CHAPTER 2

Some Formal Properties of Grammars, Trees and Rules

2.1 Introductory

Before the reader embarks on reading this chapter a warning is in order. This chapter is not meant to be read in the ordinary sense. Its main purpose is to serve as a reference text for the later chapters. Readers already familiar with concepts and techniques in transformational grammar will need it less than novices, who will have to spend some time getting used to the terms and techniques employed. Even they, however, are well advised not to try and master this chapter before they set out on chapter three. Instead, they should begin with the following chapter, which provides a gentler introduction into the matter, and look up technical terms and formal operations in the present chapter. This way the process of assimilation will be less demanding.

There is, however, also an important theoretical point to this chapter. It is thanks to the precise way in which the general notions are defined here that Semantic Syntax achieves the degree of compactness and uniformity in the syntactic description of the various languages shown in the following chapters. The universality of grammar starts at ground level.

2.2 Nodes, Constituents, Expansions and Areas

In 1.3.2 of the previous chapter the general format for Verb-first languages of the Formation Rules that generate SA-structures was specified as follows:

\[
\begin{align*}
V + (NP/S) \\
SA-Format: \quad S \rightarrow V + NP/S + NP/S \\
& V + NP/S + NP + NP/S
\end{align*}
\]

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1 In writing this chapter I was very much helped and stimulated by my Romanian colleague Dan Cristea, whose one-month stay at Nijmegen was entirely taken up with hours of concentrated work, interrupted by intensive discussions, on the issues discussed here.
This SA-Format is useful as far as it goes. It acts as a filter on structures generated by the Formation Rules. But in order to show up the underlying regularities in the rules (which were devised to show up the regularities detectable in the language), more information is needed on nodes, trees and operations on trees. This information will be provided in terms that may seem unnecessarily close to implementation. Their point, however, is not the imposition of some specific class of possible implementations but only, more modestly, to provide a set of notions precise enough to describe and analyse the operations occurring in the grammars of the languages described to an acceptable degree of formal precision.

Let us consider a tree to be a set of nodes and of relations of nodes, each node being characterized by a tag and by its values on a number of parameters. Each node is obligatorily specified for the parameters of category, parent node, right and left brother under the same parent, and lexical filler or dependents (the two being mutually exclusive), and optionally also for possible features. There are three kinds of features, rule features, which only occur with categorial nodes (see 2.6), plus/minus features, only occurring with noncategorial nodes, and neutral features, occurring with either. Thus, the general structure of a node specification for a node tagged N is as follows, with p, q, r, s and t as appropriate variables. The value for all parameters except ‘category’ may be zero (Ø).

\[
\begin{align*}
N_i \quad \text{cat}=P \quad \text{('cat': category)} \\
p=N_j \quad \text{('p': parent)} \\
rb=N_k \quad \text{('rb': right brother)} \\
lb=N_l \quad \text{('lb': left brother)} \\
d=N_m, ..., N_k \text{ or: fill}=Q \text{ ('d': dependent nodes; 'fill': lexical filler)} \\
optional: fe=[+/-R] \text{ or: fe}=[S] \text{ or: rulf}=<T> \text{ ('fe':; 'rulf': rule feature)}
\end{align*}
\]

At SA-level the only categorial node (see 2.6) is V: all lexically filled nodes have the category value ‘V’ (predicate). The category value may be changed during the Cycle by means of node category change (see 2.5). Many predicates bring along from the lexicon a rule feature inducing a cyclic rule. Rule features are removed when the rule in question starts to operate. When a cyclic rule results in a V-cluster through attraction of material from outside, any remaining rule features are inherited by the new cluster.

The parameters for parent, right/left brother and dependents define the local surroundings of the node. They express the two mathematical properties in terms of which tree structures are defined: dominance and precedence.