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SOME CONCEPTS IN WORD-AND-PARADIGM MORPHOLOGY

INTRODUCTION [1]

It is important to distinguish between two types of statement which are both, in a sense, statements 'about' a particular language. The first is one which would form part of a generative grammar (Chomsky, 1961a; etc.) of the language concerned. An example is the statement, in some grammars of English, that a Noun-phrase may consist of an Article followed by a Noun; cf., e.g., Lees (1960: Constituent-structure Rule 22). Another would be the statement, in many feasible grammars of Latin, that Verbs such as MONEO, RAPIO or VETO have a Perfective stem (*monu-*, etc.) which is formed from the root (*mon-*, etc.) by the suffixation of *u*; see Matthews (1965) for the concepts involved. Following Chomsky (1961b), Lamb (1964a), Gleason (1964) and others, we will refer to such statements as grammatical rules or rules of grammar; the form and interpretation of such rules have, of course, been widely debated in recent years. In this paper, however, it is our second type of statement which will principally concern us. This may be characterised, roughly, as a statement about some generative grammar or about some part or component of such a grammar. Examples would be the statement that Chinese is a tone-language or that Spanish, say, has a triangular vowel-system. Neither of these statements would appear to add anything to the lexical or phonological components of a grammar: it is sufficient (following one possible approach) that the former should list the base realisations of the various morphemes, and that the latter should contain no more than a set of sandhi-rules (Allen, 1962; Garvin, 1962; etc.) which map, in one way or another, a morphonological onto a phonetic transcription of the various sentences. Nevertheless the statements cited are not meaningless, nor is it true that they 'tell us nothing about' the relevant languages. The interpretation suggested here is that they are both comments, in general terms, on certain aspects of what seem to be the most suitable grammars of Chinese in one case and Spanish in the other. More precisely, we may say that a language is a tone-language if and only if the rules of the

[1] Various friends and colleagues, notably J. P. Thorne, D. G. Hays, F. W. Householder and F. R. Palmer, were kind enough to criticize an early draft of this paper; I am grateful to Mr. Thorne, in particular, for his very patient assistance. None of these scholars, of course, would necessarily agree with what I say.

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lexical component must specify a tonal property for every vowel.[2] Similarly, a language has a triangular vowel-system (Trubetzkoy, 1949: 101) if and only if the set of phonemes defined by its grammar has at least twice as many members with the properties vocalic and close as it has with the properties vocalic and open, likewise at least twice as many (or else none at all) with the properties vocalic and half-close, etc. Regardless of details, it is a matter of interest whether a language satisfies, or does not satisfy, this sort of broad definition.

For the examples cited so far, the distinction should be obvious enough. The present writer would like to suggest, however, that there are a large number of 'descriptive statements' which appear (at first sight) to be statements directly 'about' some body of data, but which may more clearly be evaluated as statements about some relevant grammar. For a brief illustration, consider the statement: Noun-phrases in English exhibit an endocentric construction. This statement is evidently of a taxonomic character; hence, if the description of a language is seen as a taxonomic problem, there is little difficulty in regarding it as a statement of the same order as other (allegedly taxonomic but less general) statements such as that *book* is a Noun, *Harry* a Christian Name, etc. But it is precisely this taxonomic character which renders it unsuitable as a grammatical rule. It is hard to see how a generative grammar, as opposed to the hopefully moribund type of taxonomic 'grammar', could be improved by incorporating generalisations of this kind. What status has such a statement, in that case? It seems unreasonable, on the one hand, to dismiss the distinction between endocentric and exocentric constructions as a distinction of no value. On the other hand there is no point, given that one is writing a generative grammar, in attempting any further direct characterisation of the language. One may therefore consider, at least, a suggestion that the term 'endocentric construction' refers not to certain configurations of elements in (recorded) data, but to a configuration of rules in a certain type of grammar. Thus, for any grammar which assigns constituent-structure to sentences, the definitions in Bloomfield (1935: 194), Hockett (1958: 184) and Robins (1964: 234) might be reformulated as follows. For any non-terminal symbols A and B, A's exhibit an endocentric construction (with respect to B's as their head) if and only if, for any terminal string T where T is dominated by A, either T is also dominated by B, or there exists some substring S of T such that S is dominated by B and may (elsewhere) be dominated both by B and by A.[3]

[2] Definition proposed by J. D. McCawley in a presentation to the August, 1964 meeting of the Linguistic Society of America; I am indebted to Dr. McCawley for a copy of his paper.

[3] 'Dominate' in the sense of Chomsky (1961b: 9). If this strategy is adopted, we need

The merits of this particular definition need not concern us here. What is important is that, given some definition of this kind, the verification (as a statement 'about' English) of the statement 'Noun-phrases in English exhibit an endocentric construction' involves at least two separate questions. First, is it a true statement about a set of rules expanding Noun-phrase (and expansions of Noun-phrase) in some putative grammar? Secondly, is this grammar of English a better grammar, *ceteris paribus*, than others for which the statement is false? Both these questions must be answered; to put it in Firthian terms (Robins, 1963: 21), there is no direct 'renewal of connection' between a comment about a grammar and any body of phonic data. Only a set of grammatical rules is eligible to 'renew connection'. In this sense one cannot, even in evaluating what seem to be the simplest taxonomic statements, evade the problem of evaluating a generative grammar.

The main body of this paper may now be taken as an extended illustration of the approach suggested in the preceding paragraphs. We will begin, in the next section, by explaining the relevant characteristics of what will be referred to (cf. Hockett, 1954: 210; Robins, 1959) as a word-and-paradigm grammar. The central section will then define a number of concepts (in particular that of a 'paradigmic structure') which seem to be useful in making comments, especially comments of typological interest, about a grammar of this type. Illustrations, in both these sections, will presuppose a particular grammar of Latin and a particular grammar of Modern Greek.

WORD-AND-PARADIGM GRAMMARS

The term *word-and-paradigm grammar* may be used of any grammar for which, to quote Priscian[4], 'dictio est pars minima orationis constructae'. More precisely, the terminal strings of the syntactic component of such a grammar will be composed either entirely of grammatical words (henceforth simply *words*) or partly of words and partly of *particles* of various kinds. We will assume, for the purposes of this paper, that a particle is a syntactically unstructured element; a word, however, is a composite element uniquely identified first by its assignment to a particular vocabulary element or *lexeme*[5],

not criticize Chomsky's formulation of constituent-structure (cf. Van Holk, 1962: 220) for failing to distinguish endo- and exocentric constructions by rules of grammar as such.

[4] Keil, 1855: 53, line 8. The formula and concept go back to Dionysius Thrax: Λέξις ἐστὶ μέρος ἐλάχιστον τοῦ κατὰ σύνταξιν λόγου (Uhlig, 1883: 22, line 4).

[5] For 'lexeme' in roughly this sense, cf. Lyons (1963: 12); this is not inconsistent with Whorf's original usage (Whorf, 1938: 132). For other uses ('lexeme' is a spare term which it is tempting to appropriate) cf. Hockett (1958: 170), Juilland (1961: 17, fn. 4) and, more important, Lamb (1964b: 60f); the reader is merely warned that these uses are different from ours.

and secondly by the assignment to it of a particular set of *morphosyntactic properties*. An example will clarify this. For a word-and-paradigm grammar of Latin, the terminal string which maps onto the sentence *sed cave canem* ('But look out for the dog') might be represented, say, in the form:

$$\text{Sed} + \text{CAVEO}_{\text{IMP, I, sg, A}} + \text{CANIS}_{\text{ACC, sg}}$$

The first of the three elements in this string is the particle Sed ('But'). The second, however, is a word defined by the lexeme CAVEO (conventionally translated 'Beware') and the morphosyntactic properties IMP[erative][6], [Mode] I[7], s[in]g[ular] and A[ctive]; the third, likewise, is a word defined by the lexeme CANIS ('Dog') and the properties ACC[usative] and sg. The expressions $\text{CAVEO}_{\text{IMP, I, sg, A}}$ and $\text{CANIS}_{\text{ACC, sg}}$ would, of course, be read conventionally in the form: 'The singular Active of the Mode I Imperative of CAVEO' and 'The Accusative singular of CANIS'.

Let us consider the characteristics of such a grammar a little further. It is clear that in addition to the syntactic component – which will generate strings of words, particles or both, the grammar will also include a morphological component which relates the strings concerned to composites of phonological or graphological elements. Thus our grammar of Latin might relate the three terminal elements above to the strings of letters:

$$s+e+d \qquad c+a+v+e \qquad c+a+n+e+m$$

In such a case, the string $s+e+d$ may be said to be the *realisation* (or a realisation) of Sed, $c+a+v+e$ a realisation of $\text{CAVEO}_{\text{IMP, I, sg, A}}$, and $c+a+n+e+m$ a realisation of $\text{CANIS}_{\text{ACC, sg}}$. The precise form of such a

[6] Abbreviations will normally be explained on first appearance. For convenience, however, we append a list (in alphabetical order) of all those employed in the main body of this paper:

A[ctive]	IMP[erative]	PR[esent Participle]
Ac[cusative-type]	INF[initive]	Pr[esent-]I[ndicative]
ACC[usative]	Masc[uline]	Pr[esent-]S[ubjunctive]
Ab[lative-type]	Neut[er]	P[er]f[ective]
ABL[lative]	NOM[inative]	s[in]g[ular]
DAT[ive]	P[assive]	SU[pine]
Fem[inine]	Pa[st]	VOC[ative]
FIN[ite]	PA[st Participle]	
FU[ture Participle]	Pa[st-]I[ndicative]	[Mode] I
Fu[ture-]I[ndicative]	Pa[st-]S[ubjunctive]	[Mode] II
GE[rundial]	pl[ural]	1[st Person]
GEN[itive]	Pr[esent]	2[nd Person]
I[mper]f[ective]		3[rd Person]

[7] The distinction between [Mode] I and [Mode] II corresponds to the traditional distinction between 'Present' and 'Future' Imperatives (cf. Neue and Wagener, 1897: 213 f); thus *amā* is Mode I and *amātō* Mode II.

morphological component (cf. Matthews, 1965) need not be debated here; nor the precise form of the syntactic component with which it is coupled. All that is essential, for our purposes, is that the morphological component as a whole (together with certain rules in the syntactic component) may be said to define a certain set of relations over certain sets of primitive or composite elements. These may be explained as follows.

Let us take the primitives first. The symbols of the metalanguage in which word-and-paradigm grammars will be written must be of at least four different types; any particular grammar, therefore, will define at least four sets of primitive elements. These are

(a) A set of lexemes L, where, for the grammar of Latin under discussion, L has the members CAVEO, CANIS, etc.;

(b) A set of phonological or graphological elements Φ, where, for the same grammar, Φ has as its members the letters *a*, *b*, *c*, etc.;

(c) A set of morphosyntactic properties Q, where Q would in this case have the members IMP, sg, ACC, A, etc.;

and finally (we have not alluded to this set so far);

(d) A set of *morphosyntactic categories* C[8] where, for the same Latin grammar, C has the members *MOOD*, *VOICE*, *CASE*, *NUMBER*, and so forth.

The relations which will concern us may now be introduced as follows. First, certain rules of the syntactic component may be said to define

(A) A relation *T (*is a term in*) whose domain is Q and whose converse domain is C. Thus, still for the same grammar, ACC *T *CASE* (i.e. ACC is a term in the morphosyntactic category *CASE*), IMP *T *MOOD*, sg *T *NUMBER*, A *T *VOICE*, I *T *MODE*, etc. We may further stipulate that a grammar is self-consistent only if[9]

Requirement 1:

$$(q{*}\mathrm{T}\,c) \rightarrow \sim (\exists x)\,((x \neq c)\cdot(q{*}\mathrm{T}\,x))$$

(i.e. no morphosyntactic property may be assigned to more than one morphosyntactic category) and

Requirement 2:

$$(q{*}\mathrm{T}\,c) \rightarrow (\exists x)\,((x \neq q)\cdot(x{*}\mathrm{T}\,c))$$

(i.e. each category must be assigned at least two properties).

[8] Cf. 'modulus category' in Whorf (1945: 95). The term 'category' (*toute simple*) is unfortunately used in a bewildering variety of senses. For 'terms' in a morphosyntactic category (see (A) below), cf. e.g. Carnochan (1952: 79): compare 'terms' in a Firthian or Neo-Firthian 'system'.

[9] Small *q* will normally be used for members of Q, small *c* for members of C, and so forth; the main exception is Definition (6), where small *k* is used alongside *q* – also capital *K* for subsets of Q.

Next, for some set W of grammatical words, the grammar will define first

(B) A relation *F (*is a form of*) whose domain is W and whose converse domain is L. Thus, for the same grammar, $\text{CANIS}_{\text{ACC, sg}}$ *F CANIS (i.e. the ACC sg of CANIS is a form of CANIS), $\text{CAVEO}_{\text{IMP, I, sg, A}}$ *F CAVEO, etc. Secondly it will define

(C) A relation *P (*has the property*) whose domain is W and whose converse domain is Q. Thus $\text{CANIS}_{\text{ACC, sg}}$ *P ACC (the ACC sg of CANIS has the property ACC), $\text{CAVEO}_{\text{IMP, I, sg, A}}$ *P sg, and so forth. A grammar will be self-consistent, of course, only if

Requirement 3:

$$(w{*}\mathrm{F}l) \rightarrow \sim(\exists x)\,((x \neq l)\cdot(w{*}\mathrm{F}x))$$

(i.e. no word may be assigned to more than one lexeme); in addition it will be self-consistent only if

Requirement 4:

$$(w{*}\mathrm{P}q)\cdot(q{*}\mathrm{T}c) \rightarrow \sim(\exists x)\,((x \neq q)\cdot(w{*}\mathrm{P}x)\cdot(x{*}\mathrm{T}c))$$

(i.e. no word may be assigned more than one property from the same morphosyntactic category).

Finally, the morphological component may be said to define

(D) A relation *R (*is a realisation of*) whose domain is a set of strings (let us say) over Φ, and whose converse domain includes W. Thus, for the same grammar, $c+a+n+e+m$ *R $\text{CANIS}_{\text{ACC, sg}}$, and so forth.

Any grammar which defines, in one way or another, the relations set out above is a word-and-paradigm grammar within the scope of the discussion which follows.

PARADIGMIC STRUCTURES

We may now broach our central problem. It is customary, in traditional descriptions which are (at least implicitly) of this type, to display the 'paradigm' of some lexeme or other (or some part of its paradigm) as some sort of two-dimensional table. Thus for the lexeme CANIS we might have the diagram shown in Figure 1,

	sg	pl
NOM	*canis*	*canēs*
VOC	*canis*	*canēs*
ACC	*canem*	*canēs*
GEN	*canis*	*canum*
DAT	*canī*	*canibus*
ABL	*cane*	*canibus*

Figure 1

where sg and pl[ural] are the two [morphosyntactic properties which are] terms in the morphosyntactic category *NUMBER*, NOM[inative], VOC[ative], ACC, etc. the various terms in the category *CASE*, and *canis*, *canem*, etc. (let us continue to dispense with the concatenation symbol) various appropriate strings of letters. What this diagram represents, we might suggest, is an 'arrangement' of the paradigm of CANIS in accordance with a 'paradigmic pattern' formed by the sets {NOM, VOC, ACC, GEN, DAT, ABL} and {sg, pl}. But what would be a more precise formulation of these notions? And what may usefully be said concerning the typology of 'patterns' of this kind?

It seems appropriate to think of a 'paradigmic pattern', provisionally, as a set of ordered n-tuples of morphosyntactic properties – e.g., for the example above, the set of ordered pairs

$$\left\{\begin{array}{ll} (\mathrm{NOM}, \mathrm{sg}), & (\mathrm{NOM}, \mathrm{pl}), \\ (\mathrm{VOC}, \mathrm{sg}), & (\mathrm{VOC}, \mathrm{pl}), \\ (\mathrm{ACC}, \mathrm{sg}), & (\mathrm{ACC}, \mathrm{pl}), \\ (\mathrm{GEN}, \mathrm{sg}), & (\mathrm{GEN}, \mathrm{pl}), \\ (\mathrm{DAT}, \mathrm{sg}), & (\mathrm{DAT}, \mathrm{pl}), \\ (\mathrm{ABL}, \mathrm{sg}), & (\mathrm{ABL}, \mathrm{pl}) \end{array}\right\}$$

where the first co-ordinate of each pair (see the vertical axis in Figure 1) is a term in *CASE*, and the second (see the horizontal axis) a term in *NUMBER*. Now let the expression

$$w:p$$

(where w is a word and p such an n-tuple of morphosyntactic properties) abbreviate the expression[10]

$$(q \text{ is a co-ordinate of } p) \leftrightarrow (w^{*}\mathrm{P}q)$$

(i.e. w has all and only the properties which are listed in p). On this basis we may state the following definition:

(1) For any paradigmic pattern P and lexeme l, an *arrangement* of the paradigm of l in accordance with P is a relation A such that

$$((s^{*}\mathrm{R}\,w)\cdot(p \in P)\cdot(w^{*}\mathrm{F}l)\cdot(w:p)) \leftrightarrow ((p, s) \in \mathrm{A}).$$

(i.e. each n-tuple of properties is paired with each realisation of the appropriate form of the lexeme concerned). Thus for one feasible grammar of Modern Greek the relation

[10] We will say that q is a co-ordinate of p where p is an ordered n-tuple $(x_1, x_2, \ldots\ldots, x_n)$ and, for some i, $q = x_i$.

$$\left\{\begin{array}{l} ((\text{FIN, A, Pa, If, 1, sg}), \textit{éγrafa}),\\ ((\text{FIN, A, Pa, If, 2, sg}), \textit{éγrafes}),\\ ((\text{FIN, A, Pa, If, 3, sg}), \textit{éγrafe}),\\ ((\text{FIN, A, Pa, If, 1, pl}), \textit{γráfame}),\\ ((\text{FIN, A, Pa, If, 2, pl}), \textit{γráfate}),\\ ((\text{FIN, A, Pa, If, 3, pl}), \textit{γráfane}),\\ ((\text{FIN, A, Pa, If, 3, pl}), \textit{éγrafan}) \end{array}\right\}$$

would be an arrangement of the paradigm of ΓΡΑΦΩ ('Write') in accordance with a 'non-maximal paradigmic pattern' (we will define it as such below) formed by the sets of morphosyntactic properties {FIN[ite]}, {A}, {Pa[st]}, {I[mper]f[ective]}, {1[st person], 2[nd person], 3[rd person]} and {sg, pl}.[11] For the grammar concerned, that is to say, *éγrafa* is the only realisation of $\text{ΓΡΑΦΩ}_{\text{FIN, A, Pa, If, 1, sg}}$, *γráfane* and *éγrafan* are alternative realisations of $\text{ΓΡΑΦΩ}_{\text{FIN, A, Pa, If, 3, pl}}$, and so forth. The term 'paradigm' may of course be defined (independently of the term 'arrangement of a paradigm') as follows:

(2) For any lexeme *l*, the *paradigm* of *l* is the set of all strings of letters, etc. *s* such that, for some *w*, s*Rw and w*Fl.

Thus the paradigm of CANIS (see above) is the set {*canis*, *canem*, *canī*, *cane*, *canēs*, *canum*, *canibus*}. In the Modern Greek example it is only a proper subset (we might call it a 'sub-paradigm') of the paradigm of ΓΡΑΦΩ which is involved.

Can we now proceed along these lines? It is clear, first of all, that the paradigmic pattern for Latin set out above is equivalent, in some sense, to the further pattern

$$\left\{\begin{array}{l} (\text{sg, NOM}), (\text{sg, VOC}), (\text{sg, ACC}), (\text{sg, GEN}), (\text{sg, DAT}), (\text{sg, ABL}),\\ (\text{pl, NOM}), (\text{pl, VOC}), (\text{pl, ACC}), (\text{pl, GEN}), (\text{pl, DAT}), (\text{pl, ABL}) \end{array}\right\}$$

where it is the first co-ordinates which are terms in *NUMBER*, and the second which are terms in *CASE*. Similarly the paradigmic pattern exemplified for Modern Greek ΓΡΑΦΩ must be regarded as equivalent to the further patterns[12]

$$\{\text{If}\} \times \{\text{Pa}\} \times \{\text{A}\} \times \{\text{FIN}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\},$$
$$\{\text{If}\} \times \{\text{A}\} \times \{\text{Pa}\} \times \{\text{FIN}\} \times \{\text{sg, pl}\} \times \{1, 2, 3\},$$

[11] For all but FIN[ite], which contrasts with IMP[erative] in a category *MOOD*, cf. Koutsoudas (1962: 23-4); for a comparison with the traditional terminology, with examples in the traditional spelling, see Householder, Kazazis and Koutsoudas (1964: Chapter 5).

[12] This use of the multiplication-sign may be unfamiliar to some readers. Briefly, where $A_1, A_2, \ldots\ldots, A_n$ are sets, $A_1 \times A_2 \times \ldots\ldots \times A_n$ is the set of all ordered *n*-tuples with a member of A_1 as first co-ordinate, a member of A_2 as second co-ordinate, etc.

etc. What we are ultimately concerned with, therefore, is some entity (let us call it a *paradigmic structure*) which may be defined as an equivalence class of paradigmic patterns; 'equivalence', in this context, may be defined as follows:

(3) The paradigmic patterns $P_1, P_2, \ldots\ldots, P_n$ are equivalent if and only if, for any i and j, $(p \in P_i) \rightarrow (\exists x)\ ((x \in P_j)\cdot((q$ is a co-ordinate of $p) \leftrightarrow (q$ is a co-ordinate of $x)))$ (i.e. the co-ordinates are the same, although the ordering is different).[13] Given this concept of a paradigmic structure we are free to concentrate, in the paragraphs which follow, on the less abstract concept of a paradigmic pattern. Any qualifying terms which we introduce may then be applied, vicariously, to the structures of which the relevant patterns are members.

We may begin with a preliminary definition. First, for any grammar G, let P^G be the set of all ordered n-tuples (for all $n = 2, 3, \ldots\ldots$) whose co-ordinates are members of the set Q which it defines. Then:

(4) For any grammar G and subset P of P^G, the *basis* of P (we will use the notation B^P) is the set of all lexemes l such that, for any $p \in P$, there exists some word w such that $w:p$ and $w{*}Fl$.

Thus, to take a further aspect of Latin, the set of lexemes AMO ('Love'), REGO ('Rule'), AVDIO ('Hear'), and so forth would be the basis of the unit set of sextuples

{(FIN, If, Pr[esent-]I[ndicative], sg, 1, A)}[14],

and also of a set

$$\left\{\begin{array}{l}\text{(FIN, If, PrI, sg, 2, A),}\\ \text{(FIN, If, PrI, 3, A, pl),}\\ \text{(INF[initive], If, A),}\\ \text{(If, P[assive], INF)}\end{array}\right\}$$

[13] Note that by this definition the set

{sg, pl} × {NOM, VOC, ACC, GEN, DAT, ABL}

(the first example in the text) is equivalent not only to

{NOM, VOC, ACC, GEN, DAT, ABL} × {sg, pl}

but also to

{sg, pl} × {sg, pl} × {NOM, VOC, ACC, GEN, DAT, ABL}

and so forth *ad infinitum*; all such sets, moreover, are paradigmic patterns within the definition proposed below. It is this formulation which permits a paradigmic structure involving only one category. Thus for 'nominal' forms in Italian the structure would be an infinite equivalence-class with the members

{(sg, sg), (pl, pl)},
{(sg, sg, sg), (pl, pl, pl)},

etc.: the category *NUMBER* (with the terms sg and pl) is the only category involved.

[14] We depart from previous accounts in recognizing only three *MOODS*, namely FIN, INF and IMP[erative]; PrI, Pr[esent-]S[ubjunctive], etc. are then grouped together into a category which we will refer to, following a private suggestion by N. E. Collinge, as the category of *ACTUALITY*. The merits of this must be debated elsewhere.

which comprises both sextuples and triples; etc., etc. We may now define a 'minimal paradigmic pattern' (loosely a 'paradigmic pattern' with only one member) in the following way:

(5) For any grammar G and morphosyntactic properties $q_1, q_2, \ldots\ldots, q_n$, $P = \{q_1\} \times \{q_2\} \times \ldots\ldots \times \{q_n\}$ is a *minimal paradigmic pattern* with respect to G if and only if $\mathrm{B}^P \neq \varnothing$.

For example, the set

$$\{(\mathrm{FIN, A, Pa, If, 1, sg})\}$$

would be a minimal paradigmic pattern with respect to the grammar of Modern Greek presupposed above; i.e. there is at least one word (say the word realised by *éγrafa*) with all and only the properties FIN, A, Pa, If, 1 and sg. Similarly the set

$$\{(\mathrm{DAT, pl})\}$$

would be a minimal paradigmic pattern with respect to our grammar of Latin.

On this basis we may formulate a recursive definition of the term 'paradigmic pattern' in general. This reads as follows; a step-by-step illustration will appear below.

(6) For any grammar G and sets $P_1, P_2, \ldots\ldots, P_n$ such that

(i) For any i, P_i is a (minimal or non-minimal) paradigmic pattern with respect to G,

(ii) $\mathrm{B}^{P_1} \cap \mathrm{B}^{P_2} \cap \ldots\ldots \cap \mathrm{B}^{P_n} \neq \varnothing$,

and

(iii) For some k and l ($\mathrm{k} = 0, 1, 2, \ldots\ldots$; $\mathrm{l} = 1, 2, \ldots\ldots$), it is the case that for any i $P_i \subseteq (\{q_1\} \times \{q_2\} \times \ldots\ldots \times \{q_k\}) \times (\{k_{i1}\} \times \{k_{i2}\} \times \ldots\ldots \times \{k_{il}\}) \times (K_{i1} \times K_{i2} \times \ldots\ldots \times K_{im_i})$ for $\mathrm{m_i} = 0, 1, 2, \ldots\ldots$,

where

(iv) For any j, there exists some morphosyntactic category c such that, for any i, $q_{ij} {}^*\mathrm{T}\, c$,

(v) For any i and j ($\mathrm{i} \neq \mathrm{j}$), either
(*a*) for any t, $K_{it} = K_{jt}$,
or
(*b*) $\{K_{i1}, K_{i2}, \ldots\ldots, K_{im_i}\} \neq \{K_{j1}, K_{j2}, \ldots\ldots, K_{jm_j}\}$,

$P_1 \cup P_2 \cup \ldots\ldots \cup P_n$ is a *paradigmic pattern* with respect to G, provided that there exists no further set X ($X \notin \{P_1, P_2, \ldots\ldots, P_n\}$) such that, for the same values of k and l, conditions (i) to (v) are also satisfied with $X = P_{n+1}$.

For a thorough illustration, let $P_1, P_2, \ldots\ldots, P_n$ be the six sets

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{1\} \times \{\text{sg}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{2\} \times \{\text{sg}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{3\} \times \{\text{sg}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{1\} \times \{\text{pl}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{2\} \times \{\text{pl}\},$$

and

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{3\} \times \{\text{pl}\}$$

where G is our putative grammar of Latin. It is evident that each of these sets satisfies condition (i): for example, the lexeme AMO is a member of the basis of the first set (cf. (4) and (5) above) by virtue of the word realised by *amō*; the lexeme REGO is a member of the basis of the second, by virtue of the word realised by *regis*; and so forth. It is also evident that together they satisfy condition (ii): there is a large class of lexemes (AMO, REGO, etc.) which is included in the basis of each. But now consider the remaining conditions. Condition (iii) simply imposes a fixed analysis (or any one of a number of fixed analyses) on each of the sets concerned. For this example, one such analysis (not the one we want) is as follows: taking $\text{k} = 1, \text{l} = 5$ and m_i (for any i) $= 0$, we would have $q_1 = \text{FIN}$, $k_{\text{i}1}$ (for any i) $= \text{If}$, $k_{\text{i}2}$ (for any i) $= \text{A}$, $k_{\text{i}3}$ (for any i) $= \text{PrI}$, $k_{\text{i}4}$ variously $= 1, 2$ or 3, and $k_{\text{i}5}$ variously $=$ sg or pl. Similarly, the analysis we do want is as follows: taking $\text{k} = 4, \text{l} = 2$, and again m_i (for any i) $= 0$, we have $q_1 = \text{FIN}$, $q_2 = \text{If}$, $q_3 = \text{A}$, $q_4 = \text{PrI}$, $k_{\text{i}1} =$ variously $1, 2$ or 3, and $k_{\text{i}2} =$ variously sg or pl. With this second analysis, conditions (iv) and (v) and the final proviso are all satisfied. To be precise:

(a) With $\text{j} = 1$, condition (iv) is satisfied with respect to the category *PERSON*, whose terms comprise all of 1, 2 and 3; with $\text{j} = 2$, it is satisfied with respect to the category *NUMBER*, whose terms comprise both sg and pl.

(b) Since $\text{m}_\text{i} = 0$ for any i, condition (v) simply does not apply.

(c) The final proviso would only apply, given this much, if there existed some term x in *PERSON* in addition to 1, 2 and 3, or some term y in *NUMBER* in addition to sg and pl, such that at least one of the sets

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{x\} \times \{\text{sg}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{x\} \times \{\text{pl}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{1\} \times \{y\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{2\} \times \{y\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{3\} \times \{y\}$$

or

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{x\} \times \{y\}$$

was a minimal paradigmic pattern with one or other of the lexemes AMO, REGO, etc. as a member of its basis. This is not the case.

It follows from all this that the union of these six minimal paradigmic patterns, *viz*. the set

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\},$$

is a paradigmic pattern in the sense of Definition (6).

The recursive character of this definition may now be illustrated as follows. By similar reasoning, each of the sets

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PaI}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{FuI}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\},$$
$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrS}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\}$$

and

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PaS}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\}$$

is a further paradigmic pattern with respect to the same grammar of Latin: the reader may check this with his own knowledge of the language. Let us therefore consider these four sets, together with the set

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI}\} \times \{1, 2, 3\} \times \{\text{sg, pl}\}$$

which we have just discussed in detail, as a further set of values for $P_1, P_2, \ldots\ldots, P_n$. We have seen that condition (i) is satisfied; so also is condition (ii), the intersection of the bases again comprising AMO, REGO, etc. But then one possible analysis, in accordance with condition (iii), is as follows: taking $\mathrm{k} = 3, \mathrm{l} = 1$ and $\mathrm{m_i}$ (for any i) $= 2$, we have $q_1 = \text{FIN}$, $q_2 = \text{If}$, $q_3 = \text{A}$, $k_{\mathrm{i}1} =$ one or other of PrI, PaI, FuI, PrS and PaS, $K_{\mathrm{i}1} = \{1, 2, 3\}$ for any i, and $K_{\mathrm{i}2}$ (for any i) $= \{\text{sg, pl}\}$. With this analysis, clearly, conditions (iv) and (v*a*) are both satisfied – (iv) with respect to the category *ACTUALITY* (whose terms comprise all of PrI, PaI, FuI, PrS and PaS), and (v*a*) by virtue of the analysis (since $K_{\mathrm{i}1}$ is always $\{1, 2, 3\}$ and $K_{\mathrm{i}\,2}$ always $\{\text{sg, pl}\}$). Furthermore, the final proviso would only apply (compare the first illustration) if, for some further term x in *ACTUALITY*, at least one of the sets

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{x\} \times \{1, 2, 3\} \times \{\text{sg, pl}\},$$

etc. was at least a paradigmic pattern; this is not, of course, the case. It follows that the union of these five sets, *viz*.

$$\{\text{FIN}\} \times \{\text{If}\} \times \{\text{A}\} \times \{\text{PrI, PaI, FuI, PrS, PaS}\} \times \{1, 2, 3\} \times$$
$$\times \{\text{sg, pl}\}$$

is itself a paradigmic pattern within the definition given.

These two examples should suffice to illustrate the simplest type of paradigmic pattern: each such pattern is identical with the successive Cartesian products of the sets of morphosyntactic properties involved. But in other cases two types of complication arise.

(a) For the first, consider the corresponding paradigmic pattern (still with respect to the same grammar of Latin) which comprises all such sextuples with FIN as their first co-ordinate. This may be regarded, for our purposes, as the union of the three patterns

$$\{\mathrm{FIN}\} \times \{\mathrm{If}\} \times \{\mathrm{A}\} \times \{\mathrm{PrI, PaI, FuI, PrS, PaS}\} \times \{1, 2, 3\} \times \\ \times \{\mathrm{sg, pl}\}$$

(see above),

$$\{\mathrm{FIN}\} \times \{\mathrm{If}\} \times \{\mathrm{P}\} \times \{\mathrm{PrI, PaI, FuI, PrS, PaS}\} \times \{1, 2, 3\} \times \\ \times \{\mathrm{sg, pl}\}$$

and

$$\{\mathrm{FIN}\} \times \{\mathrm{Pf}\} \times \{\mathrm{A}\} \times \{\mathrm{PrI, PaI, FuI, PrS, PaS}\} \times \{1, 2, 3\} \times \\ \times \{\mathrm{sg, pl}\}.$$

The reader may check that for these sets both condition (i) and condition (ii) are satisfied. Furthermore, conditions (iv) and (v*a*) are satisfied with one possible analysis in accordance with (iii): the analysis concerned has $\mathrm{k} = 1$ ($q_1 = \mathrm{FIN}$), $\mathrm{l} = 2$ ($k_{\mathrm{i}1} =$ either If or Pf; $k_{\mathrm{i}2} =$ either A or P) and $\mathrm{m_i} = 3$ for each i ($K_{\mathrm{i}1} = \{\mathrm{PrI, PaI, FuI, PrS, PaS}\}$; $K_{\mathrm{i}2} = \{1, 2, 3\}$; $K_{\mathrm{i}3} = \{\mathrm{sg, pl}\}$). But the case is not so simple when we turn to the final proviso. Whereas in the last example, for instance, there were no further sextuples at all with FIN as their first co-ordinate, If as their second, A as their third, a term from *ACTUALITY* as their fourth, a term from *PERSON* as their fifth and a term from *NUMBER* as their sixth, in this case there does exist a further set

$$\{\mathrm{FIN}\} \times \{\mathrm{Pf}\} \times \{\mathrm{P}\} \times \{\mathrm{PrI, PaI, FuI, PrS, PaS}\} \times \{1, 2, 3\} \times \\ \times \{\mathrm{sg, pl}\}$$

which, taken in conjunction with the others, would satisfy (iv) and (v) for the same analysis in accordance with (iii). The conditions which would not be satisfied, of course, are (i) and (ii): there are no words ('periphrastic forms' do not count as words)[15] with both the properties Pf and P. Hence,

[15] More precisely, we may assume that any syntactic structure with, let us say, $\mathrm{AMO}_{\mathrm{Pf, FIN, PrI, 3, sg, P}}$ as a terminal element is converted (by obligatory syntactic rules) to the corresponding structure with terminal elements $\mathrm{AMO}_{\mathrm{PA, Masc, NOM, sg}}$ (or whatever *GENDER* is appropriate) followed by $\mathrm{SUM}_{\mathrm{If, FIN, PrI, 3, sg, A}}$: these elements are then separately realised as *amātus* and *est*. But the details are irrelevant here.

although the set $((\{FIN\} \times \{If, Pf\} \times \{A, P\} \times \{PrI, PaI, FuI, PrS, PaS\} \times \times \{1, 2, 3\} \times \{sg, pl\}) - (\{FIN\} \times \{Pf\} \times \{P\} \times \{PrI, PaI, FuI, PrS, PaS\} \times \times \{1, 2, 3\} \times \{sg, pl\}))$ is certainly a paradigmic pattern within the definition given, we might like to say that it is a pattern of a different type from the two earlier examples. Let us suggest, provisionally, that the earlier type should be referred to as 'symmetrical' whereas this type (where there is a 'hole' in the pattern) should be referred to as 'asymmetrical'; definitions of these terms will be set out below.

(b) To illustrate the second complication, let us extend this example still further to cover n-tuples with INF and IMP (as well as those with FIN) as their first co-ordinate. One relevant pattern may be regarded, for our purposes, as the union of the 'asymmetrical' pattern in (a) with the further patterns

$$(\{INF\} \times \{If, Pf\} \times \{A, P\}) - (\{INF\} \times \{Pf\} \times \{P\})$$

and

$$\{IMP\} \times \{I, II\} \times \{A, P\} \times \{sg, pl\}.$$

The reader may again check that conditions (i) and (ii) are satisfied.[16] Furthermore it is evident that condition (iv) is satisfied for the analysis $k = 0$, $l = 1$ (k_{i1} = one or other of FIN, INF or IMP), m_i successively = 5, 2 and 3 ($K_{i1} = \{If, Pf\}$ or $\{I, II\}$; etc.). However in this case (unlike all three earlier illustrations) there is no possible analysis such that (v*a*), as opposed to (v*b*), will also be satisfied. Hence, although the union of these sets is itself a paradigmic pattern (the final proviso, as well as (v*b*), is satisfied for the analysis given)[17], we might like to say that it is a pattern of yet another different type. In this case, let us suggest, the pattern is 'complex', whereas in the three earlier cases it was 'simple'.[18]

It remains for us to define the terms 'symmetrical', 'complex', etc. which we have just introduced. This may be done as follows (Note that (7) and (9) are riders to Definition (6)).

[16] Note that we have accepted all the traditional 2nd Person (including Mode II Passive) Imperatives; but none of the so-called 3rd Person Imperatives. For the *MODES* see Fn. 7 above.

[17] Condition (v*b*) serves merely to prevent, for example, the union of

$$\{FIN\} \times \{If\} \times \{A\} \times \{PrI, PaI, FuI, PrS, PaS\} \times \{1, 2, 3\} \times \{sg, pl\},$$
$$\{FIN\} \times \{If\} \times \{P\} \times \{PrI, PaI, FuI, PrS, PaS\} \times \{sg, pl\} \times \{1, 2, 3\},$$

and

$$\{FIN\} \times \{Pf\} \times \{A\} \times \{sg, pl\} \times \{PrI, PaI, FuI, PrS, PaS\} \times \{1, 2, 3\}$$

from being defined as a paradigmic pattern: if it was, it would unfortunately be complex by Definition (7), though others in the same structure would be simple.

[18] The term 'neutralisation' has sometimes been used in this context: e.g. the distinctions between *PERSONS*, *NUMBERS* and *ACTUALITIES* might be said to be 'neutralised' with respect to INF[initive]. But there is nothing like an agreed concept of 'morphological neutralisation'; cf. Bazell's review (Bazell, 1961) of a symposium devoted to this topic.

(7) For any such $M = P_1 \cup P_2 \cup \ldots\ldots \cup P_n$, M is *complex* if and only if condition (v*a*) is not satisfied.

(8) Any paradigmic pattern which is not complex is *simple*.

(9) For any such $M = P_1 \cup P_2 \cup \ldots\ldots \cup P_n$, if M is not complex, then M is *asymmetrical* if and only if, for some p (where, for some i, $p \in \{q_1\} \times \times \{q_2\} \times \ldots\ldots \times \{q_k\} \times (\{k_{11}\} \cup \{k_{21}\} \cup \ldots\ldots \cup \{k_{n1}\}) \times (\{k_{12}\} \cup \{k_{22}\} \cup \cup \ldots\ldots \cup \{k_{n2}\}) \times \ldots\ldots \times (\{k_{1l}\} \cup \{k_{2l}\} \cup \ldots\ldots \cup \{k_{nl}\}) \times K_{i1} \times K_{i2} \times \times \ldots\ldots \times K_{im_i}$), there exists no word w such that $w:p$, where $w:p$ would not imply that G was inconsistent by Requirement 4.

Next (let us generalise this):

(10) Any paradigmic pattern which is not asymmetrical is *symmetrical*.

The point of this generalisation is that there are clearly patterns which are both 'complex' and 'symmetrical' as opposed to others which are both 'complex' and 'asymmetrical'. The latter may be defined as follows.

(11) If M is a complex paradigmic pattern, then M is asymmetrical if and only if it includes some simple paradigmic pattern which is itself asymmetrical.

We may illustrate this last distinction by comparing the paradigmic structure for 'verbal' (excluding 'participial') forms in Latin with the corresponding structure for Modern Greek. First it will help, perhaps, if we introduce some sort of display device for paradigmic structures (see the beginning of this discussion) as opposed to the paradigmic patterns defined by (6). Briefly, such a structure may be represented by a directional graph with a single initial node I and a single terminal node T, some (but typically not all) of whose intermediate nodes are labelled with the relevant morphosyntactic properties. A graph of this kind is a representation of a specific paradigmic structure S under the following condition: that there is a path from I to T through nodes labelled $q_1, q_2, \ldots\ldots, q_n$ if and only if, for some p, $p \in P$ (for some $P \in S$) and all and only $q_1, q_2, \ldots\ldots, q_n$ are coordinates of p. Thus the graph in Figure 2 would represent the paradigmic structure for 'nominal' forms in Latin.

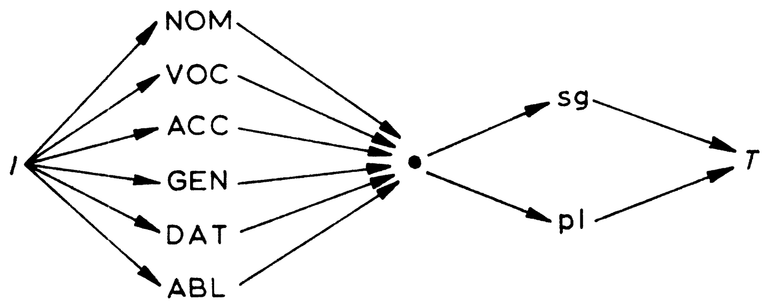

Figure 2

This structure is, of course, both simple and symmetrical; that is to say, it has as its members paradigmic patterns which are both simple and symmetrical in the sense of Definitions (7) to (9). In the same way, the paradigmic structure for 'verbal' forms in Modern Greek may be represented by the graph in Figure 3.[19]

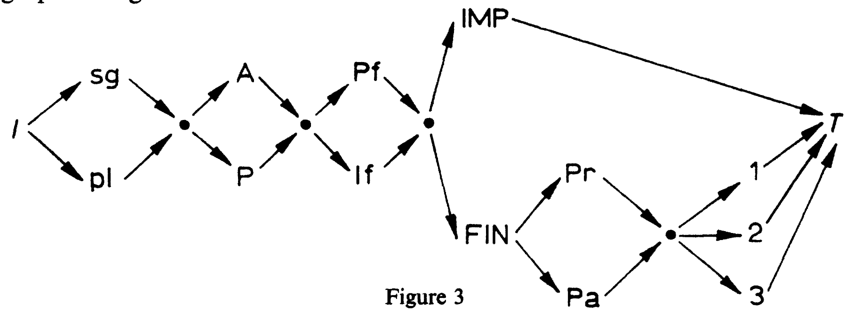

Figure 3

In this case, however, the structure is complex instead of simple; it has as its members paradigmic patterns such as $(\{\mathrm{FIN}\} \times \{\mathrm{sg, pl}\} \times \{\mathrm{A, P}\} \times \times \{\mathrm{If, Pf}\} \times \{\mathrm{Pr, Pa}\} \times \{1,2,3\}) \cup (\{\mathrm{IMP}\} \times \{\mathrm{sg, pl}\} \times \{\mathrm{A, P}\} \times \{\mathrm{If, Pf}\})$ which are defined as such by virtue of condition (v*a*), rather than (v*b*), in Definition (6). But it is clear, at the same time, that this structure (like the structure in Figure 2) is symmetrical in the sense of Definitions (10) and (11): none of its members includes a smaller paradigmic pattern which is itself asymmetrical by Definition (9). The corresponding structure for Latin, on the other hand, is the one represented in Figure 4

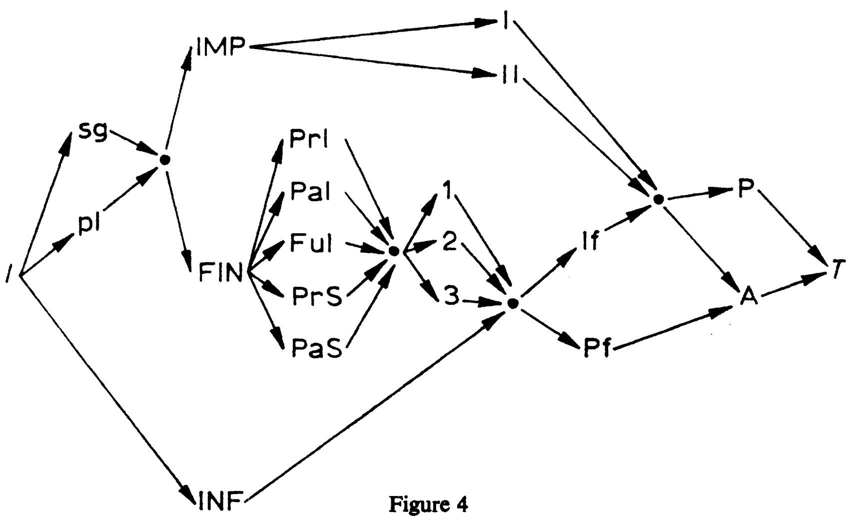

Figure 4

[19] Cf. Koutsoudas (1962: *loc. cit.*); the Imperatives have been supplemented from Mirambel (1959: 151–2 and the table facing 140).

and is at once asymmetrical as well as complex. Members of this structure (cf. the last of our illustrations, under (b), of Definition (6)) are complex paradigmic patterns which include smaller patterns, e.g. the example previously discussed under (a), which do satisfy Definition (9). Therefore, by Definition (11), each member as a whole is itself asymmetrical.

POSTSCRIPT

The foregoing paragraphs complete the central part of this paper; it would seem to be at least gratuitous, in a preliminary and relatively informal paper, to develop a typology of paradigmic structures beyond the point reached by our final definitions. Essentially, all we have done is as follows. We have simply clarified (and illustrated) certain concepts which we may now feel free to use in statements of the type: 'The paradigmic structure for verbal forms in Modern Greek involves the morphosyntactic categories *NUMBER*, *VOICE*, *ASPECT*, *MOOD*, *TENSE* and *PERSON*' or 'In many languages (e.g. Latin) the paradigmic structure for nominal forms is both simple and symmetrical, whereas the paradigmic structure for verbal forms is both asymmetrical and complex', and so forth. The distinctions involved in such statements (e.g. the distinction between the terms 'simple' and 'complex') are roughly of the same order of generality as those involved in the statements 'Spanish has a triangular vowel-system' or 'Noun-phrases in English exhibit an endocentric construction' which were referred to in the introduction to this paper. As such, there is every reason for supposing that they are useful; at this stage of our research, however, it is not clear precisely which finer distinctions will be of typological significance.

What may be profitable, however, is to inquire (as a postscript to this paper) whether there are any further points of linguistic theory which our definitions may help to clarify. Two points at once spring to mind. The first concerns the so-called 'matrix-theory' developed, in recent years, by Pike (1962; 1963) and his associates. This work is not easy to assess, partly because it is vitiated (increasingly in the latest articles) by a tendency to impose or 'discover' quite tendentious 'isomorphisms' between different linguistic levels.[20] To achieve this end, the concept of a 'matrix' (along with the whole distinction between 'particle', 'wave' and 'field') has simply been made so general that it is largely empty of meaning. The term now appears to refer to anything, e.g. a 'paradigm' for a language like Latin, a set of affixes in a 'polysynthetic' language (see the Potawotami material in Pike

[20] 'Isomorphism' in the non-mathematical sense of Kuryłowicz (1949) and other discussion of that period: for purely terminological parallels between levels see the Preface, in particular, to Bazell (1953).

and Erickson, 1964), a set of sentence- or clause-types defined by intersecting syntactic properties (Pike, 1963), a set of 'blended' Christian names[21] or a phonological system, which may for at least some purpose be displayed by some sort of multi-dimensional diagram. Such a concept is surely of little interest. However, there are (indeed there could hardly fail to be!) certain aspects of 'matrix-theory' which might usefully be reformulated along the lines suggested above. In particular, it seems that the typology of 'syntactic matrices' or 'syntactic paradigms' might raise problems similar to those raised by the typology of paradigmic structures. Let us consider one fairly complicated example. The matrix for clause-types in Sierra Popoluca, as described by Lind (1964), can be displayed quite successfully (using our notation) by the graph in Figure 5.[22] We have, in other words, something analogous to a complex and asymmetrical paradigmic structure which is formed by a set of seven syntactic 'systems' – one with the 'terms' Independent and Dependent, another with the 'terms' Transitive, Intransi-

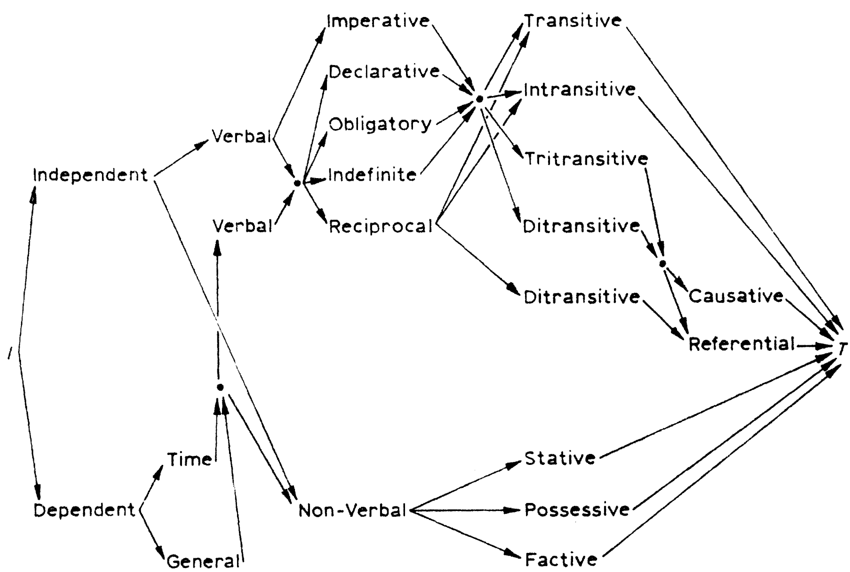

Figure 5

[21] This refers to one example which Pike gave in a course of lectures to the 1964 Linguistic Institute. I have not yet traced the published reference.

[22] This follows the text of Lind's article, except that we have separated Causative and Referential from Ditransitive and Tritransitive. Note that the 'Tagmemic notation paradigm' and 'Citation paradigm' on 342–3, like a number of 'tagmemic' diagrams and formulae which have come to my attention, are positively misleading: specifically, they do not indicate that Dependent Clauses can be Declarative, Reciprocal, etc. or (if we are supposed to guess that) that they cannot also be Imperative.

tive, Ditransitive and Tritransitive, and so forth: this use of 'system' is apparently one of the uses in Halliday (1961; etc.). Unfortunately, it is not at all clear how far this analogy can (or should) be taken. It is evident (to the present writer at least) that 'terms' such as Transitive, Dependent or Verbal are not the same type of entity as 'terms' such as ACC, PrI, pl, etc. in Latin: but how much difference (on this level of abstraction) does this make? Further work by Pike, and perhaps also by Halliday, should help to clarify this point.

The second matter concerns the traditional problem of 'Parts of Speech'. Let us begin by formulating three further definitions. First:

(12) A paradigmic pattern is *maximal* if and only if there is no morpho-syntactic property which is a co-ordinate of each of its members.

Thus the paradigmic structures displayed in Figures 2, 3 and 4 are all classes of maximal (as opposed to non-maximal) patterns: on the other hand, the structure displayed in Figure 6

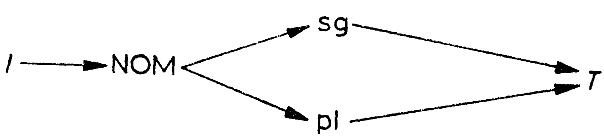

Figure 6

has as its members patterns such as {NOM} × {sg, pl} which are non-maximal by virtue of the property NOM. Two further concepts, those of a word-type and lexeme-type, may now be introduced as follows.

(13) For any maximal paradigmic pattern P, the *word-type* defined by P is the set of all words w such that $w:p$ for some $p \in P$.

(14) For any set of maximal paradigmic patterns $P_1, P_2, \ldots\ldots, P_n$, where $B^{P_1} \cap B^{P_2} \cap \ldots\ldots \cap B^{P_n} \neq \emptyset$, the *lexeme-type* defined by $\{P_1, P_2, \ldots\ldots, P_n\}$ is the set of all lexemes l such that, for some word w, w*F l and w (for some i) is a member of the word-type defined by P_i; any such lexeme-type is a *maximal lexeme-type* if and only if there is no larger lexeme-type in which it is included.

Alternatively, the word-type may be said to be defined by the paradigmic structure of which the pattern P is a member; likewise, the lexeme-type may be said to be defined by the set of structures which corresponds to the relevant set $\{P_1, P_2, \ldots\ldots, P_n\}$ of patterns. Thus, to illustrate (13), the words which have as their realisations the strings *amāmus*, *moneam*, *regō*, *audīvistī*, etc. would all be members of the word-type (let us call it the class of *verbals*) defined by the structure in Figure 4; on the other hand, those realised by *amandus*, *monentis*, *rēctūrus*, *dictū*, etc. would be members of a different word-type (the class of *participials*) defined by the structure represented in Figure 7.[23]

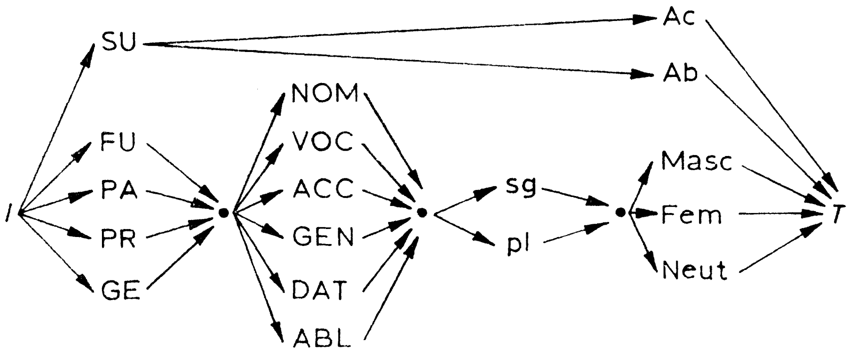

Figure 7

But to these two separate word-types, there corresponds only one maximal lexeme-type by Definition (14). The lexeme-type concerned (we may call it the class of *verbs*) is defined, *inter alia*, by the union of this pair of paradigmic structures – and has as its members lexemes such as AMO, MONEO, REGO, etc. whose forms comprise both verbals and participials.

What light does this shed on the question of 'Parts of Speech'? It is clear, of course, that the traditional classes[24] (let us illustrate with Latin alone) are neither maximal lexeme-types nor word-types as such: our definitions fail to draw the gross distinction between verbs and 'substantives', let alone the distinctions between conjunctions, prepositions and other sub-classes of particles. The present writer would like to suggest, however, that word-types and maximal lexeme-types are two of at least four sorts of classes which general definitions of 'Part of Speech' should take into account. The other two are as follows. First, the syntactic component of a grammar (or the syntactic and lexical components) will define a set of what might be referred to as *colligational classes*: it is in this respect that we may distinguish the lexeme-classes of *transitive* and *deponent* verbs, or the class of *numerals* (which comprises both lexemes and particles) from the particle-class of *conjunctions*. Secondly, the morphological component will define certain classes (let us call them *form-classes*) denoted by cover-symbols in various morphological rules. For instance, a rule which may be verbalised as follows: 'All substantives with the properties ACC and sg have realisations formed

[23] We simply assume, for the sake of an illustration, that the Supines in *-um* realise words with the properties SU[pine] and Ac[cusative-type], and those in -ū realise words with the properties SU[pine] and Ab[lative-type]. Gerunds and Gerundives are conflated as GE[rundial].
[24] For a history of the terminology and definitions cf. the Introductory Chapter of Brøndal (1948).

from the (thematic) stem by the suffixation of m' refers to a class of words *substantive* which is the union of the word-types participial (see above), *nominal* and *adjectival*.[25] As one might expect, the classes defined in these various ways only roughly coincide: thus the distinction between (forms of) *nouns* and (forms of) verbs reinforces the distinction between participials and nominals, but cuts the form-class of substantives (not the traditional class) in two. With such discrepancies, it is unwise (cf. Bazell, 1952; etc.) to define the general concept 'Part of Speech' in terms of any one of the more restricted concepts 'lexeme-type', 'form-class', etc. The statement that the Parts of Speech in Latin are such-and-such and such-and-such is a statement which should be made with all these sorts of classes in mind.

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[25] For uses of 'form-class' which clash with this see Bloomfield (1935: 164 *et passim*), Hockett (1958: 162), etc.

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