

THE GRANULAR NATURE OF A CONSTRUCTION AS ILLUSTRATED BY  
"FLYING PLANES"

Kenneth L. Pike and Evelyn G. Pike  
Summer Institute of Linguistics

1.0 Purpose

The purpose of this article are three:

1.1 Notation

First, we wish to illustrate one particular variety of tagmemic grammatical notation. This notation has underlying it an implicit constituent tree structure (with some network exceptions) for the language system as a whole. In it each constituent has a four-cell representation in terms of simultaneous emic slot (not sheer physical order), emic role (emic "case", on the clause level), emic class, and emic category. Of these four, slot and class represent grammatical arrangement, whereas role and category represent grammatical situational elements; in addition, slot and role represent functions, whereas class and category represent filler units. The notation has generative capacity (if one is careful to be sure that every structurally-complex filler class is accompanied by its own breakdown formula, or successive sets of formulas, until the analysis reaches down to the level of the morpheme class.

Our presentation of the structure of "flying planes" takes off from a list of utterances for analysis, sorted into two closely related groups in a workchart in Figure 1. (See paper by Peter Westrum in this volume for the method of preparing workcharts.) Then it gives formulas which are supposed to lead to these utterances (as part of the generative capacity of the formulas), as well as leading to other utterances not listed (since neither the beginning analyst nor the professional can ever have before him a complete list if it is either vast or open-ended). Appended to the formulas is a miscellaneous set of comments to help make the formulas more readily interpretable by the tagmemically uninitiated.

1.2 Comparative Theory

Our second purpose is to choose, for tagmemic analysis, an utterance cited by transformational grammarians in order to make it possible for readers with wide enough interests in comparing types of linguistic theory to be able, with some effort, to cross the communications gap which for some years has been distressingly wide in our discipline. The item chosen is Chomsky's 1958 elegant selection (in Third Texas, 1962: 148) of the ambiguous string "Flying planes can be dangerous."

Chomsky claims for it that it is analyzable adequately "if a certain verb is in

both  $V_1$  [i. e. intransitive] and  $V_t$  [i. e. transitive]." The readers should note, in our formulas below, that in some sense we are in accord with this claim: in the appropriate cells of the formulas contrasting the constructions the symbols I and T in the lower and upper right hand cells treat the problem. In order, however, to reach our goal of illustrating tagmemic notation on a slightly larger scale than the ambiguity itself, we include a set of related sentences, and to the formulas themselves we append various footnotes to encourage the reader to focus on certain crucial elements.

In our frame of reference, however, "Flying planes can be dangerous" is not one 'sentence' which can be ambiguous, but is rather an ambiguous utterance, representing either one of two sentences, but not both at the same time (except in a special context where it might conceivably be a pun on the sentence level). The two are homophonous, but exhibit different structures. We avoid, therefore, such statements such as Chomsky's (148) where he says: "Notice that transformations 17a and 18a may lead to the same (hence ambiguous) sentence [underlining added, K. L. P]." Yet here, again, a difference in the underlying definition of the term sentence does not prevent discussions of various important descriptive analytic issues across these two perspectives. Nor does it prevent our agreement in terms of certain--not all--characteristics of notation or of theory which can be mechanically convertible into one another. This, then, opens the door to the discussion of deeper differences which are philosophical in nature.

### 1.3 The Granular Universe of Linguistics

Our third purpose is to show a deep philosophical difference between tagmemics and the Chomsky analysis (and, incidentally, between tagmemics and stratificational grammar) by reference to this same early illustration from Chomsky. A profound difference remains even after the lesser matters of notation or of terminology are no longer in focus.

Tagmemic theory specifies that it is concerned with items-in-relation-to-an-observer (Pike, 1967); the thing-in-itself is inaccessible to us, and, concerning it tagmemics is silent (1967), neither denying its presence nor attempting to characterize it. Similarly, pure abstractions or pure relationships are in themselves unobservable; and therefore neither an abstract relation, nor a net of relationships nor an abstract feature of a relationship can be the starting point for an investigation in science.

Tagmemics as science (not as mathematics, and not as logic) is a theory of experience-as-part-of-the-environment; and, conversely, it is a theory of environment-as-part-of-the-experiencer. No observer, no data. Even "thingness" implies an observer reacting to something as a thing, or (including where language is involved) calling it a thing. The naming of (or description or reference to) an item is an observer's act, and until this occurs no item becomes related to language. Only the observer can make a pen to have the feature of "used-for-writing"; without this feature a pen is not a pen, but an unclassified useless thing of the broad set of items treated as having boundaries of figure-against-ground, but not as part of the wider behavioral net.

Thus, (a) the emic verbal classification act, especially by naming (or, in the early stages of thought or research, by lengthy discourse not-yet-"compacted" into a single label) is one part of the emic thing-in-relation-to-the-observer (it is a pen only in some observer's emic system), and (b) it is simultaneously part of the observer himself. (He is not describable or knowable apart from his net of emic units.) Observer and observed, in the tagmemic view, share certain components--essentially, not optionally--in any universe which we can live in, know, or analyze.

One step further: the universe as we experience it is not made up of dimensionless points, since experience-shrunk-to-a-point loses observability, and hence disappears from the universe of man. (Certainly one cannot draw such a point--though one can pretend that the ink continues to contract until it disappears and leaves its near-gone image like the smile of Alice's cat.) Thus, for example, the notation which suggests that a constituent tree structure has nodes as dimensionless points is false to any observable universe; the nodes must have dimensions.

It is here that our current tagmemic four-celled notation (or notation with more or fewer cells) gives dimensional reality to the nodes of a tree, or to the constituents of a formula. At each node, or for each constituent of the formula, one finds (two or more of the features of) slot, role, class, and category. (See in this volume, for example, the tree notation for a discourse in the article by Erickson and E. G. Pike; slot and role labels are attached to a branch leading to a node, while a class label--with or without category label--is placed between that branch and the node directly below it. See, also, Hale, 1973, for further related samples.)

Similarly, abstract rules can be neither the entrance point nor the sole end product of scientific research; they fail to have the necessary concreteness for the observer-observed correlation. Tagmemics, on the contrary, emphasizes the philosophical relevance to science of the specific and concrete as well as the general and the abstract.

### 1.3.3 Variation

This principle, in turn, opens the door for bringing into the theory those elements of variation within unit identity which may otherwise be difficult or impossible to handle directly: dimensionless points, or non-thing symbols can scarcely be treated (consistently) as having variant shapes, manifestations, or alloforms. Experienced variableness of experienced identity would otherwise have to be generated as a mere differentiated output of rules, tied together only by mathematical meta-language process, not by experience.

### 1.3.4 Physics Versus Mathematics

Six years or more ago K. L. Pike was trying to explain to Pierre Noyes (professor of theoretical physics at the Stanford Linear Accelerator) the tagmemic objection to classical mathematics when it affirms that the same number of points (an infinite number) may be specified as occurring in a short line as in a longer one; and the tagmemic insistence on the necessity of having dimensions to a point, for understanding the universe. Noyes, to Pike's delight, said (as best the latter can recall the incident) that the physicists refer to some such view as the granular nature of

the universe. Earlier, Noyes had helped Pike to understand himself in relation to the current intellectual climate, by telling him that he "thinks more like a physicist than a mathematician."

We adopt the term "granular", here, to emphasize the significance of the concrete and the particular units in our science, which are emically identifiable even after etic change. This implies the possibility of at least some emic segmentation (with or without some indeterminate boundaries). But this positive particularity does not rule out, in tagmemics, the complementary importance of essential pattern, which is seen as general.

The study of abstract mathematics or of logical relations should not be seen as a replacement for the study of man-in-environment (a social creature, and a participant observer in his physical and social worlds) nor for the study of environment as it is structured emically, unavoidably, by the observing man as part of that environment. Environment and man are each in the other in any universe knowable to man.

If, now, we assume that Chomsky in 1958 was, on the other hand, thinking more like a mathematician or logician than like a physicist, a hypothesis is available to help explain some of the deeper differences between our approaches to theory. In the article quote above, Chomsky (1962: 129) says:

"Motivated now by the goal of constructing a grammar, instead of a rule of procedure for constructing an inventory of elements, we no longer have any reason to consider the symbols 'NP', 'sentence', a 'VP', etc., that appear in these rules to be names of certain classes, sequences, or sequences of classes of concrete elements. They are simply elements in a system of representation which has been constructed so as to enable us to characterize effectively the set of English sentences in a linguistically meaningful way."

But what of the phrase "the set of ... sentences" in this quotation? Does it never enter the rules (say as "S")? If it does, it cannot be concrete; it cannot represent English occurring elements (even if the potential inventory is not countable). His theory (i. e. as a theory, not as a highly useful descriptive heuristic) seems to me to destroy itself by committing the epistemological fallacy--he excludes his own starting point from his purportedly completely inclusive statement.

Again, though he explicitly rejects classes of concrete elements from the representational system, and hence affirms VP as merely a symbol, not a class, we cannot personally reconcile this claim (though presumably he thought he could do so) with such phrases as: "Notice that if a certain verb is in both  $V_1$  and  $V_t$ ..." (1962: 148). But how can a "certain" word be other than concrete (it seems as clearly so as English can make it)? And the word "verb" in this context seems to suggest concreteness of the class, as if it indeed contained an inventory of elements. He acts as if he believed that there exist elements (not simply symbols) which can conveniently be referred to as verbs. To us it seems that he has an equivocation in his early use of these terms.

If, however, he wishes to treat his terms consistently as empty of all content (i. e. as mathematical points only as he implies), it is most unfortunate to use these same labels as if they sometimes applied to some thing, or to some class of

things.

On our part, we reject a philosophical platonism here, as being unlivable. Tagmemics, on the contrary, allows us by its acceptance of granular structure to live our metalanguage as we live our lives.

Yet here, once more, we wish to affirm that in actual practice the two approaches are by no means as far apart as a study of their philosophical underpinnings would seem to suggest. On the one hand, the transformational rules work only when applied to phrase structures treated as containing many fairly solid (garden variety) constituents. On the other hand, tagmemics has used abstract mathematical structures--e. g. group theory--to help understand and to describe certain complicated relations between language structures and societal structures (e. g. Pike, 1973).

The mind and language of man are too complicated to be represented both easily and completely by any one theory made by man about man. We turn now to our specific analysis.

## 2.0 Analysis of "Flying Planes"

### 2.1 The Data

A sample of the data which is crucial to the problem of the two homophonous sentences "Flying planes can be dangerous" is presented in Figure 1. One of the two sentences is Example 8 and the other is Example 16.

Clause Nucleus-as-Statement				Margin-as-Time
S-as-Item	P-as-Statement	Co-as-COS		
1 Those big flying planes	can be	dangerous	at this time	
2 Those big flying planes	are	dangerous	now	
3 That big flying plane	is	dangerous	now	
4 - Big flying planes	can be	dangerous	-	
5 - Big flying planes	are	dangerous	-	
6 Those - - planes	can be	dangerous	-	
7 Those - - planes	are	dangerous	now	
8 - - FLYING PLANES	CAN BE	DANGEROUS	-	
9 - - Flying planes	are	dangerous	now	
10 - - - Planes	are	dangerous	-	
11 His flying those big planes now	can be	dangerous	at this time	
12 His flying those big planes now	is	dangerous	-	
13 His flying those - planes -	is	dangerous	-	
14 - Flying big planes -	is	dangerous	-	
15 - Flying - - planes -	is	dangerous	-	
16 - FLYING - - PLANES	CAN BE	DANGEROUS	-	

FIGURE 1

The highest level construction which the chart presents is a clause. The slot-role of each of the two constituents is seen in the first row in the chart, heading the two columns: Nucleus-as-Statement and Margin-as-Time. In the columns are the fillers or manifesting clause or classes. There is just one class which manifests the Clause Nucleus-as-Statement: Equative Clause Root. The two contrastive structures which are crucial to our problem are fillers of the Subject-as-Item in the clause root. The first is a Noun Phrase (Examples 1 - 10) and the second is a Possessed Participial Clause (Examples 11 - 16).

## 2.2 The Formulas

$$1. \text{ Statement Clause} = + \frac{\text{Nuc} \mid \text{Eq Cl Rt}}{\text{Sta} \mid \{-\}} + \frac{\text{Mar} \mid \text{Tm W}}{\text{Tm} \mid \{-\}}$$

The formula is to be read: Statement Clause equals (is made up of) an obligatory Nucleus-as-Statement filled (manifested) by Equative Clause Root followed by an optional Margin-as-Time filled by either a Time Word or a Time Phrase. The symbol  $\{-\}$  means that there is no subcategorization of the class(es) manifesting the tagmeme which is relevant to our present discussion. Note that any tagmeme marked as obligatory has no empty row in its column, whereas an optional tagmeme does have at least one empty row; there is no empty row in the Clause Nucleus-as-Statement column whereas there is in the Margin-as-Time column. Statement is the role of the Clause Nucleus; this is in contrast to the role of question or of command.

Each construction class needs a lower level formula. Each morpheme class with its members is listed following the formulas. Only one class in the above formula is a morpheme class. The two others are construction classes, hence need lower level formulas; because Tm P (Time Phrase) is not relevant to our problem, we will not present it, but will continue with the other construction formula:

$$2. \text{ Eq Cl Rt} = + \frac{\text{S} \mid \text{NP}}{\text{Item} \mid \{-\}} + \frac{\text{P} \mid \text{VP}}{\text{Sta} \mid \text{Eq, ag } \bar{c} \atop \# \text{ of S}} + \frac{\text{Co} \mid \text{Adj}_2}{\text{COS} \mid \{-\}}$$

This formula is to be read: Equative Clause Root equals an obligatory Subject-as-Item filled by either a Noun Phrase, or a Possessed Participial Clause, followed by an obligatory Predicate-as-Statement filled by Verb Phrase-as-Equative, which is in agreement with the number of the Subject, followed by an obligatory Complement-as-Characteristic of the Subject filled by Adjective<sub>2</sub>. The number of the subject is to be found in the nucleus of the class which fills the subject slot, and is specified in the category cell of the governing tagmeme.

It is in this formula that the relevant contrastive classes appear: Noun Phrase and Possessed Participial Clause. Example 8 is one of the former in which planes is the nuclear element and Example 16 is one of the latter in which planes fills the Object-as-Undergoer slot.

We will not develop further either the Eq VP or Adj<sub>2</sub> because neither is relevant to the problem at hand.

$$3. \text{ NP} = \begin{array}{c} \pm^1 \\ \text{Spec} \end{array} \begin{array}{|c|} \hline \text{Mar} \\ \hline \end{array} \begin{array}{|c|} \hline \text{Dem Pro} \\ \hline \end{array} \begin{array}{c} \pm \\ \text{in Nuc} \end{array} \begin{array}{|c|} \hline \text{Qual} \\ \hline \end{array} \begin{array}{|c|} \hline \text{Adj}_1 \\ \hline \end{array} \begin{array}{c} \pm \\ \{-\} \end{array} + \begin{array}{c} \text{Mar}^2 \\ \text{Qual} \end{array} \begin{array}{|c|} \hline \text{I Pr Ptc} \\ \hline \end{array} \begin{array}{c} \pm \\ \{-\} \end{array} + \begin{array}{c} \text{Nuc} \\ \text{Item} \end{array} \begin{array}{|c|} \hline \text{N} \\ \hline \end{array} \begin{array}{c} \pm \\ \text{Num} \end{array}$$

That                      big                      flying                      plane  
Those                                                                planes

Note that Adj<sub>1</sub>, a morpheme class, is in contrast to Adj<sub>2</sub> in Formula 2, which is a construction class. Also note footnote 2. We will not develop the noun construction, but next present the formula for Intransitive Present Participle.

$$4. \text{ I Pr Ptc}^3 = \begin{array}{c} \pm \\ \text{Pred} \end{array} \begin{array}{|c|} \hline \text{Nuc} \\ \hline \end{array} \begin{array}{|c|} \hline \text{V Rt} \\ \hline \end{array} + \begin{array}{c} \pm \\ \text{Pred} \end{array} \begin{array}{|c|} \hline \text{Mar} \\ \hline \end{array} \begin{array}{|c|} \hline \text{Pr State Mkr}^4 \\ \hline \end{array}$$

fly                      ing

Predication is the role of the nucleus, rather than statement, because at this level in English there is no contrast between statement, question, and command. The category of the Verb Root is Intransitive as in birds fly. See Footnote 2 for the convention used to reduce redundancy in the representation of the margin tagmeme.

$$5. \text{ Ps'd Ptc Cl} = \begin{array}{c} \pm \\ \text{Psr} \end{array} \begin{array}{|c|} \hline \text{Mar} \\ \hline \end{array} \begin{array}{|c|} \hline \text{A} \\ \hline \end{array} \begin{array}{|c|} \hline \text{Pos Pro} \\ \hline \end{array} \begin{array}{c} \pm \\ \{-\} \end{array} + \begin{array}{c} \pm \\ \text{Item} \end{array} \begin{array}{|c|} \hline \text{Ptc Cl} \\ \hline \end{array} \begin{array}{c} \pm \\ \text{Singular} \end{array}$$

his                      flying those big planes now

A significant feature of tagmemics is seen in the dual role of the first tagmeme in this construction: possessor and actor. We would say that his functions both as possessor and as actor of the clause. Note also the singular category of the Participial Clause; only a singular verb can be used with this construction.

$$6. \text{ Ptc Cl} = \begin{array}{c} \pm \\ \text{Pred} \end{array} \begin{array}{|c|} \hline \text{Nuc} \\ \hline \end{array} \begin{array}{|c|} \hline \text{T Ptc Cl Rt} \\ \hline \end{array} \begin{array}{c} \pm \\ \{-\} \end{array} + \begin{array}{c} \pm \\ \text{Tm} \end{array} \begin{array}{|c|} \hline \text{Mar} \\ \hline \end{array} \begin{array}{|c|} \hline \text{Tm W} \\ \hline \end{array} \begin{array}{|c|} \hline \text{Tm P} \\ \hline \end{array} \begin{array}{c} \pm \\ \{-\} \end{array}$$

flying those big planes                      now

Note here that we are now showing the construction of the embedded clause: the first tagmeme is filled by the Transitive Participial Clause Root and the second tagmeme is the very same one which is the margin in Formula 1.

$$7. \text{ T Ptc Cl Rt} = \begin{array}{c} \pm \\ \text{Pred} \end{array} \begin{array}{|c|} \hline \text{P} \\ \hline \end{array} \begin{array}{|c|} \hline \text{I Pr Ptc} \\ \hline \end{array} \begin{array}{c} \pm \\ \text{T} \end{array} + \begin{array}{c} \pm \\ \text{U} \end{array} \begin{array}{|c|} \hline \text{O} \\ \hline \end{array} \begin{array}{|c|} \hline \text{NP} \\ \hline \end{array} \begin{array}{c} \pm \\ \{-\} \end{array}$$

flying                      planes

Perhaps the most significant feature of this formula is that an Intransitive Present Participle fills the Predicate slot in a transitive clause root. This assumes that birds fly is the basic usage of the verb fly, and that the transitive usage is derivative. This implies that it is the same morpheme in one basic class rather than belonging simultaneously to two different classes.

### 2.3 Morpheme Classes

In the above construction formulas some slot-roles are filled by morpheme classes. Normally lower level formulas are given until only morpheme classes fill the slots, but insight into the present problem doesn't require them, so they have not been included. We will list the morpheme classes and morphemes which do occur in the formulas and in Figure 1 in order to present something of the generative mechanism of tagmemics. We list glosses only for morphemes of special interest in showing the

mechanics of tagmemics.

I V Rt: fly; Dem Pro: that 'specifier away from speaker, singular'; those 'specifier away from speaker, plural'; Pos Pro: his 'possession in cross reference to masculine, singular, person noun of context'; Tm W: now; Pr State Mkr: -ing 'present state'; Adj<sub>1</sub>: big.

This, then, presents the tagmemic analysis of the homophonous sentences: "Flying planes can be dangerous." Each of the two constructions has optional constituents, some of which if omitted allow the homonymity. Such homonymity points up contrastive structures, but the analyst must look to the expanded and maximally-contrastive forms of each construction to gain insight into the problem.

## NOTES

- <sup>1</sup> In order to be strictly generative, this formula needs two alloformulas. The first has obligatory margin when the number of the filler class of the nuclear tagmeme is singular; but is optional, as indicated here, when the nucleus is plural. We have given only the more general formula here, with the optional margin.
- <sup>2</sup> This is a repetition of the preceding tagmeme. An emic formula would have one Mar-as-Qual, with both classes listed, with the rule that the tagmeme may be repeated. That big precedes flying is a lexical constraint rather than a grammatical one, so is taken care of elsewhere.
- <sup>3</sup> We have taken the label of construction Intransitive, Present Participle from the filler class of the optional margin for the noun phrase in Formula 3. Alternatively we could have listed in that margin merely the present participle, without mentioning the intransitivity subset of present participle. If this had been done, then Formula 4 to the left of the equals sign would also have omitted the intransitive symbol; but to the right of the equals sign in Formula 4, the filler of the nucleus would not have been merely the verb root, but would rather have been a class of verb roots--bitransitive, transitive, bi-intransitive, intransitive, bi-equative, and equative. Then there would have been corresponding changes in Formula 6--with a similar list in the filler of the nuclear slot. In Formula 7, intransitive would have been omitted from the present participle filler of the predicate; and a new formula, Number 8, would have been required to give the intransitive formula corresponding to Formula 7 for the transitive. This Formula 8 would have been:

$$8. \text{ I Ptc Cl Rt} = + \frac{\text{P}}{\text{Pred}} \mid \frac{\text{Pr Ptc}}{\text{I}}$$

The contrast between transitive and intransitive would then have shown up in two places: in the difference between the cohesion lower right hand cells of Formulas 7 versus 8, and the difference between the Noun Phrase (representing Illustrations 1 - 10) in Formula 3, and the Possessed Participial Phrase (representing the subject in illustrations 11 - 16) in Formula 5. Thus the basic differences between the two utterances of "Flying Planes" would have shown up there.

We have handled the contrast as in the text, however, because of a constraint



imposed upon us by the approach--namely that we are dealing with a single set of materials, basically two contrasting utterances. In a situation more normal for tagmemics, we would have been dealing not with just the pair of ambiguous utterances but rather with the whole system; in that case, we would want to know the full set of classes.

This implies that, at different stages in the analysis, the symbol "=" reflects the emic stage of the analysis in reference to the system as a whole; early in the analysis, the symbol "X" is likely to mean "construction X has the following potential, illustrated by a preliminary example, but may have further potentials which would show up if further illustrations of the total emic construction were later to be discovered." That is,  $X_1 = [Y]$ --as a preliminary etic part of the total emic formula. On the other hand, after the analysis of a particular construction is assumed to be complete, the equals sign has a more emic flavor, and would then mean: "construction X is made up of or has the following filler set, leading to its total generative potential." That is, X equals /Y/, where the slash lines imply full emic status.

Note, therefore, that the early representation reflects the analysis of a particular example or small subset of examples at hand, and in some sense, therefore, parallels the transformational use of a tree to show the derivation or constituents of a single example. The emic aim of tagmemics, on the other hand, is more directly focused on giving a systemic representation in which the generative potential is shown in the formula as a whole. In this respect, it is closer to a total set of rewrite rules in the transformational framework. The morpheme class listing might then be changed as follows:

I V Rt:  $I_b$  fly,  $T_d$  cause to fly, in which the index to the intransitive implies a basic intransitive form, whereas the index to the transitive implies a derived usage. Here the usage as transitive would be found in the Present Participle Formula 4, which in turn would fit into Formula 7 with a cohesion marker for transitive in the lower right cell, and the intransitive would comparably be developed in Formula 8. Other alternatives of presentation are also possible.

<sup>4</sup> If the role, the class, and the category are always the same in a given slot and if that class never occurs in another slot-role, then the tagmeme needs only slot and class labels to represent it.