:2] in it.
- (b) [CAT:noun, DECL:2, NUM:pl, CASE:dat] is realized by suffixation of /i:s/.

If [46a] were ordered so as to apply after [44a], the following derivation of the ablative plural of the first-declension noun *nauta* ‘sailor’ would result:

[47]

From Syntax:	<i>naut</i> -[CAT:noun, NUM:pl, CASE:abl, DECL:1]
By [44a]	<i>naut</i> -[CAT:noun, NUM:pl, CASE:dat, DECL:1]
By [46a]	<i>naut</i> -[CAT:noun, NUM:pl, CASE:dat, DECL:2]
By [46b]	<i>naut</i> - <i>īs</i>

But let us assume, contrary to Zwicky, that we do not allow referral of inflection class features, so that one can only capture the legitimate exceptionless generalizations in systematic homonymy, such as that relating to the nominative-accusative homonymy in Latin neuters. Even this is not as appealing as it seems. Alongside exceptionless generalizations such as this, there are also *nearly* exceptionless generalizations, such as the identity of the nominative and the vocative cases in Latin. This is true of all declined words in the language, except for the singular of non-neuter members of the second declension whose stem does not end in *-r*.

Actually, though, Zwicky could readily capture this fact too, since his referral rules are overridable defaults. But far from solving the problem, this completely undermines the alleged superiority of referral rules in accounting for the exceptionless generalizations, since these now have no more special status in the grammar than generalizations which are

subject to exceptions.

I conclude, then, that referral rules offer no overwhelming advantage over, and are very much less constrained than, a scheme that assumes that homonymies always take place amongst members of natural classes.

#### 4.5 Disjunctive Ordering

One of the examples I have used to argue for sub-classifications with un-marking is that of the German case system, which exhibits apparent natural classes such as {N A G} and {A G D} which cannot be represented within a minimal scheme of cross-classification. Now it is obvious that in this four-term system, these sets of terms can be characterized as ‘elsewhere’ cases. That is, {N A G} comprises all cases but D, and conversely {A G D} comprises all cases but N.

The set {N A G} is implicated in the plural marking of nouns. According to one analysis (2.2.6) this is achieved by affixing *-e* to a stem associated with the plural, excepting only those nouns which take a plural in *-s*. (According to a different analysis the plural of nouns is marked by a variety of affixes, but the same questions would be raised in any event.) Now under the type of analysis I have been developing there would be a lexical item *-e* (or a rule introducing the segmental material *-e*) specified for a particular morphological context, which according to the configuration [10a] can be detailed in part as [Noun\_Case -3], a natural class according to the sub-classification with un-marking which comprises the cases N, A, and G. On this analysis there would be another affix *-en* which is detailed in part as [Noun\_Case +1 +2 +3]<sup>11</sup>, i.e. the dative case D.

An alternative analysis would be to say that *-en* is specified in terms of syntactic features as something like [+pl +obl +goal] while *-e* is specified merely as [+pl]. The specification for *-e* is in this case a subset of the specification for *-en*. We might then envisage a principle that enjoins us, in choosing between items whose specifications are in this subset-superset relationship, to choose the most highly specified item that is compatible with the context. This principle, based on the fact that something like it is embodied in Panini’s *Astadhyayi*, is often called Panini’s Principle. More recent versions, usually called the Elsewhere Condition or Elsewhere Principle, derive from Kiparsky (1982a, 1982b). A principle of this general sort (though differing in important details) figures heavily in most theories of inflectional morphology that see inflection as something that occurs ‘after’ syntax, including the frameworks of Anderson (1992), Halle & Marantz (1993), Noyer (1992) and Zwicky (1985b). I will refer to principles of this sort as ‘disjunctive ordering’.

In the present instance, imagine that the context specifies plural number and dative case, i.e.

[+pl +obl +goal]. Now this is a superset of, and therefore compatible with, the specification for *-e* of [+pl]. However, it is also consistent with the richer specifications of *-en*, and the principle ensures that the latter will be chosen. By contrast, imagine that the syntactic context specifies a genitive plural, i.e. [+pl +obl –goal]. Now this is incompatible with the specifications for *-en* (because of [–goal]). It is compatible with the specifications for *-e*, i.e. [+pl], and since there is no lexical item (or rule, etc.) which is more richly specified and still compatible, then *-e* must be chosen.

Disjunctive ordering is attractive because it can be imagined to be a universal constraint on the selection of lexical entries, and therefore need not be learned or stipulated in any particular grammar. It has the desirable effect, apparently, of allowing one to work with syntactically based features and yet still refer to sets of items which cannot be characterized as a natural class. But this can be a danger as well as a blessing.

Consider, for instance, an imaginary language with four cases NAGD cross-classified by the features [ $\pm$ obl] and [ $\pm$ goal], in the same way as proposed for German in [9]. Imagine that this language has several declensions, and that homonymies occur in each declension, so that there is no declension that actually distinguishes all the cases (the situation in, e.g., Polish 2.2.10). The following table schematically shows the various affixes (labelled ‘a’, ‘b’ etc.) that realize the various sets of conflating cases:

[48]

	1	2	3	4	5
N			e		
A	a	c		h	k
G		d	f	i	l
D	b	c		j	
		d	g	h	k

Using disjunctive ordering, the context for the affixes of the first four declensions can be defined as follows:

[49]

1	2	3	4
a –obl	c –goal	e –obl –goal	i –obl +goal
b +obl	d +goal	g +obl +goal	j +obl –goal
		f <i>elsewhere</i>	h <i>elsewhere</i>

That is, the formalism defines as addressable sets all of {N A}, {G D}, {N G}, {A D}, {A

G} and {N D}, the last two, which do not constitute a natural class, as elsewhere sets. Note that this is every combination possible of two cases. In fact the only thing the formalism cannot define is the situation in Declension 5, exhaustively partitioned between the sets {N D} and {A G}, and therefore with no sets characterizable as natural classes with respect to which to be elsewhere to.

In addition, all three-member sets are definable with the help of disjunctive ordering, by making them elsewhere with respect to each of the four total categories N, A, G and D. So {A G D} is elsewhere with respect to N, {N G D} elsewhere with respect to A, {N A D} elsewhere with respect to G, and {N A G} elsewhere with respect to D.

It is obviously a consequence of disjunctive ordering that it increases the number of sets of terms that can be addressed as a unit in the grammar, i.e. it adds to the already definable set of natural classes further numbers of ‘unnatural’ classes. Since a major thrust of the argument of Chapter 3 was that cross-classifications define an excessive number of natural classes, this criticism applies to cross-classifications augmented by the disjunctive ordering even more strongly.

It seems promising to explore the possibility that homonymies within single morphological categories (including those single morphological categories like German number/gender that correspond to more than one morpho-syntactic category) are constrained to designate natural classes, and that therefore there is no need for disjunctive ordering in this domain.

However, the situation is obviously different with homonymies that occur across morphological categories, and it may be that disjunctive ordering is involved in these cases. After all, we saw in 2.4.1-2 that some homonymies that satisfy the co-extension criterion for systematicity are not representable geometrically. However, one’s suspicions of disjunctive ordering are aroused by a number of circumstances: (1) the degree to which the cross-categorical homonymies *can* be represented geometrically (2.3.2-4, 2.3.7), which is utterly unexpected on the disjunctive ordering hypothesis; (2) the fact that certain polarity relations seem to obey a constraint of geometric *non*-contiguity (2.4.2), again unexpected on the disjunctive ordering hypothesis; and (3) the fact that some homonymies that appear systematic, and are representable as such geometrically, cannot be so represented by means of disjunctive ordering.

As an example of (3), Noyer (1992) presents a detailed analysis of the Arabic prefix conjugation presented in 2.3.7 within a framework allowing for disjunctive ordering, yet still must include two homonymous *t*- prefixes, one associated with the second person and the other associated with the feminine gender. The reason is that he needs to use the ‘elsewhere’ clause to account for the *y*- prefix. The geometric representation, by contrast, is

able to account them both as systematic homonymies.

The lesson, of course, is that the lessons of paradigm geometry are far from exhausted.

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<sup>1</sup>Strictly speaking, Anderson assumes that in the first instance the syntax assigns features only to maximal projections. These features are then spread to various word-level items by separate rules, ensuring for instance that the genitive case is realized on the final word of an English NP but on every case-inflectable constituent of a Latin NP. The simpler statement in the text suffices for present purposes, however.

<sup>2</sup>Though the morpho-syntactic representation may, in special cases, be modified by a rule of ‘re-layering’ which swaps subject-agreement and object-agreement features, for instance. Anderson (1984) uses this to analyse the phenomenon of ‘inversion’ in Georgian.

<sup>3</sup>Halle assumes that morphemes representing case, number etc. are linearized at some stage prior to the operation of these rules, but nothing in the following discussion hinges on this. I must note also that I have regularized certain inconsistencies in the formulation of the rules, such as the fact that the accusative case is represented variously as “acc”, “[acc]” and “A”, variability in (typographical) case, etc. Finally, in the Russian examples below I have replaced his transliteration with the transcription of Russian used elsewhere in this thesis and detailed in Appendix 2.

<sup>4</sup>An alternative account of the situation with Latin first/second-declension adjectives is found in Carstairs-McCarthy (1994). This account hinges on joining the two declensions in a single ‘macro-paradigm’, i.e. regarding them as a single inflection class, on the basis that membership in one or the other sub-paradigm is predictable, largely on the grounds of gender. The argument is that while the first declension contains both feminine and masculine nouns, the masculine nouns are limited to those associated with human male referents. The second declension, by contrast, contains nouns of all three genders. “It seems reasonable to say, therefore, that first-declension affixes include ‘feminine’ in their information content, thereby contrasting with second-declension ones, which do not; but if a first-declension noun denotes a human male, this semantic fact overrides the usual morphological gender assignment on the basis of inflection class.” (p.751) It is not clear to me, however, how we are to *know* that a certain male-denoting noun stem such as *naut-* ‘sailor’ is first declension rather than second to begin with, and therefore how we are to know to attach to it the ‘feminine’ affixes of the combined first/second declension. Similarly, it is not clear to me how we are to know that the feminine noun stem *fic-* ‘figtree’ is second declension rather than first, and therefore requires the ‘not specifically feminine’ variants of the affixes of the combined declension.

<sup>5</sup>Further examples of gender assignment based on inflectional class are given in Corbett (1991).

<sup>6</sup>In addition to the uses I discuss in this section, the form in question also has a limited use as a perfect but active adjective derived from intransitive verbs: *fallen leaves*, *expired options*, etc. Naturally this merely strengthens the case for a discontinuous mapping from syntax to morphology, as argued for presently.

<sup>7</sup>Though one of the examiners of this dissertation has pointed out to me that the construction is also found in Hittite of Western Anatolia, hence slightly outside the Western European *Sprachbund*.

<sup>8</sup>I use the terminology of Matthews (1972, 1974), who distinguishes between an ‘imperfective’ and a ‘perfective’ sub-system within Latin conjugation. The terms are not intended to evoke echoes of the better known Slavic aspectual distinction.

<sup>9</sup>In fact merely ‘perfectness’, but I will retain the less awkward term in the text.

<sup>10</sup>Though Zwicky has no doubt been the major investigator of rules of referral, a particularly clear idea of the concept is given in Stump (1993). But my criticisms of Zwicky’s approach apply, *mutatis mutandis*, to Stump’s also. Stump does acknowledge, however, that ‘the goal of restricting the pretheoretical notion of what constitutes a possible syncretism in human language’ is an ‘important and urgent’ task (at 477), which distances him from Zwicky’s apparent willingness to impose few if any constraints on referrals.

<sup>11</sup>In fact, since [+3] is positive and terminal, the extra specifications [+1 +2] are redundant.

## APPENDIX 1

## Transcription/Transliteration of Greek

## 1. Ancient Greek

In this thesis a uniform method of representing Ancient Greek word forms is adopted. Since Ancient Greek orthography was largely phonemic, the representation is able to approximate to both a transcription and a transliteration at the same time. However, some points need mentioning.

Length is marked on all vowels by a following colon. The digraphs *ει*, *ου* are represented as *e:*, *o:* respectively. The iota subscript is represented as a following *i*, a subscripted *i*, or an *i* in parentheses according to the period under discussion and the claims made as to its pronunciation. Initial rough breathing is represented by *h-*, smooth breathing by nothing. Initial *ρ-* is represented by *r*. Acute, circumflex and grave accents are used as in traditional orthography: note in particular that they are placed over the second vowel of a diphthong, even when the diphthong is presumed to be falling. In a disyllabic sequence of vowels which could form a diphthong, the second is marked with a diaeresis. Otherwise word forms are transliterated according to the following table.

<u>Greek</u>	<u>Roman</u>	<u>Greek</u>	<u>Roman</u>
α	a	ν	n
β	b	ξ	ks
γ	g	ο	o
δ	d	π	p
ε	e	ρ	r
ζ	z	σ, ς	s
η	e:	τ	t
θ	th	υ	u
ι	i	φ	ph
κ	k	χ	kh
λ	l	ψ	ps
μ	m	ω	o:

## 2. Modern Greek

Modern Greek is transcribed phonemically in IPA characters, except that *e* and *o* are used even though *ɛ* and *ɔ* would be more accurate. Questions as to the phonemic status of surface [b d g] are avoided by not citing forms that contain them.

## APPENDIX 2

### Transcription/Transliteration of Russian

In this thesis a uniform method of representing Russian word forms is adopted, even to the extent of altering the representation of word forms in citations. The aim of the representation is to bring out as clearly as possible those aspects of Russian phonology and morphology that are relevant to the issues being discussed, without distracting the reader with explanations about why a certain affix is written now one way, now another, etc. Accordingly the representation is part-transliteration, part-transcription.

The reason transliteration is not used consistently is that Russian orthography is not entirely phonemic, and moreover has some rather complicated conventions for indicating the palatalization or otherwise of a consonant by means of the form of the following vowel letter. In this thesis, palatalization of consonants is indicated consistently by means of a following prime: thus *t'*, *b'*, *l'* indicate palatalized versions of *t*, *b*, *l* respectively whether followed by a vowel or not. All vowel letters are represented by one of *a*, *e*, *i*, *o*, *u*. The pronominal/adjectival genitive endings in **-oro**, **-ero** are transcribed with a *v*, even though the orthography, for historical reasons, writes a *g*. These deviations aside, the transcription is a transliteration according to the equivalences set out in the table below.

The reason a phonemic transcription is not employed is that it would be necessary to deal with aspects of Russian phonology that are not relevant to the subject matter of this thesis. This is especially true in the case of the various alternations of the vowels in unstressed position, and the variation in the realization of *i* in palatalized versus non-palatalized environments. The explicit representation of these details would serve only to distract attention from those aspects of the inflectional morphology that are under consideration at any given point.

In the following table, two representations are listed for some of the vowel letters. In each case, the first representation is used word-initially or after a prime, the second elsewhere.

<u>Cyrillic</u>	<u>Roman</u>		<u>Cyrillic</u>	<u>Roman</u>
А	a		Р	r
Б	b		С	s
В	v		Т	t
Г	g		У	u
Д	d		Ф	f
Е	je, 'e		Х	x
Ё	jo, 'o		Ц	c
Ж	ž		Ч	č
З	z		Ш	š
И	i, 'i		Щ	šč
Й	j		Ъ	—
К	k		Ы	i
Л	l		Ь	'
М	m		Э	e
Н	n		Ю	ju, 'u
О	o		Я	ja, 'a
П	p			

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