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The Semantics of Gradation

1 Introduction

The term 'gradation' is meant to cover a range of phenomena which for the time being I shall call quantitative evaluations regarding dimensions or features. I shall actually be looking into the principles governing the way gradation is expressed in language. The quantitative aspect of the adjectives of dimension occupies a key position which can be systematically explained and this aspect will be the crucial point of the discussion. I shall focus on the various grammatical forms of comparison: comparative, equative, superlative and some related constructions, and indications of measurement and adverbial indications of degree.

A substantial number of the relevant facts have been researched in a series of analyses and theoretical proposals on the semantics of comparison.[1] There are two main reasons why the present essay, while building on the insights gained so far, attempts to formulate a new theory concerning the same facts.

Firstly, there remain many relevant and revealing facts that have not been taken into account in previous analyses and could in fact not be incorporated without radical changes.

Secondly, while the facts dealt with so far have been systematically analysed and explicitly described, they have not been traced back to the general conditions and principles underlying the interactions of the phenomena observed.

A fresh approach also seems called for if we are to bring together systematically the explanations and insights provided by existing analyses, because of their sometimes widely differing orientation regarding (a) the way they treat the central facts, (b) their aims in doing so and (c) the methods they use.

Regarding the first point, the theory I propose extends the domain of 'relevant and revealing facts' in an attempt to achieve greater *descriptive adequacy*. However, it is important that this aim is not achieved only by enriching descriptive statements and generalizations but – and this is where the second point comes in – by tracing the facts back to underlying principles, thus attempting to achieve greater *explanatory adequacy*. Important ideas and findings are taken over from existing analyses and theories; they are modified, mostly slightly, and extended. But the total picture that emerges is a radically different one, regarding both the semantic structure of the elements and constructions concerned and, more

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importantly, the overall theory in which the assumptions underlying them are placed.

The picture which emerges results from an attempt to bring together, and generalize upon, the various relatively independent but interacting mechanisms which underly the phenomena of gradation. Although this was not part of the original intention, one point of view which has been crucial to developments in the theory of syntax over the past ten years has had a particularly important bearing on the elaboration of the present theory: the discovery of general conditions and principles which allow us to disentangle special properties of particular rules and of structures, in order to arrive at generalizations in the way most forcefully demonstrated by CHOMSKY (1981 and later works). In particular it will be shown that, while the comparative and constructions related to it play a crucial part in the range of facts relevant to gradation, their characteristic features follow largely from more general principles whose domain covers more than the syntax of comparison.[2] Hence the title 'The semantics of gradation'.

By the very nature of things I cannot pursue all the relationships into which the systems involved in gradation enter. Nor can I elaborate systematically upon all the components which are involved in the facts I shall be dealing with. For example, I shall confine myself to just a few remarks here and there on the role of sentence stress, although the general principles for the semantic interpretation of sentence stress play a central role in comparison. Similarly, little attention can be given to the interrelation between comparison and quantifiers. But in the course of developing and explaining the theoretical framework I shall indicate as far as possible how these problems might usefully be pursued further.

The theory proposed here, as I said above, has resulted partly from sifting through the facts previously left aside and partly from following up, modifying and rejecting ideas put forward in the various existing analyses of the syntax and semantics of comparison. In the present framework I shall refer to these analyses only where this serves to clarify and explain the issues taken up.

The form in which the theory is presented here has come about via a number of steps and not without modifications on the way.[3] While I believe that the main threads which emerge lead in the right general direction, there is no doubt that there will have to be more additions and modifications regarding both the questions left open here and the theoretical framework as a whole.

2 Technical Preliminaries

2.1 The Nature of SF

The theory must be based on a certain framework of conditions within which the various interrelated systems and the principles on which they are organized have their own place.

The theory of syntax which forms the background of the analysis is the Government and Binding Theory (GB) of generative grammar as developed in CHOMSKY (1981) and in subsequent work. I shall not take up the question of how far

the present theory of gradation can be related to other syntactic theories. The framework I shall use for the semantics of gradation can be summarized thus:

(1) $$\underbrace{(PF \ldots LF \quad SF)}_{\mathbf{G}} \Longrightarrow \underbrace{(CS \ldots)}_{\mathbf{C}}$$

The phonetic form PF is related to the logical form LF by a well defined system of intermediate representations, and regarding this relation I shall take for granted the notions and concepts developed in GB. Let me make some preparatory remarks though on the nature of the semantic form SF and its relation to LF. The whole representational system ranging from PF to SF is determined by the elements, rules and principles subsumed under the grammar **G**, which contains the lexical system LS as a component. The symbol '$\Longrightarrow$' stands for the mapping of linguistic structures onto conceptual representations, in other words the interpretation of SF on the level of conceptual structures CS. This mapping, and the structure of CS, on which only fragmentary ideas are available in comparison to the levels of linguistic structures, will be the subject of some explanatory remarks in Section 4. These will be restricted to the subject of gradation. Generally speaking, CS is determined by elements, rules and principles of the conceptual knowledge subsumed under **C**. SF, by way of technical metaphor, can be regarded as the interface between linguistic and conceptual knowledge, just as PF is the interface between linguistic patterns on the one hand and articulatory and perceptual patterns on the other.

Concerning the structure of SF I shall take for granted the basic concepts I have developed elsewhere (e.g. BIERWISCH (1982, 1983, 1986); cf. also ZIMMERMANN (this volume)), confining myself here to a few stipulations which I shall add in the course of the analysis.

The format of the representation of SF is fixed by a categorial language which contains constants and variables as basic units. The units and the complex expressions formed from these are categorized. There are two basic categories: S, which contains expressions that representations of states-of-affairs are assigned to in CS; and N, which contains expressions identifying referential instances ('things' in a sufficiently abstract sense) in CS. S and N are used to form complex categories: S/N for one-place predicates, (S/N)N for two-place predicates, etc. The categorization of the basic units at the same time determines the combinatorial structure of SF: a predicate of the category S/N together with an expression of the category N forms an expression of the category S etc. The details of this combinatory mechanism will become clear as we proceed.

Of the constants in SF we are primarily interested in those connected with gradation. They will be introduced systematically below. For purposes of illustration I shall also invoke provisional units whose status is a non-committal one: constants like TABLE or HANS, appropriately categorized, will stand for SF structures not analysed further here.

Besides the specific constants relevant to gradation, SF will contain the usual connectors $\wedge$, $\vee$, $\rightarrow$ and $\sim$, for which the standard logical axioms and definitions are valid. SF also contains the two quantifiers $\forall$ and $\exists$, which together with a variable of any category form a functor expression of the category S/S. The way the two quantifiers are used differs somewhat from the standard interpretation. They are to be understood thus:

(2)(a) $\exists x$ is interpreted in CS by the nearest instance which satisfies the category of x.

(b) $\forall x$ is interpreted in CS by any instance in a given domain which satisfies the category of x.

(c) The usual duality relation $\sim \exists x\ [Q] \equiv \forall x \sim [Q]$ obtains.

The term 'nearest instance' and 'given domain' are explicanda of a theory of CS. However, they are also partly determined by conditions in SF: if a suitable instance is determined in the environment of $\exists x$ (in a vague sense of environment for the time being), then $\exists x$ is interpreted preferentially by this instance. (LANG (1985) specifies more precisely certain conditions that come into play here). Analogous conditions obtain for the domain mentioned in (2b).

On the basis of these two quantifiers I further define two descriptive operators ε and α with the following properties:

(3)(a) If x is a variable of any category and Q is an expression of category S, then εx [Q] and αx [Q] are expressions assuming the category of x.

(b) If P and R are expressions of category S/X, where X is the category of x, then the following equivalences hold:

(i) $[P\ \varepsilon x\ [R\ x]] \equiv \exists x\ [[R\ x] \wedge [Px]]$
(ii) $[P\ \alpha x\ [R\ x]] \equiv \forall x\ [[R\ x] \rightarrow [Px]]$

(c) Regarding the classical negation the following scope relations hold:

(iii) $\sim [P\varepsilon x\ [R\ x]] \equiv \sim \exists x\ [[R\ x] \wedge [P\ x]]$
(iv) $\sim [P\alpha x\ [R\ x]] \equiv \sim \forall x\ [[R\ x] \rightarrow [P\ x]]$

In other words, ε and α are operators creating quantified descriptions: $\varepsilon x[R\ x]$ means 'an x with the property R' and $\alpha x[R\ x]$ means 'any x with the property R', again relative to the nearest instance and the given domain for x. The stipulation of the scope of negation in (c) corresponds to that of quantifiers, i.e. ε and α do not exceed the scope of other operators. Otherwise the usual conversion rules obtain. Further explanations will be given as the need arises.

Finally, SF contains the lambda operator or abstractor $\hat{x}$ with the property:

(4)(a) If x is a variable of category X and Q is an expression of category Y, then $\hat{x}$ [Q] is an expression of the category Y/X.

(b) If P is an expression of category Y/X, x is a variable of category X, and Z is an expression of category X, then the following equivalence holds: $[\hat{x}[P\ x]]\ Z \equiv [P\ Z]$

$\hat{x}[P\ x]$ means: 'x with the property P' or, more simply, 'the property P of x'. That is why the so-called lambda conversion defined in (4b) holds.

The five operators specified in (2) to (4) bind all instances of their respective variable which occur (freely) in their scope. The scope is their operand, i.e. the expression with which they form the next higher complex expression. Operators can be interlocking, i.e. one operator can occur within the scope of another.

The effect of the general stipulations I have made will become clear through the use I shall be making of them.

The general structure of SF I have indicated follows in essence the rules of standard logic, so that the usual possibilities of conversion and the usual equivalences obtain, and I shall occasionally be making use of these to clarify the points I want to make.

In general terms I would say that two linguistic expressions are SF-equivalent if the representations in SF assigned to them can be equivalently converted into each other. This allows an important distinction to be made: two expressions can be SF-equivalent without having the same representations in SF. Thus the two sentences in (5) can be SF-equivalent without being SF-identical:

(5)(a) Hans ist größer als Fritz
Hans is taller than Fritz

(b) Fritz ist kleiner als Hans
Fritz is shorter than Hans

This allows different aspects of synonymy to be meaningfully kept apart.

I shall also be using the technical means I have indicated in order to compare various proposed analyses, which means that when I am describing proposals by other authors, I shall be adapting them to the descriptive framework I am using.

2.2 The Relation Between LF and SF

An important reason for assuming a special level of representation between LF and CS is the internal structure of lexical items, which appear in LF in the first place as basic elements of the syntactic structure. However, the internal structure of lexical items in SF has far-reaching consequences that affect, among other things, the semantic interpretation or motivation of genuinely syntactic assumptions, in particular of the θ-theory – the theory of linking lexical items with their syntactic arguments by assigning thematic roles (θ-roles) – and of the binding theory, developed in GB. At the same time it provides the basis for mapping LF onto SF. Here I shall give at least a few clues to this.

I assume that in LF (and on all syntactic levels) a lexical item E is represented by a pair (PF, SF), where PF is the phonological form of E in the lexical entry LE for E and SF is the semantic form of E specified in LE. Further, in LF, E fulfils the categorization and subcategorization conditions specified in LE. In accordance with these conditions, E can adopt syntactic arguments, specifically: one and only one external argument and various internal arguments or complements satisfying its subcategorization. All syntactic arguments of E are θ-marked by E, that is, E assigns them a θ-role.

The SF representation of an item E consists of an expression of constants, variables and operators of SF. In particular, for each syntactic argument position θ-marked by E, SF of E contains an abstractor $\hat{x}$, which is labelled for the corresponding syntactic argument position, i.e. either for an external argument or for one of the complements indicated in the subcategorization frame. I shall call $\hat{x}_k$ the θ-role to be assigned to the argument k; the sum of θ-roles of a unit I shall call its θ-grid. Thus θ-roles are semantically construed as lambda operators which bind corresponding variables in the SF of their lexical entry. The following example illustrates the general pattern which emerges for the lexical entries by means of a provisional (and incomplete) entry for the German verb **zeigen** (*show*):

(6) /**zeigen**/; V; [(NP^d) NP^a __;]
$[\hat{x}^a[\hat{x}^d[\underline{\hat{x}}[\hat{x}^r\ [x^r\ [\text{INST}\ [x\ [\text{DO}[x_i\ [\text{CAUS}\ [x^d\ [\text{SEE}\ x^a]]]]]]]]]]]$

SEE, CAUS and DO are SF constants with more or less obvious interpretations in CS. INST is an SF constant of category (S/N)/S, which forms instances for a type of state-of-affairs, providing it with a referential position, which is identified by the variable x^r. The θ-grid of **zeigen** has three proper and one improper θ-role and the upper indices show which syntactic argument they are assigned to (here 'd' can be interpreted as indirect or dative object and 'a' as direct or accusative object). The θ-role for the external argument, the subject, is underlined. The improper θ-role $\hat{x}^r$ is not assigned to any syntactic argument. It is referentially bound (details below).

For the relation between LF and SF let the following hold:

(7) If a lexical item θ-marks a syntactic argument position, then the corresponding θ-role is coindexed with the argument, i.e. the θ-role receives the index i of the corresponding argument in LF.

(8) All variables bound by $\hat{x}$ in SF adopt the index of $\hat{x}$.

If the syntactic complement designated for a θ-role is not present in LF because it is optional (e.g. the indirect object of **zeigen**), then the following principle holds:

(9) If $\hat{x}$ does not θ-mark a pertinent syntactic argument, then it is replaced by $\exists x$, and $\exists x$ is subordinated to the θ-grid, i.e. it has narrower scope than all θ-roles.

This principle has elsewhere been called the Unspecified Argument Rule (UAR) (Bierwisch (1982), Lang (1985), Zimmermann (in this volume)). Besides holding for optional complements (9) also applies to the external argument of passivized verbs, which is not assigned to any syntactic argument.

Adjectives, nouns and prepositions always have a θ-role in their θ-grid for an external argument. For predicative NPs, APs and PPs this external θ-role is assigned to the subject of the copula sentence.

NPs and PPs can occur in a referential argument position. Then the external θ-role is referentially bound. The same is true of the improper θ-role of verbs. I shall assume the following principle for this:

(10) If $\hat{x}$ is the external θ-role of the head of a referential NP or PP or the improper (referential) θ-role of a verb, then $\hat{x}$ is replaced by εx_i, where i is the index of the NP, PP or VP in the head of which the θ-role in question occurs.

APs and PPs can occur in a modifying position, i.e. as attributes or adverbials. I shall take it for granted that in LF the relation 'X is a modifier of Y' is defined. Then the following modification principle holds:

(11) If X is a modifier of Y, then the external θ-role of the head of X is absorbed by $\hat{x}'$, and $\hat{x}'$ is the external θ-role of a noun or the improper θ-role of a verb that is the head of Y.

Absorption of a θ-role can also be expressed by coindexing. For the sake of clarity I shall here state the intended effect in SF.

(12) $[\hat{x}'\ [\text{P}\ x']]\ [\hat{x}\ [\text{Q}\ x]] \equiv [\hat{x}'\ [[\text{P}\ x'] \wedge [\text{Q}\ x']]]$ iff
$\hat{x}'$ absorbs $\hat{x}$ in accordance with (11).

In other words, the SF of a modifier and of the modified expression are conjoined, and the absorbing θ-role binds all variables that were bound by the absorbed one. Because the coindexing convention (8) holds here too, the variables bound by the external θ-role of the modifier receive the index of the absorbing θ-role.

In stating (12) I have expressed an extensional concept of modification which is contrary to most theories on the semantic function of adjectives. In 4.2 I shall explain why I regard my assumption as correct.

The SF-representation of a complex syntactic expression K can now be defined as the set (grouped in accordance with the phase structure of K) of the SF representations of the lexical items E occurring in K, provided that all θ-roles have been coindexed and specified on the basis of (7) to (11) according to the LF of K. This definition applies to K and all its constituents and thus stipulates a strictly compositional structure of SF on the basis of LF.

It is easy to see that the θ-marking (7) identifies by coindexing the argument assigned to each abstractor, an argument to which the lambda conversion given in (4b) can be applied. Hence the SF aspect of θ-marking can also be formulated as follows:

(13) If $\hat{x}$ is a θ-role of E and E θ-marks the argument position of a constituent C which has the SF representation Z, then $\hat{x}$ is deleted and Z is substituted for all variables bound by $\hat{x}$.

(7) and (13) correspond to each other in the sense of the equivalence defined in (4b) and thus produce equivalent representations for the SF of a given syntactic expression. (13) also defines a strictly compositional SF structure which states the SF representation for each syntactic constituent. The resulting representations may be illustrated by a simplified example:

(14) [[Hans]$_{NP_l}$ [zeigt [neue Bilder]$_{NP_j}$]$_{VP_k}$]$_S$

(15) [εx_k [$\exists x^d$ [x_k [INST [HANS$_l$ [DO x_i [CAUS [x^d [SEE [εx_j [[NEW x_j] $\wedge$ [PICTURES x_j]]]]]]]]]]]]

I suspect that the theory of SF must in principle be developed with a view to representations determined by (7) and not by (13). Nevertheless I shall be taking (13) more or less for granted and shall give representations of the type (15) because they come closer to the formulae of standard logic and often give a more transparent picture. They also allow equivalent conversions, which make the consequences of special assumptions clear, especially where complements themselves have complements, in other words, when encapsulated coindexing occurs, as is the case, for example, in comparative and equative constructions.

The various assumptions underlying the technical set-up sketched above needs further explanation, but I cannot give this here.[4] Further technical details will be introduced in the course of the analysis. There are two points to make in conclusion that are relevant to the theory of gradation.

Firstly, in the SF of a lexical item free variables can occur which are not bound by any θ-role. In the example of zeigen (*show*) I assumed that the variable x_i in (6) and (15), representing the cause of something becoming visible by showing, is one such variable. This variable is a parameter to be specified contextually in the interpretation. Variables of this kind will play a crucial part in the theory of gradation.

Secondly, the theory of predication and modification adopted here permits us to introduce a concept which allows an important generalization about the various possibilities of occurrence of adjectives:

(16) X is the relatum of Y in C if X is the narrowest constituent in C for which it holds that the external θ-role of Y is coindexed with a θ-role of X.

(16) is formulated on the assumption of (7), i.e. without the lambda conversion of the θ-role, and would have to be appropriately modified with regard to (13). The condition 'the narrowest constituent in C' needs to be sharpened with regard to LF. Here I shall rely on informal understanding. Regarding modification I have taken for granted that the absorbed θ-role is coindexed with the absorbing one. What (16) means is that the head of the subject is the relatum of the predicate, and the head of the modified constituent is the related unit of the modifier. The first point is valid on the basis of (7) and (16), and the second on the basis of (11) and (16). This gives us in particular the relevant common denominator for adjectives used predicatively, attributively and adverbially, as the following sentences show (the related unit is underlined):

(17)(a) Der <u>Baum</u> ist hoch
The <u>tree</u> is tall

(b) Der <u>entlaubte Baum</u> ist hoch
The <u>bare tree</u> is tall

(18)(a) An der Ecke steht ein hoher <u>Baum</u>
On the corner there stands a tall <u>tree</u>

(b) Hans <u>springt</u> nicht sehr hoch
Hans does not <u>jump</u> very high

(16) has various consequences, which I cannot follow up here, related to very specific assumptions on the syntax of modification and predication. For the purposes of the present discussion it follows from (16) that gradation can be developed in a largely uniform way for predicative, attributive and adverbial adjectives. Where there are not peculiarities to take account of I shall base the discussion mainly on predicative adjectives.

Regarding the basis for the syntax of constructions involved in gradation I shall in essence follow the analysis of ZIMMERMANN (this volume), but I shall here and there consider additions and alternatives.

3 Analyses of Comparison

3.1 Some Basic Assumptions Concerning the Relevant Facts

To get a proper point of departure and a useful orientation, let us in this section take a look at the most important ideas and proposals developed so far on the analysis of comparison. We may begin by listing the central and widely accepted notions on the facts to be accounted for.

(i) *Gradable adjectives can be interpreted either as nominative or as contrastive*

Interpreted as nominative, they only identify a certain dimension or a scale on a dimension, and interpreted as contrastive they pinpoint an extreme value on this scale. The adjectives in (19) are interpreted as contrastive and those in (20) as nominative:

(19)(a) Hans is groß
Hans is tall

(b) Wie klein ist Fritz?
How short is Fritz?

(20)(a) Hans ist 1.20m groß
Hans is 1.20m tall

(b) Wie groß ist Hans?
How tall is Hans?

The contrastive interpretation always depends on a contextually determined comparison class C, relative to which the extreme value is fixed. Thus (19a) is to be interpreted according to (21a) and (21b):

(21)(a) Hans ist groß für C
Hans is tall for C

(b) Hans ist größer als der Durchschnitt von C
Hans is taller than the average of C

I shall abbreviate the average of C as 'N_C' (for Norm with regard to C) and call the adjectives interpreted as contrastive 'norm-related'. I shall later give a sharpened account of the content of N_C. The paraphrase in (21b) leads straight to the next point.

(ii) *An adjective has the same lexical semantic basis for its interpretation in all the morphosyntactic constructions it can occur in.*

On this view, the positive is, so to speak, a disguised special case of the comparative. This assumption leads to a sort of paradox: the morphologically and syntactically simple positive requires a specification not required in the comparative. Most analyses give rules aimed at taking account of this paradox and determine the norm relatedness required for the positive.[5] I shall show later that this paradox, given appropriate notions on the SF of adjectives, disappears.

(iii) *Antonymous adjectives identify the same dimension but assign to it scales that are ordered in opposite directions.*

Here, I shall leave open the question of when, exactly, two adjectives are antonymous. Pairs like *large/small*, *long/short*, *clever/stupid* are sufficiently clear. The assumption made in most analyses that antonymy means the same thing for all analogous pairs of adjectives is false, as we shall see shortly.

(iv) *Antonymous adjectives in the sense of (iii) are contrary.*

This means that sentences like (22a) are contradictory, those like (22b) are contingent and those like (22c) are redundant, assuming that in each case both adjectives are interpreted in relation to the same comparison class.

(22)(a) Hans ist groß und klein
Hans is tall and short

(b) Hans ist nicht groß und nicht klein
Hans is not tall and not short

(c) Hans ist nicht groß und klein
Hans is not tall and (is) short

Clearly this property follows from (iii) and (ii), in other words it can be deduced from the assumption that the positive is a disguised comparative with N_C as the implicit value of comparison.

(v) *The relation expressed by the comparative of an adjective is the converse of the relation expressed by the comparative of its antonym.*

In other words sentences like (5) – repeated here as (23) – are SF-equivalent:

(23)(a) Hans ist größer als Fritz
Hans is taller than Fritz

(b) Fritz ist kleiner als Hans
Fritz is shorter than Hans

This property follows directly from (iii). But we can already see that not all pairs of antonyms behave in the same way:

(24)(a) Hans ist klüger als Fritz
Hans is more intelligent than Fritz

(b) Fritz ist dümmer als Hans
Fritz is more stupid than Hans

While (24b) implies (or presupposes) that both Fritz and Hans are stupid, (24a) leaves the question open whether they are both intelligent. So the two sentences are not SF-equivalent in the same way as those in (23), for which there is no such distinction.

(vi) *Comparative and equative constructions are in a certain sense dual to each other.*

This is illustrated by sentences like (25) and (26), which are pairwise SF-equivalent.

(25)(a) Hans ist größer als Fritz
Hans is taller than Fritz

(b) Fritz ist nicht so groß wie Hans
Fritz is not as tall as Hans

(26)(a) Hans ist nicht größer als Fritz
Hans is no taller than Fritz

(b) Fritz is so groß wie Hans
Fritz is as tall as Hans

Here too a certain reservation has to be made. (27b), for example, presupposes that Hans and Fritz are short (the adjective is norm-related), while (27a) does not:

(27)(a) Hans ist nicht kleiner als Fritz
Hans is no shorter than Fritz

(b) Fritz is so klein wie Hans
Fritz is as short as Hans

(28)(a) Hans ist kleiner als Fritz
Hans is shorter than Fritz

(b) Fritz ist nicht so klein wie Hans
Fritz is not as short as Hans

In (28) the situation is even more complicated: (a) is without presupposition – Hans and Fritz can both be tall – while (b) implies that Hans is short, leaving this open in the case of Fritz.

(vii) *The scales of certain dimensions contain units of measurement.*

The adjectives involved can then be used with measure phrases, both in the positive and the comparative. Simple examples of this are:

(29)(a) Hans is 1.20m groß
Hans is 1.20m tall

(b) Hans ist 30cm größer
Hans is 30cm taller

(c) Fritz ist 20cm kleiner als sein Bruder
Fritz is 20cm shorter than his brother

With this kind of measure phrases the adjectives are always nominative, i.e. not norm-related. One case needs special mention which is illustrated in (30):

(30)(a) ?Hans ist 1.20m klein
Hans is 1.20m short

(b) Hans ist 1.20m groß und das ist kleiner als N_C
Hans is 1.20m tall, and that is shorter than N_C

(30a) is deviant but has a clear interpretation which can be paraphrased by (30b). None of the existing theories provides a plausible analysis of this apparently trivial phenomenon.[6]

The points just made, (i)-(vii), record the essential structure of the range of facts which the existing theories set out to account for.

3.2 The Basic Structure of Existing Analyses

With the exception of Klein (1980) all the formally explicit analyses are based on the assumption that gradable adjectives represent a relation which assigns an object x to the value y on a certain scale. In the notion adopted in section 2 the following basic components emerge for **groß** (*tall*) and **klein** (*short*):

(31)(a) $[x\ [\text{TALL}\ y]]$ (b) $[x\ [\text{SHORT}\ y]]$

The constant TALL identifies the relevant dimension plus a suitable scale or ordering relation of degrees. Intuitively, (31a) means 'on the dimension of height x has at least the degree y'. There are a number of reasons for the interpretation 'at least y' instead of simply 'y', which will be taken up in (xxi) below. SHORT also identifies a dimension (the same one as TALL) and a scale. Intuitively, (31b) means 'x is at least y short'. However, problems arise here, to which I shall return shortly.

According to Cresswell (1976) a value on a scale or a degree on a dimension is in most cases to be thought of as the equivalence class of the objects indistinguishable with regard to the scale in question. I shall not give this analysis in the form of canonical lexical entries as introduced above, because both syntactic assumptions and the derivation of the semantic representation are the subject of widely differing notions, which I cannot go into here.

For the relation between positive, comparative, and equative three proposals can now be distinguished. I shall present these in turn from the point of view of the analyses they provide for the sentences in (32).

(32)(a) Hans ist groß
Hans is tall

(b) Hans ist größer als Eva
Hans is taller than Eva

(c) Hans ist so groß wie Eva
Hans is as tall as Eva

Version I:

(33)(a) $\hat{x}\ [\text{HANS}\ [\text{TALL}\ x]] > N_C$

(b) $\hat{x}\ [\text{HANS}\ [\text{TALL}\ x]] > \hat{x}\ [\text{EVA}\ [\text{TALL}\ x]]$

(c) $\hat{x}\ [\text{HANS TALL}\ x]] \geq \hat{x}\ [\text{EVA}\ [\text{TALL}\ x]]$

I have given this version in approximation to the one in Cresswell (1976) where the arguments of the relation '>' and '≥' represent properties, viz. the property of 'being at least the height of' Hans, Eva, etc. Consequently N_C must here be interpreted as a property, namely the average height with regard to C. It is crucial that positive, comparative and equative are determined by an ordering relation between (properties of) scale values. We can see straight away that this analysis fulfils points (i), (ii) and (vi): the positive is norm-related (i), it is a special case of the comparative (ii), and comparative and equative are dual (vi), as the representation (35) for sentence (34) shows:

(34) Eva ist nicht größer als Hans
Eva is no taller than Hans

(35) $\sim [\hat{x}\ [\text{EVA}\ [\text{TALL x}]] > \hat{x}\ [\text{HANS}\ [\text{TALL x}]]]$

(35) is equivalent to (33c) on the basis of the usual equivalence of $[x \geq y]$ and $\sim[x < y]$, so (33c) is demonstrated to be SF-equivalent to (34). But the equative is interpreted in the sense of 'at least as A as', which Atlas (1984) has shown to be incorrect. I shall leave this problem aside for the time being, returning to it in (xxi) below.

Version II:

(36)(a) $\exists x$ [[HANS [TALL x]] $\wedge \sim$ [N_C x]]

(b) $\exists x$ [[HANS [TALL x]] $\wedge \sim$ [EVA [TALL x]]]

(c) $\forall x$ [[EVA [TALL x]] $\rightarrow$ [HANS [TALL x]]]

This version also fulfils points in (i), (ii) and (vi). N_C is again a property of scale values. (36a) means that Hans has a certain height x and that the average of C does not have this height. This is a special case of the comparative: (36b) says that Hans has a height of x and Eva does not have this height. And (36c) says that for any height x it holds that if x is the height of Eva, then it is the height of Hans too (this again corresponds to the 'at-least-as' interpretation of the equative). The representation (37) for sentence (34) shows that the equative and comparative are dual:

(37) $\sim$ [$\exists x$ [EVA [TALL x]] $\wedge \sim$ [HANS [TALL x]]]

(37) is a standard logical conversion of (36c), so that (32c) and (34) are again shown to be SF-equivalent. The characteristics of positive, comparative and equative are not expressed by relations here by by logical connectors.

This version occurs in a number of variants which I cannot go into here.[7] What interests us at present are the basic components of the analyses just explained.

Both versions need to be supplemented, in order to incorporate point (vii), by the possibility of giving measurements. Semantically, measurement indications, like N_C, can be thought of as properties of values as on a scale. Hence (39) and (40) are alternative representations of (38), 1.2 METER representing the property of being the value 1m20 on a scale of measurement.

(38) Hans ist 1.20m groß.
Hans is 1.20m tall

(39) $\hat{x}$ [HANS [TALL x]] = 1.2 METER

(40) $\exists x$ [[HANS [TALL x]] $\wedge$ [1.2 METER x]]

Difficulties arise for both versions with regard to measurements in the comparative. To eliminate these difficulties is one of the aims of Version III, in which the relation between positive, comparative and equative are represented by a kind of arithmetical operation on scale values. I begin by giving the representation of the sentences in (32).

Version III:

(41)(a) $\exists x_1$ $\exists x_2$ $\exists x_3$ [[HANS [TALL x_1]] $\wedge$ [N_C x_2] $\wedge$ [$x_1 = x_2 + x_3$]]

(b) $\exists x_1$ $\exists x_2$ $\exists x_3$ [[HANS [TALL x_1]] $\wedge$ [EVA[TALL x_2]] $\wedge$ [$x_1 = x_2 + x_3$]]

(c) $\exists x_1$ $\exists x_2$ [[HANS[TALL x_1]] $\wedge$ [EVA [TALL x_2]] $\wedge$ [$x_1 \geq x_2$]]

This version, which derives from HELLAN (1981), also covers points (i) and (ii): (41a) is a special case of (41b) and is characterized by norm relatedness. The duality of the comparative and the equative (point (vi)) requires special comment. First I shall show how measurements appear in this version. For sentence (38) the representation (42) emerges, and for sentence (43), which cannot be covered by versions I and II, the representation (44).

(42) $\exists x_1$ $\exists x_2$ [[HANS [TALL x_1]] $\wedge$ [1.2 METER x_2] $\wedge$ [$x_1 = x_2$]]

(43) Hans ist 20cm größer als Eva

(44) $\exists x_1$ $\exists x_2$ $\exists x_3$ [[HANS [TALL x_1]] $\wedge$ [EVA [TALL x_2]] $\wedge$ [20 cm x_3] $\wedge$ [$x_1 = x_2 + x_3$]]

The representation of (43) is like that of the simple comparative in (41b), except that the measure for x_3 is added as a further conjunct.

Let us return to point (vi), the duality of the comparative and the equative. I shall not demonstrate in detail that the SF-equivalence of (32c) and (34) indeed again holds here, if one makes the usual assumptions for +,= and $\geq$, because (41c) does not correspond exactly to HELLAN's proposed analysis of the equative anyway. HELLAN (1981) and, after him, VON STECHOW (1985) in fact include another point in their analysis, which I shall add here:

(viii) *Equative constructions do not allow measure phrases, but they allow factor phrases.*

By factor phrases I mean expressions such as *three times, half, double*, etc.:

(45) Hans ist doppelt so groß wie Eva
Hans is twice as tall as Eva

(46) * Hans ist 1.60m so groß wie Eva
Hans is 1.60m as tall as Eva

HELLAN and VON STECHOW assume the following representation for (45):

(47) $\exists x_1$ $\exists x_2$ $\exists x_3$ [[HANS [TALL x_1]] $\wedge$ [EVA [TALL x_2]] $\wedge$ [x_3 =2] $\wedge$ [$x_1 = x_2 . x_3$]]

Comparison of (47) and (44) shows (a) that x_3 is specified as a *number* in (47) in the same way as it is specified as a *measure* in (44), and (b) that the equative is based on multiplication and the comparative on addition.[8] So we have a third way of analysing the relation between positive, comparative and equative. It not only yields a representation of (45), but also explains why (46) is ruled out: x_3 cannot be used as a factor and as a measure at the same time. However, it no longer retains the duality of the comparative and the equative, because the latter now establishes the interpretation of 'exactly as tall as', and (like the other versions) it does not work for sentences like Hans ist so klein wie Eva. That brings us to the crux of all three versions, viz. points (iii), (iv) and (v).

Point (iv) could be retained by establishing a meaning postulate of the form (48) for each pair of contrary adjectives:

(48) $[x\ [\text{TALL}\ y]] \rightarrow \sim [x\ [\text{SHORT}\ y]]$

However, this solution distributes one and the same relation over postulates which have to be stipulated for each pair of antonyms, thus missing an important generalization. But there are other reasons why it is inadequate. Firstly, it does not state that groß and klein identify the same dimension, relating it however to a different scale (or to the same scale in different ways): it thus does not cover point (iii). More importantly, though, it cannot establish the connection between (iii) and (v), the converse relation between the comparatives of the antonyms of the same pair. The problem lurking here has been suppressed in all analyses so far. Since it is an important motivation for my theory, I shall spell it out in somewhat more detail.

While the interpretation of $[x[\text{TALL}\ y]]$ given above is fairly unproblematic, that of $[x[\text{SHORT}\ y]]$ is far from obvious. What is a value on the scale of small size ('shortness')? An answer that seems most reasonable is: a value on the scale of size but with an opposite ordering relation.[9] Let us assume that, in accordance with this interpretation, the constant SHORT is replaced by U[TALL]. U is an operator that reverses the direction of the scale in the required way. If U has the right effect, then postulates of the type (48) are superfluous, since antonymous adjectives are characterized as such precisely in the sense of (ii), and points (ii), (iii) and (iv) would follow from U. But what effect would U be required to have in the representations assumed?

The intuitive answer is obvious: the relation between the values on the scale, which are stipulated in the positive, comparative, and equative, must be reversed. To illustrate this, here are versions I to III for sentence (49):

(49) Hans ist kleiner als Eva.

(50)(I) $\hat{x}\ [\text{HANS}\ [\text{TALL}\ x]] < \hat{x}\ [\text{EVA}\ [\text{TALL}\ x]]$

(II) $\exists x\ [\sim[\text{HANS}\ [\text{TALL}\ x]] \wedge [\text{EVA}[\text{TALL}\ x]]]$

(III) $\exists x_1\ \exists x_2\ \exists x_3\ [[\text{HANS}\ [\text{TALL}\ x_1]] \wedge [\text{EVA}[\text{TALL}\ x_2]] \wedge [x_1 = x_2 - x_3]]$

In other words, for I '>' is replaced by '<', for II the negation of the second conjunct is put before the first, and for III '+' is replaced by '−'. This must happen both in the comparative and in the positive. I have not discussed the widely differing notions of how the semantic representations are produced on the basis of the lexical items and the syntactic structure. What we would need to do here would be to convert the specification U contained in the lexical structure into the reversal of the interpretation of the comparatives. No variant of any of the versions I to III envisages or even allows such an operation without stipulating arbitrary mechanisms.[10] But even if one accepts a suitable interpretation rule for the comparative, another rule with a similar effect would have to be added for the positive, and the equative would require yet another interpretation rule. I shall not ventilate any further the chances of adding such rules, because even if they were technically possible they remain inadequate for other reasons: since in

all three versions considered only the bare positive is interpreted as norm-related, it is impossible to express the fact that (51a) is not norm-related, as envisaged, but that (51b) is:

(51)(a) Hans ist so groß wie Fritz
Hans is as tall as Fritz

(b) Hans ist so klein wie Fritz
Hans is as short as Fritz

In other words, phenomena such as those illustrated in (24), (27), (28) and (30) remain anomalous in the framework of all the existing analyses.[11] They are only examples of a large number of phenomena which I shall discuss in the next section.

The structure of the array of facts indicated by points (i)-(viii) obviously has a far wider background than the versions I to III are aware of. These versions were, however, useful for the further course of the discussion.[12]

4 More Facts and Distinctions

4.1 Classes of Adjectives

A large number of existing semantic (and incidentally also syntactic) analyses of comparison are geared to adjectives like groß (*big/tall*) and suggest implicitly that an adequate analysis of groß can be generalized to cover all gradable adjectives. I have already discussed some problems which thus arise regarding klein (*small/short*). Some of the facts to be examined in this section concern distinctions which occur in the grading of various adjectives. They can best be ordered and commented on if we distinguish between suitable classes of adjectives. So before discussing the problems in question I shall first sort out the relevant adjectival classes. Then, in the light of this classification, I shall go back to interpret once again points (i)-(viii) discussed above.

I have already made an implicit distinction between gradable and non-gradable adjectives. When we come to look at actual instances the distinction is far from clear-cut. Interpreted strictly, an adjective like weiblich (*feminine/female*) is not gradable, and yet combinations like sehr weiblich (*very feminine*) and sie ist viel weiblicher geworden (*she has become much more feminine*) are possible. The question of prime importance is thus: if an adjective is gradable, what are the consequences? I shall show later how (given the appropriate conditions) non-gradable, absolute adjectives become gradable and why the distinction does not seem clear-cut. I shall call gradable adjectives GAs.

Syntactically GAs have a degree complement (which is optional), the category of which is specified in the syntax.[13]

I shall regard this complement as degree-phase DP, unless other, special assumptions are being discussed, so that GAs, apart from other possible complements, always have the subcategorization frame [(DP)__]

There are two classes of GAs, which I shall call dimensional adjectives, DA, and evaluative adjectives, EA. Here too the distinction is not very clear-cut on the surface. The reason is that DAs can have a secondary interpretation as EAs. I shall show how this comes about. Again it is important which properties a DA has compared with an EA, and why.[14] Clear examples of DA are lang (*long*), kurz (*short*), alt (*old*), jung (*young*), neu (*new*), while EA is exemplified by faul (*lazy*), fleißig (*industrious*), schön (*pretty*), häßlich (*ugly*). I shall first list three points for comment, which I shall number like (i) to (viii) as groups of structured facts.

(ix) *Antonymous* DAs *refer to the same scale of a given dimension and differ in the ordering on the scale, antonymous* EAs *refer to different scales or parts of scales.*

The first part of this statement was mentioned at the end of 3.2. The second part means, intuitively, that Hans ist klein (*Hans is short*) assigns to Hans a certain degree of height, while Hans ist faul (*Hans is lazy*) does not mean that Hans has a certain degree of industriousness. Put somewhat differently, even a negative DA always specifies a positive value on the scale of its antonym, whereas this does not apply to a negative EA: even a short person has height, but a lazy person cannot be to any extent industrious.

If this statement is correct, it implies that DAs and EAs have different relations between dimension reference and scale reference. Antonymous DAs put the scale of degrees on the same dimension in opposite directions, while antonymous EAs have the same direction of ordering, but on two opposite parts of the same dimension – or on two different dimensions, depending on whether laziness and industriousness are regarded as parts of one dimension or as two different dimensions. I shall show later that this intuitive distinction has clear consequences and can be adequately sharpened. Briefly, this point says that dimension reference and scale reference of GAs must be kept apart, and that DAs and EAs establish both references in different ways.

As for terminology, I shall divide DAs, regarding their scale reference, into +Pol-A and −Pol-A, and the EAs into Pos-A and Neg-A. It is usual to regard +Pol-As such as groß, lang, alt, etc. as unmarked and −Pol-As such as klein, kurz, neu, jung as marked elements of a pair of antonyms, because only the first group can be used both contrastively and nominatively. We already know, however, that in the comparative neither +Pol-A nor −Pol-A are norm-related, so that an evaluation of markedness cannot be handled that way. The classification of Pos-A and Neg-A with regard to markedness is even more complicated.

As far as +Pol-A and Pos-A on the one hand, and −Pol-A and Neg-A on the other can be grouped together, I shall call the former P-A and the latter N-A. Thus we have the following cross-classification:

(52)

GA	DA	EA
P-A	+Pol-A	Pos-A
N-A	−Pol-A	Neg-A

This diagram is not meant to imply that all adjectives can clearly be assigned to one of the four subclasses (I have already indicated possible fuzzy edges), but it does imply that an adjective, on the basis of its SF structure, has well specified properties if it belongs to one of these classes.

(x) *The norm-relatedness introduced in point (i) has a different basis for* DA *and* EA

The paraphrase 'taller than the average of C' given in (21b) is only valid in this form for DA. For EA a paraphrase like (53b) may be appropriate, but not one like (53c):

(53)(a) Hans ist fleißig
Hans is industrious

(b) Hans ist fleißig für C
Hans is industrious for C

(c) Hans ist fleißiger als der Durchschnitt von C
Hans is more industrious than the average of C

This claim is rather uncertain and is only of heuristic value. What it means is that EAs, if they are interpreted as grading (and we shall see that they need not be thus interpreted), refer to a scale in a comparison class C but do not have an average value as a relatum. The point can be illustrated thus: if (54a) is to have any sense, then C cannot be the class of all pupils of the school, while this is certainly possible in the case of (54b).

(54)(a) Alle Schüler dieser Schule sind groß
All the pupils at this school are tall

(b) Alle Schüler dieser Schule sind fleißig
All the pupils at this school are industrious

To interpret (a) other people must be taken into account, but to interpret (b) they need not be. To put this very simply: for some people to be tall there must be short people too, but for some to be industrious there do not need to be any lazy ones.

Following up this assumption, which certainly needs further clarification, I shall restrict N_C as a condition involved in the contrastive use of DA. Therefore, I shall apply the term 'norm-related', technically henceforth N_C-related, or for short NR, only to DA. However, the distinction between nominative and contrastive use also obtains in the case of EA. (55a) does not necessarily mean that Hans and Fritz are good, but (55b) preferably means that they are both bad:

(55)(a) Hans ist besser als Fritz
Hans is better than Fritz

(b) Fritz ist schlechter als Hans
Fritz is worse than Hans

Judgements here are somewhat uncertain (and this uncertainty itself needs to be explained), but the tendency is clear. I shall therefore also make the distinction within EA and call the contrastive use C-related, or for short CR. I shall use the term 'contrastive' to subsume NR and CR and with a view to the further discussion I shall operationalize the term as follows:

(56) An adjective A is used contrastively with regard to a noun N in a sentence S if the validity of 'NP is A' follows from S, where N is the head of NP and NP preserves the reference of N.

The condition that the reference of N is preserved is not easy to make any more precise, and in the next section I shall be looking at some of the problems lurking here. For the time being I shall rely on an intuitive understanding. The criterion is illustrated by the following sentences:

(57)(a)	Das Haus ist sehr groß *The building is very tall*	→	Das Haus ist groß *The building is tall*
(b)	Er kennt ein großes Haus *He knows a tall house*	→	Das Haus ist groß
(c)	Hans ist so klein wie Eva	→ →	Hans ist klein Eva ist klein
	Hans is as short as Eva		*Hans/Eva is short*
(d)	Hans ist kleiner als Eva	$\not\rightarrow$ $\not\rightarrow$	Hans ist klein Eva ist klein
(e)	Er sieht nur die höheren Türme *He sees only the taller towers*	$\not\rightarrow$	Die Türme sind hoch *The towers are tall*

The adjectives in (a) to (c) are contrastive, more particularly: NR, those in (d) and (e) are not (the suppletion of the complement belonging to höher in (e) plays an important part).

(xi) *The antonymy relation (i.e. the relation between a P-A and its N-A counterpart) is more systematic for* DAs *than for* EAs *in two ways.*

Firstly, for each +Pol-A, at least for practical purposes, its −Pol counterpart is uniquely determined (and vice versa), which does not hold for Pos-A and Neg-A. Often, but not always, the +Pol/−Pol pairs are also lexically realized uniquely. This qualification is necessary because of antonym branching as in the cases of *high* vs. *low* and *deep, old* vs. *young* and *new*, presumably also *high* and *tall* vs *low*. What is important is that a DA uniquely determines its antonym, even if the specifications thus given are not lexicalized. For branching antonyms the reference is pairwise unique, even if the designation of the dimension results from different conditions. LANG (in this volume) demonstrates in detail how such cases work for the designation of spatial dimensions.[15] EAs on the other hand often present us with bundles of antonyms which do not produce any ordering into pairs. The bundle *brave, bold, cowardly, timid, fearful* is one example, and the bundle *clever, bright, shrewd, intelligent, stupid, idiotic, foolish* is another. What is important is not how complete or even well structured these nests are but the considerable vagueness of the relation.

Secondly, DAs always have a virtual and nearly always an actual antonym (even if this is within a branching antonymy triple), whereas EAs can be quite isolated. Words like *shy, jolly, frightened*, and many others, have no antonyms, and one cannot say, without being arbitrary, whether they are Pos-A or Neg-A.

Both points are directly related, and imply that the strict pairing of P-A and N-A is structurally determined for DA, while for EA it is more like a systematic epiphenomenon. In a certain sense, (xi) is a corollary of (ix), in that antonymous DAs have the same dimension with systematically differing scale relations, while EAs all establish their own scale with their respective dimension.

One indirect result of (xi) is that the derivational means for forming antonyms, in particular prefixes like *un-, in-, a-* and sometimes suffixes like *-less*, hardly ever figure in DAs, while they contribute to forming bundles for EAs, such as *true, untrue, false*, or *faithful, unfaithful, faithless.* The numerous idiosyncracies and semi-regularities at work here need not occupy us any further, since what is relevant to the theory of gradation is only the type of scale reference.

4.2 Determining the Comparison Class

The relation to a class of comparison contained in N_C is one of the main reasons for the assumption by KAMP (1975), CRESSWELL (1976), KEENAN (1983) and others that adjectives are essentially adnominal functors of the category (S/N)/(S/N), which for example turn the properties expressed by *pupil* into those expressed by *good pupil.* In stating the modification theory contained in (12) I have stipulated a different, and in a definite sense 'extensional' concept of the adjective, because I regard the 'intensional' view I mentioned as false. I shall now explain why, since this is directly related to the character of NR.

The point of departure for the 'intensional' adjective theory is the following consideration. The (a)-sentences in (58) and (59) make explicit the reference class which in the (b)-sentences is left unexpressed.

(58)(a) Hans ist ein kleiner Basketballspieler
Hans is a short basketball player

(b) Hans ist klein
Hans is short

(59)(a) Hans ist ein guter Basketballspieler
Hans is a good basketball player

(b) Hans ist gut
Hans is good

Non-attributive GAs are thus apparently incomplete, and must at least implicitly be supplemented by a noun. I shall leave aside the various artificial assumptions which such a theory makes necessary[16] and shall explain why it is inappropriate by showing the alternatives.

Firstly, it is fundamental that what decides the property illustrated in (59) is the relatum in accordance with (16), whether the adjective is predicative, attributive or adverbial. This is made clear by (60).

(60)(a) Der Wein/Arzt ist gut
This wine/doctor is good

(b) Er kennt einen guten Wein/Arzt
He knows a good wine/doctor

(c) Der Wein schmeckt/gärt gut
The wine tastes/ferments well

The notoriously context-dependent interpretation of gut is determined in each case by the relatum. This shows the adnominal adjective theory to be inappropriate.

Secondly, (58) and (59) illustrate two different phenomena, though both occur in both pairs. I will say provisionally that what we have here are two parameters in the SF representation of the adjective, which I shall call Q and C for the time being. C is a free variable for the comparison class already discussed which is involved in NR and CR. Q is a parameter connected with the specification of the dimension for evaluation. For gut/schlecht (*good/bad*), for example, Q is determined by the conditions of the entity referred to which are relevant to quality, and for tief (*deep*) by the conditions on which an object is related to its (spatial) environment.[17] I assume that a variable of the kind necessary for Q actually occurs in the lexical SF of gut, schlecht and others. For cases such as breit (*wide*), tief (*deep*), and several others Q is largely or wholly contained in the constants which determine the object-dependent specification of the dimension graded, as LANG (in this volume) shows. Q and C behave quite differently in their dependence on the relatum. I shall sharpen this statement somewhat below. In any case there are various aspects to the adjective-noun relation which the attributive connection affects in different ways.

Thirdly, and most importantly, even in the case of the adnominal use the phenomenon illustrated in (58) and (59) is not generally valid. Rather, the particular comparison class depends on a number of complicated additional factors, even in the case of the attributive adjective, which have close parallels in predicative adjectives. This would indicate once more that the adnominal ('intensional') adjective theory is mistaken.[18]

Regarding the dependence of the parameter Q on the relatum I shall be brief, because it does not affect gradation directly. The main point is a simple one, and is already illustrated in (60): if the relatum of an adjective, whether a predicative, an attributive or an adverbial one, contains the necessary information, then it fixes Q.[19] If it does not contain this information, then Q is fixed in CS by the reference instance from the interpretation context. Accordingly schlecht in (61) is not determined by the related noun but by the context of interpretation:

(61)(a) Das war eine schlechte Zeit
Those were bad times

(b) Die Zeit war schlecht
The times were bad

(c) Hans ist schlechter als sein Bruder
Hans is worse than his brother

The conditions for C being determined by the relatum are more complicated. I will outline them here because C is involved in the contrastive use of GAs and not least because there are some largely ignored facts to be discussed. First it is necessary to make several distinctions.

Firstly, C, as we know, plays a part in NR and CR. For NR a norm N_C has to be formed on the basis of C; for CR, C only provides the basis for the ordering relationship underlying the scale, without there having to be a norm. Secondly, a comparison class C can be determined extensionally, i.e. by its elements, or intensionally, i.e. by its features. Diese Türme (*these towers*) (interpreted deictically) is an example of the former case, and Türme (*towers*) (interpreted generically) is an example of the latter. For a given dimension D an extensionally determined class C always provides an average N_C (whether as an arithmetical, geometrical, or other, means of C regarding D), but an intensionally determined class C only does this when N_C regarding D is warranted by the defining properties of C. When this is the case I shall say that C has an intrinsic norm N_C with regard to D, otherwise C only has an extrinsic norm N_C with regard to D. This divides relata into two kinds. *Circle, sphere, square*, for example, do not provide any intrinsic norm for size, while *bed, house, city* do have an intrinsic size norm. Obviously this distinction is only relevant to DAs, because only these require the N_C specification. From this follows the condition:

(62) DAs require specification of C by a class with the intrinsic norm N_C for the relevant dimension or by an extensionally determined class.

Examples:

(63)(a) Der Tisch ist groß
The table is large

(b) Die Figure ist groß
The figure is large

(c) Die Frau ist faul
The woman is lazy

In (a) the relatum Tisch indicates a class with an intrinsic norm. In (b) this is not the case: N_C can only be specified by relating the reference instance to a comparison class. The distinction is irrelevant to (c), because faul is an EA, which does not require a norm but something like an ideal type which induces a possible order of comparison into C.

It thus becomes important when and in what way the relatum yields an extensionally determined comparison class. I cannot answer this here, because it involves problems both of modification theory and of reference theory which go beyond the scope of the present discussion. But I want to indicate what the problem is and introduce provisionally the following distinction:

(64)(a) A relatum K determines C *directly* if C is the class determined by K (intensionally) in CS

(b) A relatum K determines C *indirectly* if C properly contains the class determined directly by K.

With the help of these terms we may formulate provisionally the following generalization:

(65) Let K be the relatum of an adjective A and C the specification of the comparison class for A, then:

(a) K determines C directly if A is a restrictive modifier of K or K is the subject of a sentence with particular reference.

(b) K determines C indirectly if A is an appositive modifier of K or K is a generic or all-quantified subject.

In other words, where we have restrictive attributes and particular subjects the related noun provides the comparison class, but with appositive attributes and 'all-subjects' a superordinated class must be formed. The following minimal pairs illustrate this:

(66)(a) Dieser Turm ist hoch
This tower is high (for towers): direct
(b) Ein Turm ist hoch
A tower is tall (for a building): indirect
(67)(a) Diese Türme sind hoch
These towers are tall (for towers): direct
(b) Alle Türme sind hoch
All towers are tall (for buildings): indirect
(68)(a) Wir sahen hóhe Türme (restrictive: tall for towers)
(b) Wir sahen hohe Türme (appositive: tall buildings)
We saw tall towers
(69)(a) Er liebt Türme, die hóch sind
He likes towers that are tall (restrictive: for towers)
(b) Er liebt Túrme, die hóch sind
He likes towers, which (as we know) are tall (appositive: for buildings)

(65) and these examples only represent a first approach to the problems; the conditions in (65) need to be sharpened, and the basis for the envisaged parallels between reference type and modification type needs to be clarified. In addition, (65) must undergo filtering by (62): the direct determination of C only applies to DAs if the related noun provides an intrinsic norm. The total network which emerges for the specification of C is a highly complex one, and I cannot unravel it here.

What is crucial for the theory of gradation is that C, and in the case of DA N_C too, is specified at all. This can be separated from the question *how* this is done. The aspect I have opened up can be summarized in the following point:

(xii) *If GAs are contrastive, they contain a parameter C which is specified by the comparison class. For DAs C must be specified in such a way as to produce a norm N_C with regard to the graded dimension.*

The specification of C is conditioned by the relatum of the adjective and its reference type or by the type of modification.

4.3 Wonders of Contrastiveness

In this section I shall use the distinctions suggested above to sort out another series of facts. This will at the same time help to clarify and justify these distinctions. Let us begin with the complicated distribution I mentioned above of contrastive interpretations. I shall list the relevant constructions for DA. I shall give the +Pol-A parallel to the −Pol-A, and I shall mark the occurrence of NR by +NR and its absence by −NR.

(70)(a)	Hans ist groß/klein *Hans is tall/short*	+NR	+NR
(b)	Hans ist 1.50m groß/$^?$klein *Hans is 1.50m tall/short*	−NR	(+NR)
(c)	Wie groß/klein ist Hans? *How tall/short is Hans?*	−NR	+NR
(d)	Hans ist so groß/klein wie Eva *Hans is as tall/short as Eva*	−NR	+NR
(e)	Hans ist größer/kleiner als Eva *Hans is taller/shorter than Eva*	−NR	-NR
(f)	Hans ist am größten/kleinsten *Hans is the tallest/shortest*	−NR	−NR
(g)	Hans ist zu groß/klein dafür *Hans is too tall/short for that*	−NR	−NR
(h)	Hans ist groß/klein genug dafür *Hans is tall/short enough for that*	−NR	+NR
(i)	Hans ist weniger groß/klein als Eva *Hans is less tall/short than Eva*	+NR(?)	+NR

In assessing the '*too*' and '*enough*' constructions it is important that there is a certain desired value, but that this is specified by the complement of *too* and *enough* and not by N_C. In the case of *short enough* both a desired value and N_C are involved.

In the distribution pattern illustrated in (70), we are dealing with hard facts of gradation to which none of the versions discussed in 3.2 offers any kind of approach. (70) enables us to make the following generalization on the observed facts:

(xiii)(a) *The positive of DAs without a complement is always N-related.*
(b) *Comparative, superlative and 'too' constructions are never N-related.*
(c) *In all other cases, +Pol-A are not N-related, −Pol-A are N-related.*

What (xiii)(b) suggests is that the comparative, superlative and *'too'* constructions ought to be given a parallel analysis. This is of course usual for the comparative and the superlative. We shall see that the kind of connection that exists between the comparative and the *'too'* constructions also obtains between the equative and the *'enough'* and *'less'* constructions and that this also explains the rather uncertain evaluation of *less tall*.

For (xiii)(c) to be valid, one or two remarks are necessary on the following constructions:

(71)(a)	Sie weiß, wie groß/klein Hans ist *She knows how tall/short Hans is*	−NR	+NR
(b)	Wie groß/klein Hans ist! *How tall/short Hans is!*	+NR	+NR
(c)	Hans ist groß/klein wie ein X *Hans is tall/short, like an X*	+NR	+NR
(d)	Hans ist sehr groß/klein *Hans is very tall/short*	+NR	+NR

(71)(a) behaves just like (70)(c), so it can be subsumed under (xiii)(c) as an adjective with the complement wie (*how*). But the cases in (b)-(d) must be regarded as the simple positive without a complement. For (c) this assumption follows from independent facts. In Hans ist groß wie ein Bär, wie ein Bär (*like a bear*) is not the complement of groß but an adverbial modifier of groß sein, in which groß has no complement. Apart from semantic reasons this interpretation is supported by the fact that constructions of the type (71c) do not have the attributive counterpart which – given the appropriate morphosyntactic adaptations – exists for all other cases in (70) with the same distribution of +NR and -NR.

(72)(a)	ein großes Haus *a large building*	+NR
(b)	ein 100m² großes Haus *a 100m² large building*	−NR
(c)	ein wie großes Haus hat er? *how large a house has he got?*	−NR
(d)	ein (eben) so großes Haus wie das vorige *(just) as large a building as the previous one*	−NR
(e)	ein größeres Haus als das vorige *a larger building than the previous one*	−NR
(f)	das größte Haus *the largest building*	−NR
(g)	ein dafür zu großes Haus *a building too large for that*	−NR
(h)	ein dafür genügend großes Haus *a building sufficiently large for that*	−NR
(i)	ein weniger großes Haus als das vorige *a less large house than the previous one*	+NR

(73)(a) ?ein wie ein Schloß großes Haus
a building as large as a palace
(b) ein großes Haus wie ein Schloß
a large building such as a palace
(c) ein Haus, groß wie ein Schloß
a building large, like a palace

(73) gives three possible counterparts to (71c). The most likely version (c) identifies groß wie x as predicative and thus assimilates it to (71c), i.e. wie ein Schloß in (73c) is again a modifier of the predication and not the complement of groß.

(71b) requires an analysis of the status of exclamations of pseudo-questions. It would be a plausible speculation regarding the aspect relevant here to interpret (71b) by analogy with rhetorical questions, i.e. according to the anticipated answer, which would be most likely (71d), so that (b) would have to be explained in a somewhat similar fashion to (d). Because sehr (*very*) with adjectives must be regarded as a degree complement, we must supplement (xiii) (a) by stating an extra condition: the positive with sehr or without a complement is always N-related.

In the distribution of NR another distinction is necessary: in the positive (70a) it is asserted that Hans is above/below N_C regarding height; in the equative this relation – given that we have −Pol-A – is more or less presupposed. It is neither possible nor necessary to go into the complex discussion about presuppositions, implicatures, etc. I shall operationalize the sufficiently clear intuitive distinction in the following way:

(74) *N_C is part of the assertion if the relation to N_C determined by the adjective is affected by negation in case the* AP*, whose head is the adjective, is within the scope of a negation. Otherwise N_C is part of the presupposition.*

Let us consider the following cases in this light:

(75)(a)	Hans ist nicht groß/klein *Hans ist not tall/short*	+NR
(b)	?Wie klein ist Hans nicht? *How short isn't Hans?*	+NR
(c)	Hans ist nicht so klein wie Eva *Hans is not as short as Eva*	+NR
(d)	Hans ist nicht klein genug dafür *Hans is not short enough for that*	+NR
(e)	Hans ist nicht weniger klein als Eva *Hans is no less short than Eva*	+NR

The fact that the N-relatedness is retained in all cases fulfils the criterion in (74): in the presupposition, N_C is not affected by the negation and in the assertion, although the relation to N_C is subject to negation, N_C itself is not eliminated. Nevertheless several points have still to be clarified. I first notice without further comment the questionable status of (75b), which is obviously related to that of −Pol-A with measure phrases. This is even clearer if we compare (71a) with (76):

(76)(a) ?Sie weiß, wie groß Hans nicht ist −NR(?)
She knows how tall Hans is not
(b) ??Sie weiß, wie klein Hans nicht ist +NR
She knows how short Hans is not

What is relatively clear is that according to the criterion of contrastiveness formulated in (56), which provides the distribution of NR given in (70) to (73), (75a) is not contrastive, since Hans ist groß cannot follow from Hans ist nicht groß. To diagnose the problem indicated, we need a rider to (56). I shall not formulate this, since its content is intuitively clear: a contrastive adjective stays contrastive under negation. So if we call the extended criterion (56'), then (75a) is contrastive in the sense of (56'), but not in the sense of (56). This gives us the following interesting fact: in (75c) – nicht so klein wie – klein is contrastive with regard to Eva in the sense of (56) but with regard to Hans only in the sense of (56'). Put somewhat differently, (75c) must make use of N_C twice, and only one of these uses is affected by negation.[20] Double reference to N_C is also present in (75e) nicht weniger klein, the one which makes klein contrastive with regard to Eva being presupposed: the N_C relatedness regarding Hans is intuitively somewhat more difficult to judge, in the same way as that in (75d) nicht klein genug. The reason is that criteria like (56) or (74) always apply only partially. We shall see later that (75d) and (e) in fact cannot adequately be covered by these criteria. But there is no doubt that N_C is involved.

To summarize the observations connected with the status of NR:

(xiv) *The contrastiveness of an adjective has the character of an assertion or a presupposition. The former applies to the positive. In the equative and the comparative contrastiveness is asserted with regard to the relatum and presupposed with regard to the complement.*

The extension of contrastiveness-splitting to the comparative, which, as we know, is not contrastive in DA, anticipates a generalization regarding EA, which is explained below.

The already complicated picture becomes even more complicated when EAs are included. With the exception of the positive with measure-phrase the same constructions are available:

		Pos-A	Neg-A
(77)(a)	Hans ist fleißig/faul *Hans is hard-working/lazy*	+CR	+CR
(b)	Wie fleißig/faul ist Hans? *How hard-working/lazy is Hans?*	+CR?	+CR
(c)	Hans ist so fleißig/faul wie Eva *Hans is as hard-working/lazy as Eva*	−CR?	+CR
(d)	Hans ist fleißiger/fauler als Eva *Hans is more hard-working/lazier than Eva*	−CR?	+CR
(e)	Hans ist am fleißigsten/faulsten *Hans is the most hard-working/laziest*	−CR?	+CR
(f)	Hans ist zu fleißig/faul dafür *Hans is too hard-working/lazy for that*	−CR?	+CR
(g)	Hans ist fleißig/faul genug dafür *Hans is hard-working/lazy enough for that*	−CR?	+CR
(h)	Hans ist weniger fleißig/faul als Eva *Hans is less hard-working/lazy than Eva*	−CR?	+CR

Two things are immediately noticeable. Firstly, the decision on contrastiveness in the case of Pos-A varies, and intuitions vary inter- and intra-individually. This is indicated by the question marks. Secondly, the distribution differs from the distribution in the case of DA: Neg-As are (rather uncontroversially) always CR; the non-norm-relatedness of the comparative, equative and superlative noted in (xiii) (b) is confined to Pos-A and appears as a (rather uncertain) −CR.

The variation is different for different lexical items. For comparison notice that in the following examples the evaluations are clearly opposite:

(78)(a) Hans ist besser als Eva −CR
Hans is better than Eva
(b) Anna ist schöner als Eva +CR
Anna is prettier than Eva
(79)(a) Hans ist so gut wie Eva −CR
Hans is as good as Eva
(b) Anna ist so schön wie Eva +CR
Anna is as pretty as Eva

It is important that the variation is systematic, occurs in certain constructions and differs in strength between Pos-As. The theory must be able to explain this. The contrastiveness of EAs may be summarized in the following point:

(xv) *Neg-As are contrastive in all constructions. The contrastiveness of Pos-As varies depending on individual lexical items in the constructions in which +Pol-As are not contrastive.*

There are now some more cases to add to the difference between asserted and presupposed contrastiveness. I shall not comment on everything that can occur but shall only emphasize what is contained already in (xiv): the double reference to N_C noted in the equative of −Pol-As occurs here as a double reference to the desired value C both in the equative and in the comparative of EAs if they are contrastive in these constructions:

(80)(a)	Hans ist nicht fauler als Eva *Hans is not lazier than Eva*	$\stackrel{?}{\rightarrow}$	Hans ist faul *Hans is lazy*	$\rightarrow$	Eva ist faul *Eva is lazy*
(b)	Hans ist nicht so faul wie Eva *Hans is not as lazy as Eva*	$\not\rightarrow$	Hans ist faul	$\rightarrow$	Eva ist faul
(c)	Anna ist nicht schöner als Eva *Anna is no prettier than Eva*	$\stackrel{?}{\rightarrow}$	Anna ist schön *Anna is pretty*	$\stackrel{?}{\rightarrow}$	Eva ist schön *Eva is pretty*
(d)	Anna ist nicht so schön wie Eva *Anna is not as pretty as Eva*	$\not\rightarrow$	Anna ist schön	$\rightarrow$	Eva ist schön

Whereas in the non-negated sentences the diagnostic implication always holds for the subject and the complement, its validity for the subject in (80) is dubious.

4.4 Riddles of Measure and Factor Phrases

Points (vii) and (viii) in section 4.2 record the phenomenon of numerical quantification already taken account of at least in version III. In addition to the strangeness of *1m short* there are other peculiarities to be accounted for.

(xvi) *The equative of −Pol-A does not allow any factor phrase.*

This point takes into account two kinds of asymmetry: one between +Pol-A and −Pol-A, and another between DAs and EAs, which do not have the first kind of asymmetry.

(81)(a) Dieses Brett ist dreimal so lang wie der Tisch
This board is three times as long as the table

(b) ??Dieses Brett ist dreimal so kurz wie der Tisch
This board is three times as short as the table

(82)(a) Der Film ist dreimal so gut wie das Buch
The film is three times as good as the book

(b) Der Film ist dreimal so schlecht wie das Buch
The film is three times as bad as the book

The multiplication of degrees of quality is not a precise operation, but this does not impair the meaning of (82). Measurements of length on the other hand are precisely defined, but (81b) is incomprehensible. A rather remotely possible interpretation would be:

(83) Das Brett ist ein Drittel so lang wie der Tisch
The board is a third as long as the table

In order to interpret (81b) similarly it is necessary to imagine a very special situation as its context, one in which, for example, especially short boards are being sought, that short boards are examined, but are still found to be too long, and that the table serves as a standard of measurement.[21] Even then the whole thing remains dubious.

Comparatives with factor phrases too can only be interpreted indirectly. Thus (84a) can either be reinterpreted (morphologically) as equative and then has the same meaning as (84b) or it can be interpreted correctly as comparative, the length of the table specifying the missing unit of measurement, so that (84c) emerges, which is practically SF-equivalent to (84d):

(84)(a) Das Brett ist dreimal länger als der Tisch
The board is three times longer than the table

(b) Das Brett ist dreimal so lang wie der Tisch
The board is three times as long as the table

(c) Das Brett ist dreimal die Länge des Tisches länger als der Tisch
The board is three times the length of the table longer than the table

(d) Das Brett ist viermal so lang wie der Tisch
The board is four times as long as the table

With high factors the distinction is irrelevant:
'Snow White is a thousand times more beautiful than you'. (I assume that the trivial morphological reinterpretation of (84a) is preferable and shall not pursue the point further.)

Examples like (82) show that it is possible to calculate in scales of BAs (if imprecisely), although no units of measurement are provided. In special circumstances though units of measurement are introduced even for EAs. Then sentences like (85) are possible:

(85)(a) Hans ist drei Punkte besser als Fritz
Hans is three points better than Fritz

(b) Fritz ist zwei Punkte schlechter als Eva
Fritz is two points worse than Eva

As already noted in point (vii) adjectives are not contrastive if measurements are given (in factor phrases on the other hand the distinction between nominative and contrastive interpretation is retained, as (82) shows). Here EAs take on, as it were, properties of DAs, but only to a limited extent, because even when units of measurement are introduced sentences like (86) remain highly questionable:

(86)(a) ??Hans ist drei Punkte gut
Hans is three points good

(b) ??Hans ist drei Punkte schlecht
Hans is three points bad

Neither do they have the status of *1m short*. We shall see that this phenomenon too is derived from the SF-structure of EAs. But it is somehow marginal, and I shall not formulate any special generalization. The core phenomena related to measure and factor phrases are taken account of in (vii), (viii) and (xvi).

4.5 Mis-construed Complements

All the analyses discussed in 3.2 are based on the assignment of a degree to the element compared with in the comparative and the equative as well as to the relatum of the GA. This corresponds well with the generally held and syntactically independently motivated view that sentences like (87a) are to be related to sentences like (87b).[22]

(87)(a) Hans ist größer als Eva
Hans is taller than Eva

(b) Hans ist größer als Eva groß ist
Hans is taller than Eva is tall

Technical details apart, (87b) provides the syntactic basis for the two occurrences of TALL assumed for the comparative in versions I - III. The representations (33b), (36b) and (41b) follow reasonably directly from (87b) if the LF of (87b) has more or less the form of (88), where DP_{comp} is to be realized as a comparative morpheme and determines semantically the assumed linking of the two degrees.

(88) [Hans ist [DP_{comp} groß als [Eva ist GP groß]$_S$]$_{AP}$]$_S$

The equative can be analysed quite analogously. Although this approach contains components essential to the analysis of comparison, we already see a whole series of difficulties which it cannot solve in this form. I shall now discuss another series of problems, which, as far as I know, nobody has so far taken into account. They are related to the assumption just illustrated about the complement sentence, more precisely to its AP, and more precisely still to the head of the AP.

The seemingly acceptable sentence (87b) becomes questionable as soon as we consider examples other than groß:

(89)(a) *Hans ist kleiner als Eva klein ist
Hans is shorter than Eva is short

(b) *Hans ist besser als Eva gut ist
Hans is better than Eva is good

(c) *Hans ist schlechter als Eva schlecht ist
Hans is worse than Eva is bad

This observation poses two problems: (a) why are sentences like (89) deviant? (b) how are the sentences to be interpreted when they are reduced analogously to (87a) and thus become correct? Let us first look at (a).

Clearly the repetition of an adjective in the complement of the comparative is ungrammatical. So one could regard the deletion rule mediating between (87a) and (87b) as obligatory.[23] This is too strict on the one hand and too special on the other. It is too special because it undoubtedly comes under a general principle which has something like the following effect:

(90) *Let K and K' be structurally analogous constituents in a structure S where K' is not p-contrastive. In such a structure, lexical filling of K' is generally avoided, if this would make it identical with K.*

I am presupposing here that the by no means trivial conditions 'K is structurally analogous to K' in S' and 'K is p-contrastive' are already explained in the theory of grammar.[24] The main domain of operation in (90) is conjunction reduction, which has essential things in common with comparative and equative reduction. One non-trivial distinction is that for the latter the reduced constituent stands in hypotactic relation to the reducing one.[25] The fact that p-contrastive units remain lexically intact is shown by examples like in (91):

(91)(a) Hans ist größer als Eva je sein wird
Hans is taller than Eva will ever be

(b) Hans ist größer als er war
Hans is taller than he was

(c) Hans denkt, daß er größer ist als er ist
Hans thinks he is taller than he is

(d) Hans kennt Berlin besser als du deine Westentasche
Hans knows Berlin better than you (know) the back of your hand

In (90) I have indicated a more general and at the same time less strict condition than an obligatory deletion in (87b) would be. This meets another point which is brought out by (89): the sentences in (88) and (87b) are subject to condition (90), but those in (89) are clearly worse than (87b). So there must be a second factor at work. It has to do with the fact that groß in the positive becomes nominative when it has a degree complement, which is not possible for a −Pol-A or EA. Recall the difference between **wie groß** and **wie klein** and between **wie gut** and **wie schlecht** (in fact such a complement of degree is involved here, which occupies the place of GP in (89); cf. ZIMMERMANN in this volume). This factor has directly to do with question (b) about the interpretation of the deleted element.

We can view deletion (or condition (90)) in such a way that as a result of it the items in question do not appear as pairs (PF, SF), but only show the SF of the lexical entry. Then (87a), though not identical with (87b) syntactically, would be identical with it in SF. Similar identity would obtain regarding the reduced variants of (89). But obviously this is not correct, because the reduced versions of (89) are semantically normal. The difference noted between (87b) and (89) would then follow from the fact that the SF of **groß** corresponds better to the semantic remainder in the lexically empty position than is the case with **klein**. We have thus broken down our intuition regarding (89), so to speak, into a syntactic factor and a semantic one, the semantic one being inapplicable to (87b). We may record this finding in the following point:

(xvii) *The semantic interpretation of an adjective not realized lexically in the complement of the comparative is not generally identical with that of the explicit adjective.*

This leaves the question unanswered how the empty position is interpreted. I shall merely indicate at this point the direction in which the solution may be sought. The problem is connected with the question mentioned above as to what degrees of shortness are. The sentence Hans ist kleiner als Eva (*Hans is shorter than Eva*) is not understood like (89a) but rather as Hans ist kleiner als Eva groß ist (*Hans is shorter than Eva is tall*). This is only an approximate statement, which does not even hold for besser (*better*). What it indicates is that the complement of the comparative must provide something like a neutral value on the scale of the dimension of comparison. This indication will be clarified and modified later.

Adjectives in the complement clause of a comparative are not subject to the condition in (90) if they differ from the matrix adjective. This applies to sentences like (92):

(92)(a) Der Tisch ist höher als breit

(b) Der Tisch ist höher als er breit ist
The table is taller than (it is) wide

(92a) is a reduction of (92b) in accordance with (90). Sentences of this kind carry a further phenomenon closely related to the one just discussed.

(93)(a) Der Tisch ist höher als breit
The table is taller than (it is) wide

(b) ?Der Tisch ist niedriger als breit
The table is lower than it is wide

(c) ??Der Tisch ist niedriger als schmal
The table is lower than (it is) narrow

(d) *Der Tisch ist höher als schmal
The table is taller than (it is) narrow

On these and the following examples we may first of all say in general that there are remarkable differences in evaluation. Again it is interesting that both the kind and the degree of difference are systematic and produce a constant pattern. This needs to be explained.

First of all, the difference between (93a) and (b)-(d) is clear: only (a) is perfectly correct. The differences in evaluation of (b)-(d) are obviously related to differences in the ease with which they can be interpreted. This becomes clear when we consider the unreduced forms, where acceptability is somewhat improved:

(94)(a) Der Tisch ist höher als er breit ist
The table is taller than it is wide

(b) ?Der Tisch ist niedriger als er breit ist
The table is lower than it is wide

(c) ?Der Tisch ist niedriger als er schmal ist
The table is lower than it is narrow

(d) ??Der Tisch ist höher als er schmal ist
The table is taller than it is narrow

(94b) is now almost a normal comparative which compares the height and width of an object. What stands in the way is only the fact that breit (*wide*) and niedrig (*low*) come from different scales. A clear difference remains for (c) and (d), which have a −Pol-A in the complement clause. They have a defect similar to the one in (89a), but here there is a way out which does not exist for (89a): the adjectives can be interpreted as contrastive, so that (c) and (d) are no longer normal comparatives without N-relatedness. Then (94c) has the reading:

(95) *The table is further below N_C regarding height than regarding width.*

What makes matters worse in (94d) is that here, as in (b), different scale references are involved. I shall call the interpretation indicated in (95) a secondary N-reference. This interpretation is a roundabout way – hence the dubious acceptability: it is obviously hardly possible with reduced sentences like (83), and for general reasons it rules out measure phrases. That is why sentences like (96) are uninterpretable:

(96)(a) *Der Tisch ist 10cm niedriger als er schmal ist
The table is 10cm lower than it is narrow

(b) *Der Tisch ist 10cm höher als er schmal ist
The table is 10cm taller than it is narrow

With a secondary N-reference even sentences like (97) are possible, which are not possible when they have a regular non-contrastive interpretation, as (98a) shows.

(97)(a) ?Hans ist größer als Eva klein ist
Hans is taller than Eva is short

(b) ?Hans ist kleiner als Eva groß ist
Hans is shorter than Eva is tall

(98)(a) *Hans is 10cm größer als Eva klein ist
Hans is 10cm taller than Eva is short

(b) ??Hans ist 10cm kleiner als Eva groß ist
Hans is 10cm shorter than Eva is tall

(97b) apparently allows two solutions: either a secondary N-reference or a solution parallel to (94b). But then groß cannot be p-contrastive: it only indicates once again the same dimension as klein and must be unstressed. This version, made inevitable by the measure phrase given in (98b), would then in addition violate the condition (90), and this considerably reduces the acceptability of (98b).

If we went through all the formally possible cases – namely the four combinations of +Pol-A and −Pol-A, same and different dimensions, with and without measure phrases, reduced and unreduced – we would have 32 types of comparative sentences with what appears at first sight to be a chaotic pattern of differing degrees of acceptability, to be arranged in the way illustrated here. I shall not demonstrate this in detail but will put the following point on record:

(xviii) *A* DA *in the complement clause of a comparative is either not realized, or is a p-contrastive +Pol-A and has the same scale reference as the matrix adjective. Deviations from these conditions require re-interpretation of the comparative and reduce acceptability.*

All the cases examined so far presuppose that the two corresponding adjectives involved identify dimensions of the same kind (for example unidimensional space coordinates). If this is not the case, the question arises whether and in what way two dimensions of different kinds can be compared with each other. This applies to pairs of DAs like *long* and *thick*, or *old* and *high*, and especially to EAs like *good* and *lazy* or even *boring* and *shy*. The problem has a large number of ramifications which do not have to be mentioned here, because in all cases where no common dimension is provided an auxiliary scale is set up for comparing the degrees on the different scales. Only the auxiliary scale is of interest here, not the conceptual mechanism that allows or prevents its being set up. The auxiliary scale works for the secondary N-reference in (94) and (97) just the same as it does in sentences like (99):

(99)(a) ?Hans ist fleißiger als er begabt ist
Hans is more hard-working than he is talented

(b) ?Hans ist fauler als Eva schön ist
Hans is more lazy than Eva is pretty

(c) ?Hans ist dümmer als er groß ist
Hans is more stupid than he is tall

(d) ??Manche Leute sind mißtrauischer als sie intelligent sind
Some people are more suspicious-minded than they are intelligent

In the case of secondary N-reference N_C is, so to speak, zero on the auxiliary scale. How an auxiliary scale differs from a primary scale arrangement needs to be explained, but for the time being it will suffice to note that the setting-up of an auxiliary scale is one of the means of re-interpretation mentioned in (xviii) and therefore results in a reduction of acceptability.

Point (xviii) as a whole is to be understood against the background of this statement. Given this precaution, the point thus applies by analogy to EAs as well.

What I have so far been saying about the complements of comparatives now has to be looked at regarding equatives. Thus to the 32 comparative cases another 32 have to be added for the equative, which further complicates the picture because the conditions are not the same as for the comparative. I shall summarize the results of the full scrutiny in point (xix) and shall only give one or two explanations.

(xix) *An adjective in the complement of an equative is either not realized or is p-contrastive and has the same scale reference as the matrix adjective.*

What was said above about re-interpretation applies here too. It is crucial that in the complement of the equative −Pol-A (and Neg-A) are possible, which points up an important difference between the comparative and the equative. The difference begins as soon as we interpret the deleted adjectives:

(100)(a) Hans ist so groß wie Eva
Hans is as tall as Eva

(b) ?Hans ist so groß wie Eva groß ist
Hans is as tall as Eva is tall

(101)(a) Hans ist so klein wie Eva
Hans is as short as Eva

(b) ?Hans ist so klein wie Eva klein ist
Hans is as short as Eva is short

Here the explicit and the reduced sentences do not differ as markedly for +Pol-A and −Pol-A as is the case with comparative constructions. The (b) sentences only violate the principle in (90) but they do not violate any other semantic principle. In other words, in the equative, even for −Pol-A, the SF of the adjective resembles sufficiently the interpretation of the deleted adjective. As we shall see, this has to do with the fact discussed above that sentences like (101) are contrastive. This also becomes apparent when we compare pairs with different dimensions, as in (102):

(102)(a) ?Der Tisch ist niedriger als er schmal ist
The table is lower than it is narrow

(b) Der Tisch ist so niedrig wie er schmal ist
The table is as low as it is narrow

In (b) there is N-reference, but it is not secondary, and therefore does not put any strain on acceptability. Reversing the scale reference, however, has the same unsettling effect as in the comparative:

(103)(a) ?Hans ist so groß wie Eva klein ist
Hans is as tall as Eva is short

(b) ?Der Tisch ist so hoch wie er schmal ist
The table is as tall as it is narrow

I shall conclude this discussion with a remark on the large class of complements which are not of the type considered so far. Examples are:

(104)(a) Hans ist größer als ich erwartet hätte
Hans is taller than I would have expected

(b) Hans ist so faul wie alle behaupten
Hans is as lazy as they all say

(c) Das Brett ist nicht so lang wie es scheint
The board is not as long as it seems

(d) Das Haus ist baufälliger als der Bericht glauben machen will
The building is more dilapidated than the report will have us believe

Two things must be noted here. Firstly, in these complement clauses always a complement clause governed by the verb is missing, due to the principle noted in (90). Thus (104a) can be added to in steps:

(105) Hans ist größer als ich erwartet hätte (daß er (groß ist)).

Secondly, the complement in this way always contains a latent (or deleted) adjective, which is interpreted in exactly the same way as in simple complement clauses of the kind discussed. Like these, complements of the type (104) thus yield a property of a degree of comparison similar to that postulated by the analyses discussed in 3.2 for simple complements.

(104b) and (c) are thus genuine equative constructions, but this does not apply to sentences like (106), which do not contain a latent adjective and are to be analysed differently:

(106) Hans ist so klug, daß ihn keiner übertölpeln kann
Hans is so shrewd that nobody can take him in

4.6 Negated Complements

The following point is a well known fact:

(xx) *The complement of a comparative cannot be negated*

(107)(a) *Hans ist kleiner als Fritz nicht ist
Hans is shorter than Fritz is not

(b) *Hans ist größer als keiner erwartet hätte
Hans is taller than nobody would have expected

(c) *Hans ist dümmer als niemand sonst
Hans is more stupid than nobody else

Sentences like these cannot be ruled out syntactically, and they are not contradictory (which they are, for example in the analysis by CRESSWELL (1976)), but are simply incomprehensible: their interpretation does not make sense. As VON STECHOW (1985) observes, all approaches have difficulty with these sentences. His own variant of version III does better than most. In it the complement lies in the scope of a definite description and consequently has no denotation when negated. His approach thus takes account of the meaninglessness of (107).[26] However, what VON STECHOW's analysis, like all others, overlooks is that (xx) in this form does not hold true for the equative. Sentences like those in (108) are thus evaluated, wrongly, parallel to those in (107):

(108)(a) Hans ist so klein wie Fritz nicht ist
Hans is as short as Fritz is not

(b) Hans ist so groß wie keiner erwartet hätte
Hans is as tall as nobody would have expected

(c) Hans ist so dumm wie niemand sonst
Hans is as stupid as nobody else

Even if we regard (a) as somewhat strange,[27] it is still clear that the sentences are perfectly interpretable and are not senseless in the way that (107) is. Therefore (xx) requires a distinction between the comparative and the equative, a distinction not envisaged by existing theories so far.

I shall conclude here the exposition of the facts which have to be accounted for in a theory of gradation, but shall include further phenomena in due course.

4.7 Consequences for the Formation of a Theory

The assumptions drawn together under (i)-(xx) on the facts to be accounted for are not a random collection: the aim has been to provide a certain structuring, and in what follows, I shall attempt to show that all the facts discussed (and a range of others) can be explained from a relatively small number of theoretical assumptions which can clearly bring out interrelations that are not at all obvious from the formulations used so far. The theory has the following components:

(109)(a) general assumptions about the form of SF and its relation to LF.

(b) a theory of the SF of the lexical items involved, notably of the DAs and EAs.

(c) a theory of the constructions relevant to gradation, that is: positive, comparative, equative, measure and factor phrases.

(d) conditions on certain SF constants and variables occurring in (b) and (c).

Component (a) is not a special component of gradation theory, but to the extent to which the theory is adequate and requires certain assumptions regarding SF, (a) is indirectly confirmed by gradation theory. Regarding (a) I make the basic assumptions indicated in section 2. Component (c) ultimately leads back to the SF of the basic syntactic elements involved, and is thus a special case of (b). More closely, then, the theory has the following structure:

(110)(a) theory of the SF of the lexical items involved;

(b) conditions on certain constants and variables occurring in (a).

Besides the special assumptions which form part of (110a), the status of (b) is of particular interest because these conditions express generalizations or regularities which apply specially to SF and thus provide evidence for the autonomous status of this level.

Before presenting the theory, there are three points to make:

Firstly, there are several groups of facts where we observed instances of fluctuation and vagueness in the judgement of their interpretation. The explanatory adequacy of a theory can be assessed in part by how far it is able to deduce the systematic structure and the reasons for such fluctuations instead of simply leaving them as residues for pragmatic or stylistic examination. I shall show that explanation is possible to a considerable degree.

Secondly, in this section I have been discussing almost exclusively what occurs in constructions of comparison. Much of what goes on in comparative constructions has ramifications in other parts of the grammar. For example nominalizations participate directly in the phenomena of norm-relatedness.

(111)(a) Der Stamm hat eine Länge von 10m
The tree trunk has a length of 10m

(b) *Der Stamm hat eine Kürze von 10m
The tree trunk has a shortness of 10m

The situation is similar with verbs such as kosten (*cost*), dauern (*last*), wiegen (*weigh*): if they are used (elliptically) without a complement, they assume the contrastive interpretation of a +Pol element:

(112) Das kostet → Das kostet viel
That costs → *That costs a lot*
(cf. Engl. *that'll cost you* → *that'll cost you a lot*)

DAs which are modifiers of PPs with a directional interpretation must be +Pol-A (I owe this observation to Ewald LANG).

(113)(a) Der Ball sprang hoch in die Luft/weit ins Feld
The ball bounced high in the air/far into the field

(b) *Der Ball sprang niedrig in die Luft/nah ins Feld
The ball bounced low in the air/near into the field

Relations of this kind show that we are dealing with phenomena of gradation, not only of comparison.

Thirdly, I have only been dealing with phenomena of German, but there are remarkable similarities among all languages having comparable constructions.[28] Apparently, though, similarities also occur in languages which do not have such constructions but use nominal or verbal constructions (for example of type (111)). To the extent that further exploration may sharpen such suppositions, the SF constants involved and the corresponding conditions (110b), can be regarded as components of universal grammar (UG).

This leads to the (rather) interesting assumption that all language particular phenomena of gradation originate in the existence of quite specific types of lexical entries based on the SF-constants in question. UG provides the possibility for these entries to exist, and simultaneously constrains their structure, their interaction with other lexical items, and their (conceptual) interpretation.[29]

5 The Conceptual Basis of Gradation

5.1 Preliminary Remarks on the Structure of the Operation of Comparison

In this section I shall state the grounds for the interpretation of the SF constants relevant to gradation and thus of the corresponding SF representations in CS. This will at the same time make the structure of the proposed theory clearer. In comparison to the linguistic levels of representation there are hardly any general and reliable notions on the structure of CS available, so I shall proceed in the following way. First I shall explain in intuitive terms the conceptual structure of comparison operations, which form the core of the conceptual component relevant here. I shall then give a provisional formalization of the relevant concepts. This is local in nature, that is, it is given without prejudice to the fundamental notions necessary to a general theory of CS. However, while the formalization presented lays no claim to more general validity, it is definite regarding what it describes, so that it does represent an exploration of certain conditions that a theory of CS must fulfil. Then I shall state explicitly the crucial SF constants and their interpretation.

I assume fundamentally that gradation is constituted by a mental operation which I shall call the comparison operation. A comparison in the sense envisaged involves as a minimum three conditions: (a) at least two entities that are to be compared. For the sake of simplicity I shall call the entity to be compared V_1 and the one with which V_1 is compared V_2. (b) An aspect with regard to which V_1 is compared with V_2. I shall call the aspect involved T. (c) The actual operation of comparing, which brings V_1 into relationship with V_2 regarding T. I assume that this is mediated by a scale D which specifies the degrees d_1 and d_2 of V_1 and V_2 respectively with regard to T. Comparison operations and degrees on a scale are mutually conditioning: there is no degree without comparison and no comparison without degree.

Perhaps a remark is called for at this point on the ontology of degrees. As mentioned earlier, CRESSWELL has defined degrees as equivalence classes of objects which are indistinguishable regarding T. My proposal is to regard degrees as actually being constituted by the comparison operation. The correspondence between the two approaches is similar to that between two ways of determining natural numbers: on the one hand as classes of equivalent sets and on the other hand as being constituted by the successor operation, that is by counting.

Comparing and counting create different but in a way related entities, namely degrees and numbers.[30] In accordance with the basic assumptions in 2.1 on the interpretation of SF I shall therefore regard degrees as mental entities which are produced by the operation of comparison. The question whether there are degrees as such (either in the Platonic sense or in reality) is irrelevant. Degrees are generated as mental structures during interaction with reality, and as such they can be projected onto reality and take on a real existence. What interests us here is their conceptual structure, the properties of which result from the comparison operation and which may now be more exactly specified.

How are V_1 and V_2 compared with each other? I make two simple assumptions which have far-reaching consequences:

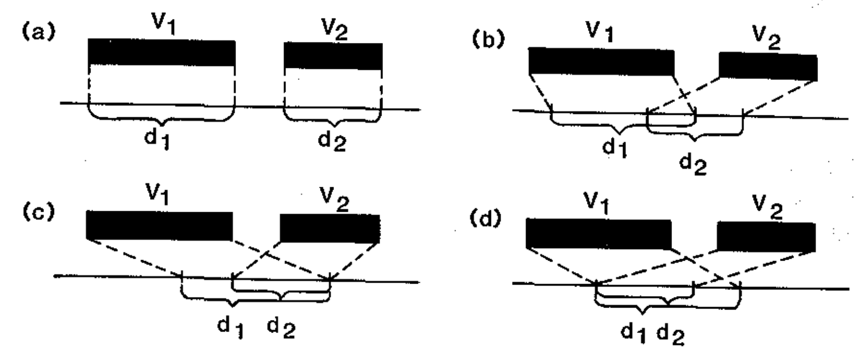
(114) V_1 and V_2 are projected onto the scale D regarding T in such a way that

(a) the degrees d_1 and d_2 of V_1 and V_2 overlap and

(b) d_1 and d_2 have a common starting point.

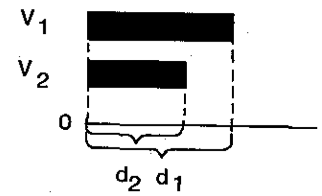
In certain cases which are in a sense archetypal, the two conditions can be fulfilled physically by placing V_1 and V_2 side by side. But this would not be making a comparison. Such a manipulation only becomes a comparison when it is based on the conceptual operation of comparison, one of the conditions of which is (114). The condition (114) rules out projections like (115a) and (b) and only allows (c) and (d):

(115)



The projections in (c) and (d) are equally valid regarding (114), even as mirror images of each other – the choice is arbitrary. The projection indicated here by dashed lines is part of the operation which constitutes the comparison; I shall take it as given without further comment, and shall call it P. It must be accounted for in a theory of the conceptual system **C**. The permitted projections can be represented more directly thus:

(116)



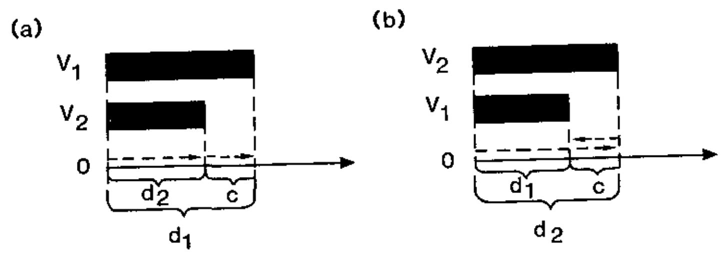
I shall call the common starting point of d_1 and d_2 zero point of the scale so that (114b) guarantees a scale with zero. According to (114a) the degrees compared lie in the same direction in relation to the zero point. The result is a directed scale, as indicated in (116). I shall call the directed scale with a zero guaranteed by (114) '(D, O)'.

The two conditions in (114) are simple but not trivial. For instance, (114b) is not fulfilled simply by giving (non-standardized) comparisons of, say, heat or pitch. This can easily be seen from the fact that Heute ist es doppelt so warm wie gestern (*today it is twice as warm as yesterday*) or Er singt halb so hoch wie sie (*he sings half as high as she does*) have no clear interpretation, while es ist kälter (*it is colder*) and sie singt höher (*she sings higher*) present no problem. I shall leave out the additional comments necessary here[31] and assume that (D, O) is a necessary condition for the comparison operation. (104) gives us the zero point and the direction of the scale. But there is another direction which is part of the structure of the comparison operation. This arises from the different functions of V_1, the entity to be compared, and V_2, the entity which V_1 is compared with. I assume the following condition for this:

(117) The degree d_1 projected by V_1 is specified in relation to the degree d_2 projected by V_2.

If the specification of the value of d is thought of as a path on the scale, then it follows from (117) that first the path of d_2 has to be passed through and from the end of this the path to d_1, which is thus being determined by d_2 and a difference c. For (116) this may be displayed as follows:

(118)



(a) and (b) are comparisons between the same entities, but with exchanged roles for V_1 and V_2. On the basis of (117) this change of roles causes a reversal of the direction in the determination of values. The two situations are of course meant to correspond to sentences like those in (119), but for the moment I shall discuss the structure of comparison in C independently of language.

(119)(a) V_1 ist größer als V_2 (b) V_1 ist kleiner als V_2
V_1 is larger than V_2 *V_1 is smaller than V_2*

It is a controversial question whether, on one of the levels determined by C (but presumably not in CS), comparison operations can have a representation with the iconic properties indicated in (118). The decision depends on the existence and role of imagery or so-called analogue or iconic representations in C.[32] I shall leave the question open but shall assume that CS, as the interpretation of SF, is of a propositional-algebraic nature, and I shall characterize the structure of the comparison operation accordingly. (114) and (117) have the following consequences:

(120)(a) A comparison operation is based on a scale (D, O) with a zero point and a direction determined by this point.

(b) The degrees d_1 assigned to the entities V_1 on the basis of the projection P regarding the aspect T on (D, O) are sections of D which begin with O.

(c) A difference c can obtain between two degrees d_1 and d_2; c begins at the end point of d_1 and has the same direction as (D, O) or the opposite direction.

This is the outline of the essential parts of an elementary comparison operation, the structure and availability of which is guaranteed by the pertinent module of C. This intuitive characterization will undergo clarification, and the effect of the metaphor of direction or movement will be formally reconstructed, in 5.2. For the moment there are three points to notice.

Firstly, following intuitive notions, I have assumed two aspects of direction which have different origins. CRESSWELL (1976) sees degrees as directed on an ordered scale (cf. note 9), but does not envisage the second directional component assumed in (120c), with the result that we run into the problems mentioned above in specifying the antonymy of DAs in addition to a number of other difficulties.

Secondly, the projection P leaves more room for manoeuvre regarding T than has been made clear so far. The aspect T with regard to which V_1 is compared with V_2 can vary within the boundaries of V_1 and V_2 that are compatible with projection onto a uniform scale (D, O). For instance, height and width have different conditions for T but a direct common scale (D, O), while height and industriousness only permit an indirect or metaphorical common scale projection. The boundary conditions for P (and the mechanisms for bypassing them) must be specified in C. This problem is analysed in detail by LANG (in this volume) for spatial dimensions. Without wishing to reduce generality, I shall assume here that projection onto (D, O) always produces unidimensional degrees, so that it is no coincidence that the scale of length has to be regarded as the archetypical case. Thus degrees of volume, area, quality, etc. in particular are also segments of a unidimensional scale (D, O).[33] The projection P hence interacts directly with the conditions specifying the parameter Q for determining the aspect to be quantified, which I discussed in 4.2.

Thirdly, (120) gives the components of elementary comparison operations which allow extrapolations in various directions. On the one hand, V_2 for its part can be determined with reference to a point of comparison V_3. For V_2 in relation to V_3 the same conditions hold as for V_1 in relation to V_2 (in principle this extension is recursive). In all cases where it is presupposed, norm-relatedness has the form of such a third point of comparison, as we shall see. On the other hand, scale values themselves can be projected onto another scale. Scales can, so to speak, be stacked or iterated (what I called an 'auxiliary scale' in 4.5 is such a case). A particularly simple case of this stacking is induced by *very*, which makes it possible to compare differences on an abstract scale.

These additional points do not extend the conditions given in (120) on the basis of (114) and (117), so the structure of the comparison mechanism paraphrased in (120) is more or less complete. It can now be made more precise.

5.2 Canonical Scales

I have so far represented the aspect of comparison T by a metavariable which has yet to be instantiated by the conceptual specification of the corresponding aspects. Formally, T(V) means "V has the aspect T". Thus L(V), for example, means "V has length", W(V) "V has width", I(V) "V has industriousness" etc. where L, W, I etc. are complex conditions represented by corresponding configurations in CS.

The projection P maps V regarding T onto (D, O). Thus it is a function which has degrees in D as its range of values. P(L(V)) has the degree d of V regarding L as its value.[34] The range of P(L(V)) and the range of P(W(V)) are the same, those of (P(L(V)) and P(I(V)) interpreting length and industriousness are not.

Now what is crucial in the following is the structure of the range of P, in other words, of the scales. As a general framework for covering these we may take the scaling theory worked out in mathematical psychology (see for example SYDOW AND PETZOLD (1981) and SUPPES AND ZINNES (1963)). However, for the conceptual structure of the comparison operation special conditions have to be set up. On these grounds the following stipulations may be made.

The conceptual structure of grading is based on canonical scales distinguished by two properties in particular: (a) that they have a zero point and (b) that they are metrical. The property of being metrical means intuitively that an interval on the scale can be shifted along the scale without its value being altered. This assumption does not rule out other than canonical scales in C. It is well known, for example, that perceptual dimensions are largely logarithmic. What I am postulating here is simply that the conceptualization of gradation is canonical, in other words that even perceptual judgements in CS are projected onto a canonical scale. This seems to be well founded.

I shall first give the structure of a scale base as follows:

(121) A scale base **D** for a comparison aspect T is a triple $\mathbf{D} = (D, D_0, \supset)$ with the following conditions:

(a) D is a (non-finite) set of scale segments d_i;

(b) D_0 is a proper subset of D, whose elements are values of P(T(V));

(c) $\supset$ is a partial ordering on D with the condition
$d_i \supset d_j \equiv \forall\, d_k\, [[d_j \supset d_k] \rightarrow [d_i \supset d_k]]$;

(d) for every d_i from D there is a d_j from D_0 with $d_j \supset d_i$;

(e) D_0 contains an empty interval d_o,
for which $\forall\, d_i\, [d_i \in D_0 \rightarrow [d_i \supset d_o]]$.

The relation $\supset$ is to be read: 'The scale segment d_i contains (improperly) the scale segment d_j'. This containment relation constitutes the basic relation of the comparison operation. D_0 is the set of degrees regarding T. Condition (d) guarantees that the elements of D_0 are initial parts of the scale and that there are no scale segments 'before' D_0. The empty initial interval d_o marks the zero point.

D_0 divides D into two subsets. D_0 is the set of degrees, $D \setminus D_0$ is the set of differences. Differences do not begin at zero, and do not have d_o as their (improper) beginning.

From condition (d) it also follows that $\supset$ is a transitive and reflexive ordering with respect to D_0. But in general, $\supset$ is only a partial ordering because differences need not include each other.

Let '$\circ$' be a concatenation operation on D which connects the immediately adjacent segments d_i and d_j to form a new segment d_k. Formally:

(122) For any d_i, d_j, d_k from D:
$d_i \circ d_j = d_k \equiv d_k \supset d_i \wedge d_k \supset d_j \wedge \forall\, d_l\, [d_k \supset d_l \rightarrow \sim [d_l \mid d_i \wedge d_l \mid d_j]]$.

'$d_i \mid d_j$' means that d_i and d_j do not overlap:

(123) $d_i \mid d_j \equiv \sim \exists\, d_k\, [d_i \supset d_k \wedge d_j \supset d_k]$.

In other words (122) stipulates that d_k contains all and only those segments which have (improper) parts contained in d_i or d_j.

Finally a measure must be assigned to the elements of D. This is done by a function μ from D in D_0, which for every scale segment fixes a degree as its length.

(124) $\mu(d_i)$ is a uniquely determined element of D_0 and is called the measure of d_i. In particular $\mu(d_i) = d_i$ for all $d_i \in D_0$.

On the basis of (122) and (124), $\mu(d_i) \circ \mu(d_j) = \mu\ (d_k \circ d_l)$ if $\mu(d_i) = d_k$ and $\mu(d_j) = d_l$. On the basis of μ the iterated concatenation (or multiplication) of segments can be defined:

(125) Let n be a natural number. Then:
$n\,.\, d_j = d_{i1} \circ d_{i2} \circ \ldots \circ d_{in}$ where $\mu\ (d_{ik}) = \mu\ (d_i)$ for $1 \leq k \leq n$.

I shall not extend (125) to positive rational numbers, since the principle is clear. We may now stipulate:

(126) $\mathbf{D}_k = (D, D_0, \supset, \circ, \mu)$ is a canonical scale for T iff

(a) $(D, D_0, \supset)$ is a scale base for T in accordance with (121),

(b) $\circ$ is a concatenation operation in accordance with (122),

(c) μ is a function from D in D_0 in accordance with (124).

D_0, $\supset$ and μ give the direction and the metric of the scale. Now we have to explain the second directional component which was introduced in 5.1. To do this we must bring in an operation I, which assigns to each element in D its inverse. The inverse element $I(d_i)$ of d_i simply changes the concatenation properties of d_i.

(127) I is a function from D in I(D) with the following conditions:

(a) $I\ (d) \in I(D)$ iff $d \in D$

(b) $\mu(\mathrm{I}(\mathrm{d}_i)) = \mu(\mathrm{d}_i)$

(c) $\forall \mathrm{d}_j\ [\mathrm{d}_j \supset \mathrm{d}_i \rightarrow \mathrm{d}_j \supset \mathrm{I}\ (\mathrm{d}_i)]$

(d) $\mathrm{d}_i \circ \mathrm{I}\ (\mathrm{d}_i) = \mathrm{d}_k$ and $\mu\ (\mathrm{d}_k) = \mu\ (\mathrm{d}_0)$

(e) $\mathrm{d}_i \circ \mathrm{I}\ (\mathrm{d}_j) = \mathrm{d}_k$ iff $\mathrm{d}_k \circ \mathrm{d}_j = \mathrm{d}_i$

'I' defines indirectly a kind of subtraction for scale segments, which does not, however, generate any 'negative' scale segments.

We can now extend $\mathbf{D}_k$ to a canonical scale with inversion:

(128) $\mathbf{D}_{k'} = (\mathrm{D}, \mathrm{D}_0, \supset, \circ, \mu, \mathrm{I})$ is an I-canonical scale for T iff $\mathbf{D}_k$ is a canonical scale for T in accordance with (126) and I is the inverse function in accordance with (127).

We have now specified the structures of CS relevant to gradation. They can be defined in a number of equivalent ways, as long as there are no grounds for independent conditions on CS representations. I have given a version which follows as closely as possible intuitive considerations and at the same time allows a simple interpretation of the linguistically motivated SF representations. To make the envisaged relationship clear I shall give two examples which represent that part of the CS representations for comparative sentences which is relevant to gradation. V_1 and V_2 are to be replaced here by the CS interpretations of Hans and Eva, while G stands for the aspect of dimension identified by groß and klein.

(129)(a) Hans ist größer als Eva (*Hans is taller than Eva*)

(b) $\mathrm{P}(\mathrm{G}(\mathrm{V}_1)) = \mathrm{P}(\mathrm{G}(\mathrm{V}_2)) \circ \mathrm{d}_i$

(130)(a) Hans ist kleiner als Eva (*Hans is shorter than Eva*)

(b) $\mathrm{P}(\mathrm{G}(\mathrm{V}_1)) = \mathrm{P}(\mathrm{G}(\mathrm{V}_2)) \circ \mathrm{I}(\mathrm{d}_i)$

Here d_i is a non-empty difference, in other words, $\mu(\mathrm{d}_i) \neq \mu(\mathrm{d}_0)$. For general reasons '=' will in the sequel be replaced by '$\supset$' in (129) and by '$\subset$' in (130), the latter being the converse ordering relation of '$\supset$', for which in general the following holds:

(131) $\mathrm{d}_i \supset \mathrm{d}_j \equiv \mathrm{d}_j \subset \mathrm{d}_i$

The semantics of gradation must determine the mapping of (a) onto (b) in (129) and (130) in a way that generally accounts for the phenomena summarized in (i) - (xx).

5.3 Norm Values and Measurement Units

For this purpose it must be explained, in particular in connection with the structure of the comparison operation, what the reference to a comparison class C and its norm in CS is.

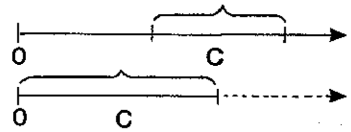
Intuitively it is clear that the class C with regard to the aspect T determines a class of degrees in $\mathbf{D}_k$. We may thus put on record:

(132) If C is a comparison class regarding T, then P(T(C)) is a subset of D_0 of $\mathbf{D}_k$ for T.

We shall see later that for EAs, but not for DAs, this subclass always includes d_0, and that the degrees of the comparison class thus determine a proper initial part of the scale. For EAs, intuitively speaking, the scale is in fact defined only with regard to C. For DAs, on the other hand, the end points of the degrees determined by C form a segment from a scale that exists independently of C. Thus we have the following situation:

(133)(a) DA:

(b) EA:



I pointed out in 4.2 that C can be determined extensionally – by its elements – or intensionally – by its properties. In the former case (P(T(C)) is determined for $\mathrm{V}_i \varepsilon \mathrm{C}$ directly on the basis of P(T(V)). In the latter case we must assume that the value of P(T(C)) can be derived from the defined properties of C for a given T. In borderline cases this is the whole scale regarding T. This assumption is not trivial, but it is plausible. It implies that the conceptual system **C** generates an order regarding T for a class C, if T is a gradable aspect of the elements of C.

Furthermore, for DA a norm value N_C depending on C must be defined. The usual view is that N_C is a standard value determined by C. Before I follow up this view I shall distinguish between various kinds of norm.

LEISI (1953) has proposed a distinction between four norms: norm of class, function, expectancy, and proportion. According to this Das Fenster ist breit (*The window is wide*) can be understood as (a) wide for the class of windows, (b) wide for a more or less specific purpose, (c) wide with regard to the relevant scope of width, (d) wide relative to height. Of these, cases (a) - (c) can be covered by determining C differently as the class norm, (b) and (c) presupposing intensionally determined comparison classes (the class of windows with a specific purpose and the class of windows within the envisaged scope of width). On the other hand, (d) presupposes – at least in addition to a comparison class – a canonical proportion schema. I shall first discuss N_C for extensional and intensional classes, that is (a) - (c), and shall then return to (d).

With regard to the class norm N_C there are two rival views which may be formulated thus:

(134)(a) N_C is the (arithmetical or geometrical, possibly weighted) mean of the $\mu\ (\mathrm{d}_i)$ of all d_i from P(T(C)).

(b) There is in C a prototypical representative V_t, and N_C is $\mathrm{P}(\mathrm{T}(\mathrm{V}_t))$.

The most careful and precise account of (134a) is given by WUNDERLICH (1973), and (134b) is to be encountered in various, usually quite vague, formulations. Here I shall skirt round the problems of whether and how prototypes are represented in CS and replace (134b) by the (not necessarily equivalent) view (135):

(135) The range of P(T(C)) and a weighted mean in this scope are included in the defining properties of C.

Now (134a) and (135) specify N_C for comparison classes given extensionally and intensionally, respectively. We know from 4.2 that both cases occur, so that (134a) and (135) cannot be mutually exclusive explanations of N_C. Of course, (135) only applies when an intrinsic norm exists in CS for C, in other words it does not apply to the non-referential use of *circle, sphere, figure* etc. Intensional comparison classes with an intrinsic norm according to (135), though, do not need to be lexically determined, but can be formed by contextual clues. The cases of expectancy norm and function norm are obvious examples. On the other hand it is clear that, say, in a situation where several geometrical figures on a table have to be distinguished, *the large sphere* is interpreted with an extensional N_C and the class of the given figures as C.

The question arises whether (134a) and (135) are in fact based on two quite different operations. I shall here make a plausible though not necessary speculation. It seems reasonable to me to assume that a general schema exists for determining the normal case given the boundary conditions in **C**, in other words that for a range that a class C has regarding T, N_C is formed automatically by a general procedure. Let us assume that this procedure is an operation M(K, C) which determines the value N_C for the range of C depending upon the contextual conditions K. The two cases (134a) and (135) are then only distinguished by the fact that C, and thus the range for P(T(C)), is given either extensionally or intensionally.

We can now see how the proportional norm can be incorporated into the given framework. The range for P(T(C)) is not determined here by the values that $P(T(V_i))$ can assume for any elements of C but by the values for $P(T(V_i))$ relative to a proportion schema. This schema is one of the defining properties of the elements of C, so that the proportion norm is always intensional. I shall not formalize these conditions any further here, but I refer to LANG (this volume) for the concept of proportion schema. Against the background of these considerations I can summarize at this point how N_C is determined for all cases which have to be taken into account:

(136) If for an extensionally or intensionally defined class C in $\mathbf{D}_k$ a range for the values of P(T(C)) is given, then N_C is also determined.

We shall see that (136) is crucial for DAs but has no effect regarding EAs. (136) gives a condition that is necessary but not sufficient for N_C, although it is sufficient for the theory of gradation. To give a full specification of N_C we must settle the question of how N_C is derived from the given range. I refer again to the assumptions discussed above, and shall let the matter rest there.

Now the formal status of N_C remains to be settled. The content of N_C is the result of an operation I have speculatively paraphrased as M(K, C). The solution thus presents itself to regard N as a function which, depending on C (and where necessary the context K, which I shall leave out), determines a degree of $\mathbf{D}_k$. For

the moment it is sufficient to identify N_C with this value and to regard it simply as a designated degree in $\mathbf{D}_k$. This gives the following structures:

(137)(a) Hans ist groß
Hans is tall

(b) $P(G(V_1)) \supset N_C \circ d_i$

(138)(a) Hans ist klein
Hans is short

(b) $P(G(V_1)) \subset N_C \circ I(d_i)$

(139)(a) Hans ist so groß wie Eva
Hans is as tall as Eva

(b) $P(G(V_1)) \supset P(G(V_2))$

(140)(a) Hans ist so klein wie Eva
Hans is as short as Eva

(b) $P(G(V_2)) \supset N_C \circ I(d_i) \# P(G(V_1)) \supset P(G(V_2))$

(141)(a) Hans ist nicht so klein wie Eva
Hans is not as short as Eva

(b) $P(G(V_2)) \supset N_C \circ I(d_i) \# \sim (P(G(V_1)) \supset P(G(V_2)))$

The conventions of notation are the same as in (129) and (130). We can see that the positive and the comparative are in fact parallel in the desired way. (139) shows why '$\supset$' and not '$=$' is the necessary relation between the degrees being compared: presupposing the definition of '$\subset$', the duality of the comparative and the equative is then guaranteed, and (139) and (142) can be converted to each other by definition:

(142)(a) Eva ist nicht größer als Hans
Eva is no taller than Hans

(b) $\sim (P(G(V_2)) \supset P(G(V_1)) \circ d_i)$

d_i must be understood as 'any d_i from D' in the scope of negation. I shall take care of this explicitly later. Intuitively, $P(G(V_1))$ contains $P(G(V_2))$ only if $P(G(V_2))$ does not contain the $P(G(V_1))$ extended by a d_i.

In (140) I have used '#' to separate the presupposed part of the CS representation. It is not affected by the negation, as (141) is intended to show. This is precisely in keeping with the phenomena of norm relatedness discussed under (xiv). Moreover, (140) is a three-part comparison involving N_C, $P(G(V_1))$ and $P(G(V_2))$. The CS interpretation contains the interpretation of the positive as a proper and non-negatable part only in the case of −Pol-A and not in the case of

+Pol-A. What has to be clarified is what the SF structure which determines this interpretation is like.

Incidentally, the form in which sentences like (137) and (138) are interpreted allows us to clear up a well known, but only apparent, problem concerning N_C that has so far not been mentioned. The intuition is strong that sentences like Hans ist nicht groß und nicht klein do not lay down a fixed value – even if C is fixed – any more than sentences like Hans ist groß do. Usually it has been concluded from this that the mean value – N_C – is not actually a value but a fuzzy section of the scale (KLEIN (1980) bases his whole theory on this fuzziness). It is now clear that the fuzziness in CS can be transferred to two places: the fuzzy specification of N_C and the range for the choice of d_i. Since the fuzziness is exactly the same as in the comparative if the difference is not specified by giving a measurement, I regard it as necessary in any case to have a general condition which lays down a context-dependent threshold for $\mu(d_i)$.[35] N_C can then be regarded as a C-dependent degree of $\mathbf{D}_k$ without reducing generality. However, the dependence on C makes this degree a special one. As we shall see, a value dependent on C cannot be the basis for giving units of measurement which I shall now consider.

Units of measurement are certain designated degrees d_i from $\mathbf{D}_k$, or more precisely the measure $\mu(d_i)$ of these degrees. Often, but not necessarily, these d_i are the projection of standardized units V_i. *Cubit, yard, day* are lexicalized examples. Others are constructed by operations on D_0, such as *hour, metre, hectare* etc. The naming of measurement units is in general, but not necessarily, standardized. *The pencil is three matchsticks long* is interpretable on a regular basis, although *matchstick*, lexically, is not a unit of measurement.[36]

Formally we can characterize a unit of measurement as the class D_i of the d_i from D, for which $\mu\ (d_i) = \mu\ (d_m)$, where d_m is an element marked as a measurement standard from D_0. It is rather less awkward to regard d_m as the representative of this class, in other words as a kind of non-localized, movable interval of $\mathbf{D}_k$. A metric ruler exemplifies both aspects: it lists the elements of the class D_i and numbers them, and it generates them by concatenation of d_m. This corresponds to the fact that units of measurement do not identify certain sections of the scale but do behave like sections of the scale. I shall therefore stipulate the following:

(143) A unit of measurement of $\mathbf{D}_k$, regarding T is the representative d_m of a subset D_m of D, for which:

(a) $\forall\ d_i\ [d_i \ \varepsilon\ D_m \rightarrow \mu(d_i) = \mu(d_m)\ ]$

(b) There is a designated $d'_m\ \varepsilon\ D_0$ with $\mu(d'_m) = \mu(d_m)$ and d'_m is the standard for d_m.

The form in which μ, the concatenation '∘' and the inverse formation I are stipulated thus allows the following CS representations for constructions with measure phrases:

(144)(a) Hans ist 1.50m groß
Hans is 1.50m tall

(b) $P(G(V_1)) \supset d_o \circ 150.d_m$

(145)(a) Hans ist 10cm kleiner als Eva
Hans is 10cm shorter than Eva

(b) $P(G(V_1)) \subset P(G(V_2)) \circ I(10.d_m)$

Here d_m is the CS representation for centimetres. Specifying d_o in (134) as the starting point is necessary because the instances of d_m, as stipulated above, are non-localized intervals of $\mathbf{D}_k$, and so it would not be specified which section contains the interval which is assigned to Hans. Concatenation with d_o localizes it as a degree, that is, as an element of D_0.

For constructions with measure phrases like (144) and (145) I have likewise not assumed equality of degrees but the relation '⊃'. This requires an explanation both of the formal status and of the content of '⊃'. Formally, '⊃' has been specified in such a way that (144) (paraphrased informally) means that each interval contained in the initial part of 150cm is also contained in the height of Hans. This leaves the question open whether the height interval of Hans exceeds 150cm. But regarding its content this corresponds exactly to the interpretation of (144a), which has sometimes been regarded as ambiguous (for example in KLEIN (1980)), on the grounds that a sentence like (146) allows for people taller than 1.80m to apply for the post:

(146) Applicants for this post must be 1.80m tall.

The CS representation given in (144) complies with this possiblity without showing that the sentence is conceptually ambiguous. At the same time it is important that (144b) is not the CS interpretation of Hans ist mindestens 1.50m groß (*Hans is at least 1.50m tall*). For sentences with *at least* (and, correspondingly, *at the most*) the additional condition obtains that the stated degree of comparison is the smallest (or largest) for which the stipulated relation of 'being included' holds. I merely refer to the distinction but will not make it explicit here.[37]

This concludes for the time being the exposition of the structures in CS relevant to gradation. This exposition is not intended as a theory of the subsystems of **C** involved (although it gives some indications of what such a theory must be about), but it does specify the elements and relations which are necessary to interpret the SF representations of expressions of gradation, and thus motivates part of the semantic theory of gradation to which I shall turn now.

6 The Semantic Form of the Dimensional Adjectives

6.1 The Structure of Lexical Entries

I shall begin to present the theory, the structure of which was outlined in 4.7, by characterizing DAs lexically, since this will provide the most plausible basis for explaining the interlocking of the various factors.

The syntactic framework is based on two conditions already mentioned. Firstly, a DA, like all adjectives, is the head of an adjectival phrase AP. It has an external argument and accordingly an external θ-role, which either θ-marks the argument of a predication or is absorbed by the θ-role of a modified constituent (cf. 2.2). Secondly, DAs take optionally a degree phrase, DP. This DP is not a modifier but an internal argument that is θ-marked by the adjective. DAs are therefore subcategorized with the feature [(DP)__] (cf. 4.1) and have a corresponding internal θ-role. By virtue of these two conditions DAs are lexical items with two syntactic arguments which set up a relation between two entities, the argument of the predication or modification and a degree expression. The first of the two arguments is marked by the external θ-role and the second by the internal θ-role. The difference between the predicative and the modifying function of the AP can largely be left aside as far as the theory of gradation is concerned. This is because the external θ-role is always assigned to the relatum as specified in (16) and only the conditions operating there can have any influence on the SF representation of DAs. Furthermore, since there is a variable in SF corresponding to each of the two θ-roles, semantically a DA is a relation between the relatum and a degree, and the specific character of the individual DA lies in distinguishing the dimension which the degree refers to and the way in which the degree is specified on the corresponding scale.

It is these considerations, more or less, that underly the assumptions of versions I-III discussed in 3.2. Now a crucial point in the theory to be presented here is the assumption that the SF structure of the DAs contains a further variable for which there is no corresponding θ-role and thus no syntactic argument. Semantically, DAs are in a sense three-place predicates which syntactically can only mark two arguments. For the role of DAs in the various gradation constructions this third variable has far-reaching consequences. As we shall see, it forms the starting point for explaining a whole series of the phenomena discussed under (i)-(xx).

As an illustration of what has been said so far, let us consider the following lexical entries:

(147) /long/; A, [(DP) __]; $[\hat{x}_3\ [\hat{\underline{x}}_1\ [[\text{QUANT MAX}\ x_1] = [x_2 + x_3]]]]$

(148) /short/; A, [(DP) __]; $[\hat{x}_3\ [\hat{\underline{x}}_1\ [[\text{QUANT MAX}\ x_1] = [x_2 - x_3]]]]$

As stipulated in 2.2, $\hat{\underline{x}}_1$ is the external θ-role and $\hat{x}_3$ is the internal one. Since the two adjectives only have one possible internal argument, it does not have to be specially indicated which argument is θ-marked by $\hat{x}_3$. QUANT, MAX, =, + and − are SF constants with more or less the following interpretation: MAX specifies a certain (in fact the maximal) dimension of x_1, QUANT projects x_1 onto the scale of this dimension. Accordingly the interpretation of [QUANT MAX x_1] as a whole is the degree of x_1 on the scale specified by MAX. This degree is now compared by '=' with another scale value or degree which is composed of two intervals, x_2 and x_3, where x_2 represents a value to be compared with and x_3 the difference. The distinction between +Pol-A and −Pol-A is precisely that in +Pol-A the difference is added to the comparison value, and in −Pol-A it is subtracted from it, and this is what is represented by '+' and '−'. The difference x_3 is bound and specified by DP, the comparison value x_2 is the third variable

mentioned above, which is not linked to a syntactic argument. I shall now explain its status in more detail.

Differing from the analyses discussed in 3.2, I assume that the scale value of x_1 is not compared with a simple degree but with one which is made up of two values. The grounds for this are derived from the considerations in section 5 on the structure of the comparison operation.[38] The degree complement provides the specification for the amount of difference x_3, while the comparison value x_2 for the time being remains a free parameter. Now this parameter can assume one of two values, depending on the context, and I shall call these 0 and N_C, because this is more or less their constant interpretation in CS (cf. 6.2). The following examples illustrate to begin with what has been said with regard to the simplest cases, where I ignore the copula and tense but adhere strictly to the stipulations discussed in 2.2 for the LF - SF relation.

(149) Das Brett ist 5m lang $[[\text{QUANT MAX B}] = [0 + [5\ \text{M}]]]$
The board is 5m long

(150) Das Brett ist lang $\exists x_i\ [[\text{QUANT MAX B}] = [N_C + x_i]]$
The board is long

(151) Das Brett ist kurz $\exists x_j\ [[\text{QUANT MAX B}] = [N_C - x_j]]$
The board is short

For the sake of simplicity I have abbreviated the SF of the subject das Brett to B and the SF of the DP *5m* to [5 M]. In (149) the DP is θ-marked by $\hat{x}_3$ and the subject by $\hat{\underline{x}}_1$ of the lexical entry (147). By lambda conversion, which I defined in (13) and use here for clarity, [5 M] is thus substituted for x_3 and B for x_1, and x_2 assumes the value 0. In (150) and (151) DP is empty. The internal θ-role of the DA, in accordance with (9), is therefore replaced by the operator $\exists$, which binds the variable involved. The free variable x_2 here assumes the value N_C. A clearer picture will be given in 6.2 of what the SF representations derived in this way actually imply, but the outlines of the analysis should be clear. It should be noted here that (150) and (151) only provide the required interpretation when first a contextually determined value is selected for C according to the conditions discussed in 4.2 (here the value will most probably be a subclass of the denotate of Brett determined by the situation), and second x_1 or x_j are interpreted by a non-empty interval on the scale of length. The scale of length as the range of interpretation of x_2 and x_3 is covered by interpretation conditions given below of the relevant SF constants. The fact that x_i and x_j must represent proper, that is non-empty, intervals follows from a general condition for the interpretation of the operators $\forall$ and $\exists$. It is not confined to the semantics of gradation, and can be formulated thus:

(152) *The range of interpretation of a variable x bound by $\forall$ or $\exists$ is the set of proper, non-empty entities of the type determined by the category of x.*

(152) guarantees not only that in (150) and (151) the length of the board differs from the contextual norm value by a non-empty amount: it also guarantees that in sentences like *Hans is eating again*, the syntactically empty object of *eat* is represented in SF by a non-empty reference carrier, or that *Hans is not eating*

is not true in a situation where an empty object (i.e. nothing) is not eaten by Hans.[39]

A condition which is crucial to the correct SF representation of sentences (149)-(151) is that the variable x_2 takes on the value given. This means not only that just the two possibilities 0 and N_C are available, and above all, that they are distributed in the manner stipulated. If, for example, in (149) x_2 were to be replaced by N_C instead of by 0, this would mean that the board is 5m longer than the average, which cannot possibly be the interpretation of (149). Similarly ruled out is the replacement of 0 by N_C in (150) and (151).

This is where another crucial point of the present theory comes in, namely the conditions for constants and variables in SF referred to under (110b) in 4.7. It is by these conditions that the values for x_2, so far only given on an ad hoc basis, are specified systematically. This is the step which makes clear the actual function of x_2 in (147) and (148).

6.2 The Interpretation and Categorization of the SF Constants

Before I discuss the conditions in question, the interpretation of the SF constants relevant to gradation will have to be sharpened and the categorial structure of the SF representations, which has so far been left open, must be clearly shown.

The interpretation of the SF constants establishes the relationship between SF and CS, which here means in particular the relationship to the structures discussed in section 5. I shall express this relationship by an interpretation function Int(K), which determines the value of each constant K in CS. The characterization of Int(K) is provisional insofar as the assumptions regarding CS are of a preliminary nature.

The crucial elements of DA are the constants, MAX, VERT etc., which determine the designation of the dimensions of any given object. The details of their CS interpretation are discussed at length by LANG (in this volume). I shall subsume them here under a metavariable **DIM** and shall discuss only what the various dimension constants have in common. In the notation used in section 5, we can first of all say:

(153) Int([**DIM** x]) = T(V_i), *where* T *specifies the aspect with regard to which the extent of* V_i *is determined.*

The argument of **DIM** is an expression of the category N. I shall assume that the constants that come under **DIM** are functors of the category N/N, so that their interpretation is a function which assigns to an individual an extension on the specified dimension. So [**DIM** x] is an expression of the category N, and its interpretation is the value of T for V_i.[40]

QUANT is the constitutive functor for the gradation of DAs. It assigns to the value determined by [**DIM** x] an interval on the scale appropriate to **DIM**. The category of QUANT is N/N, and the interpretation is the projection function P, so that:

(154) Int ([QUANT [**DIM** x]]) = Int (QUANT) (Int ([**DIM** x])) = P(T(V_i))

[QUANT [**DIM** x]] is an expression of the category N, for which there are two important statements to make. Firstly, its interpretation is a value on the scale determined by **DIM**, and secondly, on the basis of the observations made in section 5 on the projection function, this value is always an element of D_0, that is, an initial interval of the scale. In other words QUANT projects an individual x onto a scale appropriate to **DIM** and at the same time establishes the zero point of this scale.

The next thing to consider is the interpretation of '+' and '−', which represent the different scale reference of +Pol-A and −Pol-A. Both are two-place functors which determine the concatenation of two scale values. Since the concatenation is not symmetrical, they must be characterized as (N/N)/N, that is, the arguments must be distinguished as the first and the second (or internal and external) argument. The interpretation is the following:

(155)(a) Int ([x [+ y]]) = $d_i \circ d_j$

(b) Int ([x [− y]]) = $d_i \circ I(d_j)$

If we make the trivial assumption for the arguments x and y that Int(x) = d_i and Int(y) = d_j, then we can see that while Int(+) = $\circ$ as an explicit stipulation of the interpretation of '+' is possible, '−' can only be interpreted syncategorematically: it absorbs the inverse scale relation of the inner argument expressed by I. It is in this reversal of the scale operation that the greater complexity of −Pol-A, as distinct from +Pol-A, lies. The fact thus established is a structural one, which is a first step towards a theoretical sharpening of the usual assumption that +Pol-As represent the unmarked element of a pair of antonyms and −Pol-As the marked element. At the same time the distinction forms a bridge to the different degrees of processing complexity of +Pol-A and −Pol-A.[41] In any case it is important that '+' and '−' are distinguished from the arithmetical operations of addition and subtraction despite their certainly not accidental similarity. This applies even more strongly to the relation represented by '=', which, as we shall see, certainly does not represent equality.

Categorially, '=' in (147) connects two scale values whose SF representation is categorized as N to form a proposition. It thus represents a relation that is, again, asymmetrical and must therefore be categorized as (S/N)/N). The relation so far written asymmetrically as '$x = y$' must thus be represented more accurately as [x [= y]]. The relation set up by '=' between the scale values is the partial ordering relation, defined in (121c), according to which, intuitively speaking, one scale value covers the other. However, this relation has opposite directions in +Pol-A and −Pol-A, and '=' must therefore be interpreted syncategorematically, thus:

(156)(a) Int ([x = [y[+ z]]]) = Int (x) $\supset$ Int ([y[+ z]])

(b) Int ([x = [y[− z]]]) = Int (x) $\subset$ Int ([y[− z]])

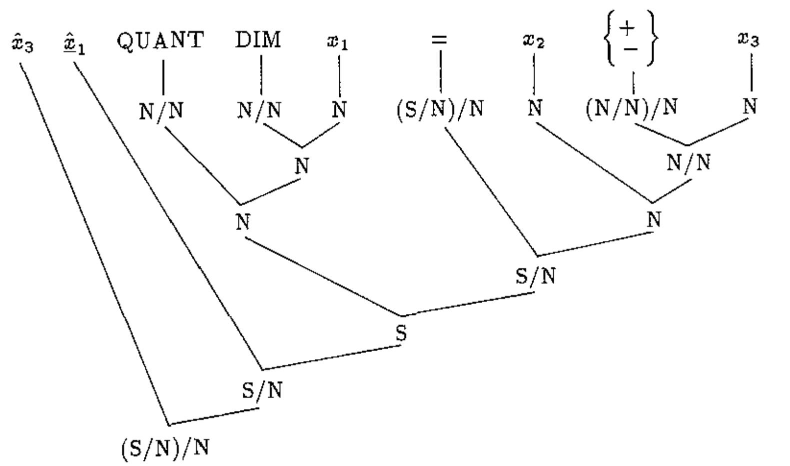
In accordance with the definition of '$\supset$' in (121c), (156a) says that any interval that lies within the interpretation of [y[+z]] also lies within that of x. Correspondingly, (156b) means that any interval that lies within the interpretation of

x lies within that of $[y[\text{-}z]]$. This double interpretation of '=' again reflects the difference in scale relatedness between +Pol-A and −Pol-A: just as '−' absorbs the reversal operation I in accordance with (155b), so '=' absorbs this operation contained in '−' in accordance with (156b).

The interpretations in (153) - (156), the categorization of constants they involve and the resulting complete SF structure of DA, may be summarized thus:

(157)(a) $\quad \text{P} \quad (\text{T} \quad (\text{V}_1)) \quad \left\{\begin{matrix}\supset \\ \subset\end{matrix}\right\} \quad \text{d}_1 \quad \circ \quad \left\{\begin{matrix}\text{d}_j \\ \text{I}(\text{d}_j)\end{matrix}\right\}$

(b)



(157a) gives the CS representation, explained in section 5, in the assignment defined by 'Int' to the SF constants. This assignment, apart from the syncategorematically conditioned restrictions, is strictly compositional. The binding of x_1 and x_3 by the θ-roles $\hat{x}_1$ and $\hat{x}_3$ assigns the total structure to the category (S/N)/N, thus turning it into a two-place relation with x_2 as a free variable.

The stipulations summarized in (157) make '=' a relatively complicated syncategorematic constant, in which there are two distinct kinds of asymmetry:

Firstly, '=' is asymmetric within any SF representation in that it represents not equality but the improper inclusion of intervals. Secondly, this inclusion is differently oriented according to the structure of the inner (first) argument. Both instances of asymmetry are clearly shown in (157a).

This raises the question whether the constant '=' is not an artifact and whether the SF of the DA would be more appropriately covered by (158):

(158)(a) +Pol-A: $\hat{x}_3\ [\underline{\hat{x}}_1\ [[\text{QUANT}\ [\text{DIM}\ x_1]]\ [\supset\ [x_2[+\ x_3]]]]]$

(b) −Pol-A: $\underline{\hat{x}}_3\ [\underline{\hat{x}}_1\ [[\text{QUANT}\ [\text{DIM}\ x_1]]\ [\subset\ [x_2[-\ x_3]]]]]$

Then the complicated sycategorematic interpretation (156) would disappear. Int($\supset$) = $\supset$ and Int($\subset$) = $\subset$ would be simple identical mappings from SF to CS, the structure of the DA would be more transparent and the interpretation (except for '−') would be entirely compositional. Henceforth I shall also largely be using the notation given in (158) in order to make the asymmetry explicit. However, there is a crucial point to make here.

If the relation represented by '=' is dissolved in the way described, then the fact that only the combinations [$\supset$ +] and [$\subset$ −] contained in (158) occur, but not [$\supset$ +] and [$\subset$ −], is only a lexical stipulation. The fact that the two missing combinations are not an accidental gap but are ruled out systematically would be missed. If on the other hand the SF of DAs has the form (157), then this accidental gap does not exist, and (156) guarantees that only the possible CS structures emerge. In other words, (156) expresses a generalization concerning the SF of possible DAs. Taking this into account it is (157) and not (158) that must be regarded as the theoretically correct representation. There is, though, another fundamental remark to make on the grounds for the double asymmetry of '=', because here too my analysis differs from most of the existing ones.[42] Let us again consider the phenomena mentioned at the end of 5.3, illustrated by the following examples:

(159)(a) Hans ist 1.50m groß (vielleicht sogar 1.60m/? 1.40m)
Hans is 1.50m tall (perhaps even 1.60m/? 1.40m)

(b) Hans ist so groß wie Eva (wahrscheinlich aber größer/? kleiner)
Hans is as tall as Eva (but probably taller/?shorter)

(c) Hans ist so klein wie Fritz (oder sogar kleiner/? größer)
Hans is as short as Fritz (or even shorter/? taller)

The possible or questionable continuations given in brackets are also true if Hans is taller than 1.50m, taller than Eva or shorter than Fritz, but not if he is shorter than 1.50m, shorter than Eva or taller than Fritz. So the actual extent must not be less than that specified in the case of +Pol-A, and must not be greater than that specified in the case of −Pol-A. This phenomenon has many ramifications and it can often only be got at indirectly. The most careful account of the relevant facts and relations concerning the comparative and the equative is given in Atlas (1984). Formulated provisionally, they can be incorporated into the series of statements summarized in (i)-(xx) as follows:

(xxi) *Gradation constructions state lower or upper limits according to the scale reference of the adjectives involved: they do not set an absolute value.*

We shall come across some of the effects of (xxi) in various places. They become most tangible when the variable x_3 in the DAs assumes an explicitly stated value. This is true in cases like (159a), as we have seen, and in (159b) and (c), as we shall see later, and in the case of the comparative with measure phrase, such as the following:

(160) Hans ist 10cm größer/kleiner als Eva (vielleicht auch 15cm/?5cm)
Hans is 10cm taller/shorter than Eva (or perhaps 15cm/? 5cm)

The theoretical explanation of the various phenomena summarized in (xxi), as already stated, lies in the asymmetry of '$\supset$' and '$\subset$': $[x[\supset\ y]]$ means that the interval y is covered by x, in other words that y is a lower limit on x but allows for x to exceed y (though with the preference, as I have said, for this not to happen). And $[x[\subset y]]$ stipulates that x is covered by y, in other words that y is an upper limit on x, but does not say whether x reaches y.

There remain the elements that can be substituted for x_2 and x_3 in the DAs. Of these, 0 is a constant of category N with the following interpretation:

(161) Int(0) = d_o, where d_o is the empty initial interval of $\mathbf{D}_{k'}$.

I shall treat N_C for the sake of simplicity as a constant of the category N with Int(N_C) = N_C, in other words with an identical mapping of SF into CS. The relation indicated by N_C to the reference class C is only fixed in CS, because N_C functions as a constant in the framework of SF.

If, however, C turns out to be grammatically determined when its specification discussed in 4.3 is further sharpened, than SF must contain a free parameter which is subject to this specification. N_C must then be replaced by a complex expression of the category N with the structure [NORM x], where NORM is a functor and x is a free variable. Then:

(162)(a) Int ([NORM x]) = N_C

(b) the value of x determines the value of C in N_C.

Finally I shall make some provisional stipulations for the SF structure of measure phrases. For the reasons discussed in 5.3 I assume first of all that measure phrases are not referential. Formally, this means that they do not contain any referential variable bound by εx.[44] I assume secondly that such phrases as a whole are of category N, so that they can correctly be substituted for x_3. Their interpretation is an interval that can be located on the scale only by concatenation in CS. Thirdly, I assume that the SF of measure phrases consists of the SF of a measurement unit and of a numerical expression. I summarize the former under a metavariable **ME** and the latter under **NUM**. These three assumptions are by no means selfevident, but they are not unmotivated. They can be implemented in a number of ways. I shall assume, with reservations, the structure (163a) with the interpretation given under (b) and (c):

(163)(a) $[_N\ [_{N/N}\ \mathbf{NUM}]\ [_N\ \mathbf{ME}]]$

(b) Int($\mathbf{ME}_i$) = d_{mi}, where d_{mi} is a unit of measurement in accordance with (143).

(c) Int($\mathbf{NUM}_i$) is a number value in CS.

At this point some conventions of notation should be fixed which make the representations and comments on them easier to handle. Instead of the indexed variables x_1, x_2 and x_3 I shall henceforth write x, v, and c, where x always stands for relatum, that is, the external argument of the adjective, v for the comparison value, and c for the difference. I shall treat similarly other variables, which will be used in ways to be explained in due course. In addition I shall give

the hierarchy induced by categorization only to the extent to which it serves to clarify the structure. The representations given in (158) then take the following form:

(164)(a) +Pol-A: $\hat{c}\ \hat{x}$ [[QUANT **DIM** x] $\supset$ [v + c]]

(b) −Pol-A: $\hat{c}\ \hat{x}$ [[QUANT **DIM** x] $\subset$ [v − c]]

In more complex representations I shall abbreviate [QUANT **DIM** x] to [QD x], so that +Pol-As, for example appear as $\hat{c}\ \hat{x}$[QD $x \supset$ v + c].

6.3 Conditions on SF Constants

The effect of the conditions mentioned in 6.1 is essentially that of determining the values that the comparison value v can assume. I shall therefore call them all v-conditions. But they must be formulated first and foremost as restrictions on the combinations and the interpretation of constants of which v occurs as the direct or indirect argument, namely '+' and '−', '⊃' and '⊂' (and '='). I shall first of all give the conditions (a) in technical and (b) in verbal form, and shall then discuss their consequences and their properties.

Let X, Y and Z be variables over any suitable SF constituents and § a variable over '+' and '−':

(165) Scale mapping condition SMC

(a) [= X] implies: Int(X) ε D_0

(b) The internal argument of '⊃' or '⊂' requires an extent, i.e. the initial part of a scale, as its interpretation.

(166) N_C-exclusion condition NEC

(a) [X [§Y]] implies: if Y = [**NUM** Z] then X $\neq N_C$.

(b) If the internal argument of '+' or '−' consists of **NUM** and its argument, the external argument cannot be N_C.

(167) 0-exclusion condition 0EC

(a) [X [+ Y]] implies: X $\neq$ 0 if Y is an $\exists$-bound variable.

(b) If the internal argument of '+' is an $\exists$-quantified variable, the external argument cannot be 0.

(165)-(167) are restrictions on permissible SF representations whose domain is defined in terms of the constants '=', '+' and '−'. For them to be used meaningfully, the variables v and c must be specified in the DAs. For c this is done by θ-marking or quantifying on the basis of (7) and (9), and for v by the following convention:

(168) Comparison value selection CVS

(a) If X in [X [§Y]] is a free variable, then:

(i) X $\rightarrow$ 0 if this is compatible with SMC, NEC, 0EC

(ii) X $\rightarrow$ N_C otherwise.

(b) The comparison value variable v assumes, preferentially, the value 0. If this produces a conflict with one of the conditions (165)-(167), v assumes the value N_C.

(168) establishes an order of preference between 0 and N_C, which has its effect in interaction with conditions (165)-(167): 0, and thus the nominative interpretation, is selected if there is no reason for not doing so (this being another aspect of the intuitive markedness asymmetry between +Pol-A and −Pol-A). Technically, the interaction of (165)-(168) must be arranged as follows:

(169)(a) SMC, NEC and 0EC are unordered conditions which apply to all relevant constructions.

(b) CVS provides by default the value 0 for v.

(c) If this leads to a contradiction, CVS provides for v the value N_C.

(d) If (c) leads to a contradiction, the structure is deviant (and requires reinterpretation).

The ordering given in (169) does not need to be stipulated, since it follows intrinsically from the content of CVS and from the fact that SMC, NEC and 0EC can only be applied to fully specified SF representations. What is crucial is the interaction of (165)-(167) in determining the permissible specifications for v. I shall show this first by taking the simple cases of DAs in the positive. To make the discussion clearer I shall formulate two subconditions which follow directly from SMC.

(170) For the structure [= [X [§Y]]]:

(a) SMC1: Int([X [§Y]]) is a scale interval.

(b) SMC2: Int(X) is an initial part of a scale.

SMC2 is fulfilled, trivially, by 0 and N_C, so it does not rule out any of the values given by CVS. But SMC2 does have decisive consequences, as we shall see, in the case of the comparative. It is immediately clear from SMC1 that [0 [− c]] is ruled out, since '$d_o \circ I(d_i)$' is undefined for any d_i. Consider now the following cases:

(171)	Das Brett ist lang *The board is long*	$\exists$ c [[QD B] $\supset$ [N_C + c]]
(172)	Das Brett ist kurz *The board is short*	$\exists$ c [[QD B] $\subset$ [N_C − c]]
(173)	Das Brett ist 5m lang *The board is 5m long*	[[QD B] $\supset$ [0 + [5 M]]]
(174)	*Das Brett ist 5m kurz *The board is 5m short*	[[QD B] $\subset$ [N_C − [5 M]]]

For (171) 0EC rules out v $\rightarrow$ 0, since c is $\exists$-quantified. Thus N_C is the only option. For (172) the same applies on the basis of SMC1, since 0 − c does not produce a scale segment. In (173) 0 does not violate any condition, so it is the obligatory value for v. In (174), as in (172), SMC1 rules out the value 0, but NEC also prevents N_C, since 5 is an instance of **NUM**. The sentence does not have a well-formed SF. The interpretation mentioned earlier for sentences of this type has the SF (175), which is not in conflict with any condition, as the two components which cause the conflict, namely the structure of the −Pol-A and the occurrence of a measure phrase, are distributed over two contaminated interpretations:

(175) [[QD B] $\supset$ [0 + [5 M]]] $\wedge$ $\exists$c [[QD B] $\subset$ [N_C − c]]

This is an example of the detour interpretation mentioned in (169d), an example which brings out an important fact that will be confirmed later: the v-conditions are categorical, no SF may violate them and detours must be made by constructing SFs which conform to the conditions. The degree to which a sentence deviates depends on the degree to which its SF differs from the syntactically and lexically regular SF. In (175) the difference consists in the fact that a −Pol-A is interpreted as a hybrid form with the representation [[QD x] = [v$\left\{\begin{matrix}-\\+\end{matrix}\right\}$c]].

Particularly revealing are sentences with a deictic DP so. For the sake of simplicity I shall assume that the SF of so is a deictically indicated interval, and shall represent it by c_k:

(176)(a)	Hans ist so_k groß *Hans is this tall (as tall as this/that)*	[[QD HANS] $\supset$ [0 + c_k]]
(b)	Eva ist so_k klein *Eva is this short (as short as this/that)*	[[QD EVA] $\subset$ [N_C − c_k]]

In (176b) 0 is ruled out by SMC but in (a) it is not. Notice that both sentences in (176) indicate a particular degree of height, but without a measure phrase. On the basis of SMC and NEC −Pol-As rule out measure phrases, more specifically **NUM**, but do not rule out height specifications as such.[45]

For somewhat different reasons we get the same distribution of 0 and N_C for the DP wie (*how*). The SF of wie is an operator WH, which is marked by the internal θ-role – in other words it is coindexed with c. I shall skip the details of the LF structure to be assumed for such operators, and shall merely give the resulting SF:[46]

(177)(a)	Wie groß ist Hans? *How tall is Hans?*	WH c [[QD HANS] $\supset$ [0 + c]]
(b)	Wie klein ist Eva? *How short is Eva?*	WH c [[QD EVA] $\subset$ [N_C − c]]

In (177), c is operator-bound but not $\exists$-quantified. Thus 0EC does not apply, so that in (177a) 0 is permitted and therefore obligatory. In (b) 0 is ruled out by SMC. Notice that (a) is not norm-related and asks about extent, while (b), which is norm-related, asks about the difference from the average. That is the reason why (177b) cannot be answered by (*Eva is*) *1.30m* (*tall/*short*) and as a consequence seems slightly abnormal. (176b), though, is quite adequate as an answer, and (177b) is perfectly acceptable. This shows that the interaction of the v-conditions explains even quite subtle distinctions in a natural way.

Let us finally consider DAs with sehr (*very*). For various reasons to be taken up later sehr has to be classified as a DP, and is thus θ-marked by $\hat{c}$. I shall abbreviate its SF to SEHR, which functions as an expression of category N. Int(SEHR) must be a relatively large interval, though 'relatively large' is of course subject to context. This requirement will be spelt out in connection with viel [*much*]. Thus we have the following representations:

(178)(a) Das Brett ist sehr lang $[[\text{QUANT MAX B}] \supset [\text{N}_C + \text{SEHR}]]$
The board is very long

(b) Das Brett ist sehr kurz $[[\text{QUANT MAX B}] \subset [\text{N}_C - \text{SEHR}]]$
The board is very short

Both sentences are norm-related, and thus require $v \rightarrow \text{N}_C$. For (178b) this follows from SMC. But what rules out 0 in (178a)? The only condition that comes into consideration is 0EC, but this requires c to be an $\exists$-quantified variable. We shall see later that there are independent reasons why SEHR fulfils the relevant condition and thus differs from measure phrases, from wie (*how*) and from deictic **so**. What has been said about sehr applies mutatis mutandis to DPs like ziemlich (*rather*), äußerst (*extremely*) etc., which I cannot consider in detail.

I have so far exemplified how the v-conditions work, and I shall now make a few comments on their content and their status.

The grounds for setting up SMC are quite transparent. As to its content, this follows directly from the fundamental considerations on the comparison operation, more specifically from the condition that the entities to be compared must be projected onto their common initial part of D, as illustrated in (116). Thus SMC expresses in terms of SF a condition contained in the conceptual component of comparison which we can formulate thus:

(179) If $d_i \supset d_j$ is the CS representation of a comparison with regard to $\mathbf{D}_{k'}$ then $d_i, d_j \in \text{D}_0$.

In fact SMC formulates a requirement on permissible SF representations using properties of their CS interpretation. So SMC does not have to be stipulated without reason: it is justified by independent assumptions about the conceptual structure of the comparison operation.

The situation is different in the case of NEC and 0EC: they do not make any reference to the function Int, and are thus formulated SF-internally in the narrow sense. Nevertheless, for them too a motivation with regard to its contents can be discerned. NEC prevents numerically specified intervals from being concatenated with N_C in whichever direction. This means that counting cannot start from the average.[47] Let us assume that this restriction actually follows from properties of the relevant conceptual components, where it is unimportant at this point whether these properties are based on a special principle or are derived from the nature of N_C, that is from the schema considered in 5.3 in connection with (135)

for determining the norm. In terms of CS the restriction in question may be formulated thus:

(180) $\text{N}_C \circ \text{n} \cdot \text{m}$ is not defined, where n is a numerical value and $\text{m} = \text{d}_i$ or $\text{m} = \text{I}(\text{d}_i)$ for any d_i.

NEC can now easily be traced back to such a condition with the help of Int: presupposing (180), the following holds:

(181) Int([X[§Y]]) is not defined if $\text{Int(X)} = \text{N}_C$ and $\text{Y} = [\text{U Z}]$ where $\text{Int(U)} = \text{n}$.

Thus NEC can be motivated by independent assumptions about CS. Moreover, it would follow as a special case from SMC in that (179) requires arguments of '$\supset$' in CS to be elements of D_0. Int([X [§Y]]) is such an argument. But since under the conditions of (181) its value is not defined, and is thus not an element of D, it certainly cannot be an element of D_0. In other words, presupposing (179) and (180), NEC is subsumed under SMC, just as SMC1 and SMC2 are only special cases of SMC.

This leaves 0EC, which rules out the preferential value 0 for v in certain cases. Since this is already ruled out for −Pol-As in the relevant instances by SMC1, 0EC is only formulated for $[v + c]$. The content of 0EC becomes clear when we consider what would happen if it were suspended. On the assumption made in CVS that v has the value 0, if there is no reason why it should not, Hans ist groß (*Hans is tall*) would then have the SF $\exists c$ $[[\text{QD HANS}] \supset [0 + c]]$, which can only mean that Hans has some value on the scale of height. But this is redundant, since QD already produces a value for Hans.[48] In other words, 0EC rules out redundant interpretations, which suggests that we should interpret 0EC as a special case of GRICE's maxim

(182) *Be relevant!*

since in the cases affected by 0EC 0 simply leads to redundant SF structures.[49]

Be that as it may, 0EC is not founded on purely conceptual principles, as SMC and NEC are, because the SFs ruled out by 0EC can certainly be interpreted conceptually. If 0EC is to be explained by a maxim like (182), then this explanation belongs more to the realm of conceptual or communicative economy or efficiency.

All v-conditions interact crucially with CVS, which contains two vital factors: (a) if no values are provided elsewhere for v (and we shall see in 7.3 that the comparative, for example, defines such values), then only 0 and N_C are available; (b) of the two, 0 is the preferred value, that is the obligatory one if there are no reasons against this. Again, we can easily see that neither of these factors is arbitrary: since Int(v) by virtue of its structural position must be an initial interval to which Int(c) has to be concatenated, the empty interval is the value produced directly by the structure of the comparison operation if there are no additional stipulations. The only non-arbitrary alternative, if d_o is blocked, is N_C, if we assume that the schema for fixing the norm value is automatically connected to the module of the comparison operation in the way already discussed.

These statements suggest some conclusions. Firstly, it is only at the first glance that the v-conditions appear to be complex additional assumptions needed to determine the specifications of a free variable introduced in an ad hoc manner. Except for 0EC all the stipulations can actually be derived from independently motivated properties of the conceptual organization underlying CS, and 0EC too is very probably derived from independent principles. This can be regarded as a revealing step towards an explanatory theory of the facts.

Secondly, the explanation outlined does not simply depend on the structure of the CS representations which I presented in 5.2 and 5.3 in a basically set-theoretical form. Rather, it depends on principles or regularities which themselves determine the CS representations: (179) and (180) and the considerations that went into setting up CVS concern empirically well founded conditions which underlie CS. The resulting argument for the empirical adequacy of the conceptual interpretation of linguistic expressions as compared with model-theoretic semantics has far-reaching consequences: conditions of the kind relevant here are not only not contained in set-theoretical models, but are not even justifiable in them, since their whole basis is the organization of the conceptual system **C**. They are conditions for the conceptualization of experience and not features of an abstract model based on set theory.

Thirdly, we must ask about the status of the v-conditions and their relation to SF. In (165)-(169) I formulated the conditions and their interaction with regard to SF. We saw then that they are largely derivable from conditions on CS. The question is, therefore, whether the v-conditions are restrictions on SF and what their theoretical status implies regarding the nature of SF.[50] Notice first of all that v cannot only assume the values provided by CVS but, as will be shown in section 7, also plays a crucial part regarding the grammatically determined combination of constituents of gradation constructions. The status of v as an element of a level determined by **G** is thus motivated independently of the v-conditions. Since v cannot be an element of LF, only SF comes into consideration. Furthermore, the structural status of v as an external argument of '+' or '−' in the configuration [= [v [§c]]] in SF is independently and clearly defined. It is only on the presupposition of this structural position that the conditions derivable from the conceptual structure of comparison become relevant to the semantics of gradation. Even if the v-conditions can be deduced from the basis of CS, they nevertheless function as conditions for SF. Since they are independently motivated they provide indirect evidence for the special assumptions about the SF of DAs and thus for the existence of SF in general. In the following I shall presuppose them in the form given in (165)-(168), as conditions on SF.

6.4 Interim Balance

The SF structure of the DAs, together with the v-conditions, sets the angle of approach to the explanation and in many cases the clarification of the facts listed under (i)-(xxi). I shall summarize here the points covered so far.

The fact that gradable adjectives can be interpreted nominatively and contrastively – point (i) – follows from v and its specification by 0 or N_C. Since this assignment does not take place in LE but only in the syntactic context, the adjectives are not lexically ambiguous. Since, furthermore, the SF of the lexical entries, as we shall see, forms the basis of the comparative, equative and all other constructions, point (ii) is also covered. Similarly, the SF of the LEs is the basis for (iii), the antonymy pairs of DAs: each instance of **DIM** determines the common dimension, while '+' and '−' stipulate the opposing scale references. This at the same time explains point (xi), the system of antonymy in DAs: together with a given dimension constant, the pair with the values '+' and '−' for '§' is also given. A +Pol-A defines, as it were, its −Pol counterpart (and vice-versa), even if this is not lexicalized.[51] Why this is not the case with EAs will be shown in section 10.

The fact that antonymous DAs without a degree specification are contrary one-place predicates – point (iv) – follows from the SF of the lexical entries, the v-conditions, and convention (9), which binds c by ∃ if there is no DP. The first property of contrary predicates, that their conjunction produces a contradiction, is clear from their representation in (150) and (151): [QD B] cannot cover [N_C + c] and at the same time be covered by [N_C −c] if c is not empty, which is ruled out by (152). The fact that the contradiction only occurs if the comparison class remains constant is covered by N_C: if C is fixed differently the contradiction can disappear. To demonstrate the second property, that the conjunction of the negations of contrary predicates is contingent, I shall add a comment on negation.

Here and throughout I shall represent the SF of nicht (*not*) by the constant '∼' of category S/S. When nicht occurs as the sentence negation, then '∼' has the SF of the sentence as its argument (i.e. as its scope). I cannot go into the derivation of this configuration from LF (and the position of nicht in LF) at this point. These stipulations for negation by no means cover all the relevant problems, but they are not arbitrary, and they are in essence sufficient for dealing with the phenomena we shall be discussing. Again ignoring tense and the copula we thus obtain the following representations:

(183)(a) Das Brett ist nicht lang ∼ [∃ c [[QD B] ⊃ [N_C + c]]]
The board is not long

(b) Das Brett ist nicht kurz ∼ [∃ c [[QD B] ⊂ [N_C − c]]]
The board is not short

The v-conditions operate independently of '∼', in other words they determine N_C in the same way as in non-negated sentences. We can easily see that the conjunction of (183a) and (b) is true only if [QD B] neither covers [N_C + c] nor is covered by [N_C − c], and thus identifies average length,[52] hence it makes a contingent assertion. This too is only valid if C remains constant. Thus point (iv) is explained. But here too it must be added that the situation is different in the case of EAs.

I shall give some equivalence rules for negation which will make the preceding statements clear and will help bring to light some of the phenomena related to point (xxi). First of all the standard equivalences, which among other things relate (183) to (184):

(184)(a) $\forall c[\sim[[\mathrm{QD\ B}] \supset [\mathrm{N}_C + c]]]$ (b) $\forall c[\sim[[\mathrm{QD\ B}] \subset [\mathrm{N}_C - c]]]$

Furthermore the negation of '=' (and thus of '⊃' and '⊂') can be explained as follows:

(185)(a) $[\mathrm{X}\ [\neq \mathrm{Y}]] =_{def} \sim [\mathrm{X}\ [= \mathrm{Y}]]$

(b) $\mathrm{Int}([\mathrm{X}\ [\neq [\mathrm{Y}\ [+ \mathrm{Z}]]]]) = \mathrm{Int}(\mathrm{X}) \not\supset \mathrm{Int}([\mathrm{Y}\ [+ \mathrm{Z}]])$
$\mathrm{Int}([\mathrm{X}\ [\neq [\mathrm{Y}\ [- \mathrm{Z}]]]]) = \mathrm{Int}(\mathrm{X}) \not\subset \mathrm{Int}([\mathrm{Y}\ [- \mathrm{Z}]])$

(c) $\mathrm{d}_i \not\supset \mathrm{d}_j =_{def} \sim \forall\, \mathrm{d}_k\ [\mathrm{d}_j \supset \mathrm{d}_k \rightarrow \mathrm{d}_i \subset \mathrm{d}_k]$

The interpretation of '≠' is syncategorematic in the same way as the interpretation of '=', so that I shall again write '⊅' and '⊄' in the appropriate SF contexts. The definiens of (185c) yields (186a) by standard conversions, and then with the help of definition (123), (186b) follows, that is: d_j contains an interval d_k, which does not overlap with d_i, and thus lies outside d_i.

(186)(a) $\exists\, \mathrm{d}_k\ [\mathrm{d}_j \supset \mathrm{d}_k \wedge \sim \mathrm{d}_i \subset \mathrm{d}_k]$ (b) $\exists\, \mathrm{d}_k\ [\mathrm{d}_j \supset \mathrm{d}_k \wedge \mathrm{d}_i \mid \mathrm{d}_k]$

Now since the arguments of a comparison on the basis of (179) are always elements of D_0, in other words begin at 0, this implies that in both $[\mathrm{X}\ [\not\supset \mathrm{Y}]]$ and $[\mathrm{Y}\ [\not\subset \mathrm{X}]]$ the value of Int(X) is properly contained in Int(Y). Therefore, for the conjunction of (184a) and (184b) [QD B] is properly contained in $[\mathrm{N}_C + c]$ and properly contains $[\mathrm{N}_C - c]$ for all c. This only applies, as has already been ascertained, when [QD B] is equal to N_C. The application of the negation to DAs, thus sharpened, has interesting consequences for measure phrases, where it helps to explain an additional effect of the limit phenomenon (xxi).

As already mentioned, the sentence Das Brett ist 5m lang (*The board is 5m long*) implies preferentially that the board is neither longer nor shorter than 5m, but it is still not wrong if the board is longer. Its negation, though, is only true if the board is shorter than 5m. The 'limit effect' is thus reversed. Cf. (187):

(187) Das Brett ist nicht 5m lang $\sim [[\mathrm{QD\ B}] \supset [0 + [5\ \mathrm{M}]]]$
The board is not 5m long

These considerations make it clear that $[0 + [5\ \mathrm{M}]]$ in (187) indeed properly contains [QD B]. It should be noted that what has been said only applies when nicht in (187) is the sentence negation.[53] It does not apply in all cases like (188), where nicht is specified by contrastive stress on fünf as the negation of a constituent:

(188) Das Brett ist nicht fünf Meter lang, sondern sechs
The board is not five metres long but six

Since the DA here is not in the focus of negation, the reversal of the limit effect does not occur either. I cannot follow up these problems here. The aim was merely to show that the interpretation of sentences like (187) is subject to the limit effect and that this is a consequence of their SF.

To conclude this interim balance, I may record that point (vii) is covered insofar as it concerns the positive: the fact that measure phrases containing numerical expressions only occur in the case of +Pol-As and these are then not norm-related follows, as has been shown from NEC and SMC, and we shall see later that measurement specifications in the comparative too are regulated in

the same way. The statements from (xiii) on norm-relatedness with regard to the positive are also covered. The remaining points require an analysis of the comparative and the equative and of the EAs.

7 The Semantic Form of the Comparative and the Equative

7.1 The Structure of Degree Complements

Assumptions about the comparative and the equative form the third crucial point in my theory as distinct from other analyses. They are already prepared for in the SF of DAs, and what they boil down to is this: the value given in the complement of these constructions replaces the variable c in the equative and v in the comparative. This basic idea will now be sharpened and its consequences will be explained. First a few preliminary stipulations have to be made which apply to both constructions.

Both the comparative and the equative allow, in principle, the same complements, which are distinguished only by their introduction by als (*than*) for the comparative and wie (*as*) for the equative. I regard this difference as an idiosyncrasy of the items governing the complements and assume that they are represented in LF and SF by the same operator.[54] For sentences like (189) I thus assume the (simplified) LF structure of the complement given in (190), in which wie_i is an operator that binds an empty DP:

(189)(a) Die Tür ist höher als das Brett lang ist
The door is taller than the board is long

(b) Die Tür ist so hoch wie das Brett lang ist
The door is as tall as the board is long

(190) $[_{\bar{S}}\ \mathrm{wie}_i\ [_S\ [_{NP}\ \mathrm{das\ Brett}]\ [_{AP}\ \mathrm{e}_i\ \mathrm{lang}]\ \mathrm{ist}]]$

In SF, the trace e_i occurs as variable c_i of category N, whose interpretation is carried out using scale segments, as is generally the case for c in the SF of DPs. As I mentioned earlier, I assume for the SF of wie an operator $\hat{c}_i$, which binds this variable. Thus, if we again disregard the copula, (190) induces the SF (191), in which I have marked the SF of lang (*long*). In accordance with (13) this yields the form (192) – abbreviated in (193) –, in which, however, $\hat{c}_i$ is not the θ-role of the DA but in a sense a θ-role of the complement sentence. The value for v results automatically from the v-conditions, since c_i is bound by $\hat{c}_i$ and is not ∃-quantified.

(191) $\hat{c}_i\ [[\mathrm{DAS\ BRETT}]_j\ [c_i\ \underbrace{[\hat{c}_i[\hat{x}_j[[\mathrm{QUANT\ \ MAX}\ x_j] \supset [v + c_i]]]]}_{\mathrm{lang}}\ ]]$

(192) $\hat{c}_i\ [[\mathrm{QUANT\ MAX\ [DAS\ BRETT]}_j] \supset [0 + c_i]]$

(193) $\hat{c}_i$ [[QD B] $\supset$ [0 + c_i]]

Complement clauses of the kind presented have two important properties in common with relative clauses: (a) they have a syntactic empty place which is occupied by an LF-variable, and (b) this variable is bound by an operator introducing the clause. Semantically, this operator makes both relative clauses and degree complement clauses into properties: in (Der Platz) den Fritz kennt (*(the place) which Fritz knows*) the relative clause expresses the property of being known by Fritz. Correspondingly, degree complements express a property of intervals – in (189) the property of being covered by the length of the board. Formally this is expressed by the fact that (191)-(193) are expressions of category S/N and $\hat{c}_i$ binds a degree variable. Given the precautions to be taken next, these two properties can be extended to all degree complements.

Since the SF of degree complements plays a central role in what follows, I shall stipulate a variable W for expressions of the form (193). W is a regular variable of the category S/N. I introduce it simply for clarity.

A difficult problem which fills a considerable part of the literature on the syntax of comparison is the question whether all degree complements can be traced back to the standard case just discussed and which rules should be assumed for doing so. (194) gives a selection of the cases that come in for consideration:

(194)(a) Der Tisch ist höher *als breit*
The table is taller than (it is) wide

(b) Der Tisch ist jetzt niedriger *als früher*
The table is lower than before

(c) Peter ist größer *als er war*
Peter is taller than he was

(d) Peter ist 3cm kleiner *als er denkt*
Peter is 3cm shorter than he thinks

(e) Das Brett ist vorne doppelt so breit *wie hinten*
The board is twice as wide at the front than at the back

(f) Hans ist fast so dünn *wie seine Schwester*
Hans is almost as thin as his sister

(g) Hier gibt es einen breiteren Weg *als am Fluß*
Here there is a wider path than by the river

(h) Am Fluß gibt es einen schmaleren Weg *als diesen*
By the river there is a narrower path than this one

(i) Hans hat ein breiteres Band am Hut *als Eva am Ärmel*
Hans has got a broader band on his hat than Eva on her sleeve

I shall call the italicized expressions surface structure complements – SSCs. Obviously the SSCs do not provide a complete basis for the SF of the examples. To characterize the necessary completion, two major alternatives have been considered:

(a) The SSCs are reduced from complete syntactic complements (CSC)s by deletion rules. The CSCs determine in a rule-governed way the SF of the complements (SFC).

(b) The SFCs are derived by interpretation rules on the basis of the SSCs without assigning these a CSC of their own.

These two possibilities need to be more precisely formulated, and the choice between them must be made within the framework of a general theory of grammatical ellipsis. The difficulties to be overcome in the case of (b) lie in characterizing the permissible SSCs in a sufficiently useful manner, and in the inevitable complexity of the interpretation rules. In the case of (a), besides the need to formulate adequate deletion rules, the difficulty lies in the fact that not all SSCs correspond to permissible CSCs. I have discussed this in detail in 4.5 for cases like (194b), while (194d) and (h) pose various additional problems. I shall outline an approach which in a sense lies somewhere between (a) and (b).

I assume, to begin with, that SFCs basically represent a property of intervals, as in the standard case discussed above, in other words that they have the form (195a), which requires an LF representation of the form (195b):

(195)(a) $\hat{c}_i$ [... [c_i ADJ] ...] (cf. (191))
(b) [$_{\bar{S}}$ wie$_i$ [$_S$ ... [$_{AP}$ e_i [$_A$ X]] ...]] (cf. (190))

where ADJ is the SF of X. The places indicated by '...' in (195b) are either occupied by the elements of SSC or are determined by the matrix sentence to which the AP requiring the degree complement belongs. The conditions valid here will be formulated on the basis of the following considerations:

If SSC is not a complete sentence which determines an LF of the form (195b), then the LF assigned to SSC is completed depending on the matrix sentence. I shall assume that the parts to be added do not have a PF but only an SF representation. Thus they result not from lexical insertion but from syntactic projection. Thus no real CSC is set up and no deletion rules are necessary. In the following I shall put elements thus projected in parentheses to indicate that they are without any PF. Which elements are projected varies, and distinctions will have to be made regarding their determination.

In the standard case the projected elements are a result of parallelization between the matrix and the complement sentence as follows:

(196) Let SSC be part of the DP of an AP in the structure (a). Then there is a corresponding projected complement (b) with the conditions (c) and (d):

(a) $[_S \dots [_{AP}$ DP $[_A \dots]\,]\dots]$
(b) wie$_i$ $[_S \dots [_{AP}$ e_i $[_A \dots]\,]\dots]$
(c) to every position X in (a) there corresponds bi-uniquely a position Y in (b) for the places marked by '...'
(d) If Y is not part of SSC, then Y = (X).

The complement structure thus defined is subject to the condition formulated under (90) in 4.5 that identical elements in (a) and (b) are not p-contrastive and their lexicalization is avoided. This now means that if Y = X, then Y must be avoided in favour of (X), the phonetically empty item.[55] The condition (d) also applies to the adjectives themselves. That is, if the SSC does not contain a lexical adjective, as for example in (194a), then $[_A \dots]$ in the complement is occupied by (X), X being the matrix adjective. I shall henceforth abbreviate $[_A$ (X)$]$ to Pro$_A$. There are two peculiarities of Pro$_A$ which distinguish it from other (X) items. Firstly, under certain conditions, Pro$_A$ can optionally be realized as es (*it*). An example of this is (197a), while es is ruled out in (197b):

(197)(a) Der Tisch ist jetzt niedriger als er es früher war
The table is now lower than it used to be

(b) *Hans steht höher als du es stehst
Hans is standing higher than you are

I must leave aside the exact status of this pro-adjectival es and the conditions on its occurrence. What is important here is the second point: Pro$_A$ differs from the SF of the corresponding matrix adjective in a small but crucial point which I shall deal with later.

In order to be empirically adequate, (196) must be supplemented by certain matching conditions for grammatical morphemes which guarantee the correct projection in cases like (198):

(198)(a) Hans ist größer als ihr Pro$_A$ (seid)/*(ist)
Hans is taller than you (are)/(is)
(b) Hans war ungefähr so groß wie Fritz Pro$_A$ (war)/$^?$(ist)
Hans was about as tall as Fritz (was)/(is)
(c) Eva wird bestimmt so dick wie Erna Pro$_A$ (ist)/(wird)
Eva will certainly get as fat as Erna (is)/(will get)
(d) Der Tisch muß breiter sein als die Tür Pro$_A$ (ist)/$^?$(sein muß)
The table must be wider than the door (is)/(must be)

Whether (b)-(d) are examples of ambiguity or unspecifiedness, and how these phenomena are to be accounted for, must remain open questions here. I shall assume provisionally that within a general theory of ellipsis (196) covers the phenomena under consideration.[56]

Given the adjustments mentioned, (196) defines the basis for complete SF complements for all sentences except cases of the type (194d) and (h).

The SSC als er denkt in (194d) is clearly distinct from als er war in (194c). The latter can be adjusted to read als er Pro$_A$ war, while als er Pro$_A$ denkt does

not produce the required SFC and indeed does not correspond to any well formed sentence. What (194d) requires is an SFC based on (199):

(199) Peter ist 3cm kleiner $[_{\bar{S}}$ als wie$_i$ er denkt $[_{\bar{S}}$ e_i $[_S$ (er ist) e_i Pro$_A]]]$
Peter is 3cm shorter than he thinks he is

In order to project the complement here the 'bridge-sentence' er denkt $\bar{S}$ has to be left out, so to speak. The actual complement being projected is lexically empty. We obtain (199) from the SSC of (194d) if we extend the structure (b) in (196) as follows:

(200) wie$_i$ $([_S$ NP$[_{VP}$ — V$[_{\bar{S}}$ $e_i)$ $[_S \dots [_{AP}$ e_i $[_A \dots]]\dots]]]]$
Condition: V is a 'bridge verb'

'Bridge verbs' are a class to be kept distinct for quite independent reasons. The class includes *think, believe, allow, expect* and a whole series of others. The '—' indicates other modifiers and complements of the verb such as in *than he would have imagined in his very darkest hour.*[57] The parts in parentheses are optional. If they are absent, (200) simply becomes the standard case (196b). Even with a bridge verb construction an SSC produces an SFC which specifies an interval property, thus falling under the expressions that can be substituted for the variable W.

There remain the cases of the form (194h) which cannot be reduced to the standard type (196). The relevant features are illustrated by the following examples:

(201)(a) Am Fluß gibt es einen schmaleren Weg *als diesen* (=(194h))
By the river there is a narrower path than this

(b) Mit einem so schweren Hammer *wie diesem* geht das nicht
With a hammer as heavy as this one it won't work

(c) Ein so kleiner Junge *wie Hans* erreicht das leicht
A boy as small as Hans can reach this easily

(d) Er braucht einen breiteren Tisch *als dieses alte Ding*
He needs a wider table than this old thing

The APs to which the SSCs belong are, firstly, adnominal modifiers of an indefinite NP.[58] Secondly, the SSCs consist of (reduced) NPs, which are in Case agreement with the modified NPs. The complement projected by the SSC must have the following properties: (a) the (completed) NP which occurs as the SSC is the subject of a predication; (b) the NP modified by AP is a predicate of the SSC, the DP in AP being realized by the trace e_i bound by *wie$_i$*. For (201) this produces projected complements of the form (202):

(202)(a) Einen schmaleren Weg als dieser ein Pro$_A$ Weg ist
A narrower path than this is a path

(b) Mit einem so schweren Hammer wie dieser ein Pro$_A$ Hammer ist
With a hammer as heavy as this one is a hammer

(c) Ein so kleiner Junge wie Hans ein Pro$_A$ Junge ist
A boy as small as Hans is a boy

(d) Einen breiteren Tisch als dieses alte Ding ein Pro$_A$ Tisch ist
A wider table than this old thing is a table

I have illustrated the predication in the complement clause by the copula for clarity, though it is not necessary for the projected form. The fact that the NP of the SSC and the matrix NP are the argument and predicate of one predication is shown by (202d) and (203):

(203) ?Ein größerer Mann als meine Mutter
A taller man than my mother

In the cases described, projection is subject to the following condition:

(204) Let Z be the SSC of a DP in an AP which is the modifier of an NP$_k$ with the structure (a). Then (a) has a corresponding projected complement (b) with the conditions (c)-(e):

(a) $[_{NP_k} \ldots [_{AP}$ DP $[_A \ldots]] [_{\bar{N}} \ldots]]$
(b) wie$_i$ $[_S$ Z $[_{NP_j} \ldots [_{AP}$ e_i $[_A \ldots]] [_{\bar{N}} \ldots]]]$
(c) For every position X in (a) there corresponds bi-uniquely a position Y in (b) for the places marked with '...' in (a) and (b). Y is occupied by (X).
(d) If Z = $[_{NP_l} \ldots]$ and NP$_l$ is in Case agreement with NP$_k$, then NP$_j$ is predicative to Z.
(e) Z is not a bridge verb construction.

I have formulated (204) in such a way that it covers cases like (205), in which the SSC is not an NP:

(205)(a) Er braucht einen niedrigeren Tisch *als du hast*
He needs a lower table than you have got

(b) Hans hat einen so langen Bart *wie du gerne hättest*
Hans has got as long a beard as you would like to have

Here the projected NP$_j$ functions as a missing argument of the SSC represented by Z.

The condition (204) is structurally more complex than (196) and is therefore, on general principles governing the structure of **G**, prior to it. Without this ordering the cases (204) is meant to cover would be subject to (196), because they trivially fulfil the structure required by it. The assumed ordering at the same time has the effect that cases like (206), which are ruled out by (204e), are correctly covered by condition (196) extended by (200):

(206)(a) Er braucht einen längeren Stift als du glaubst (daß er einen Pro$_A$ Stift braucht)
He needs a longer pencil than you think (he needs a pencil)

(b) Er kommt mit einem nicht ganz so schnellen Zug wie du denkst (daß er mit einem Pro$_A$ Zug kommt)
He is not coming by quite such a fast train as you think (he is coming by train)

Finally, condition (d) guarantees that only NPs with Case agreement are covered by (204). Thus (204) is applied to (207a) but (196) is applied to (207b). Depending on the Case of *Fritz*, (207c) is covered by (204) or (196) and the ambiguity is correctly taken into account.

(207)(a) Hans hat einen stärkeren Rivalen als dich
Hans has got a stronger rival than you (accusative)

(b) Hans hat einen stärkeren Rivalen als du
Hans has got a stronger rival than you (nominative)

(c) Hans hat einen stärkeren Rivalen als Fritz
Hans has got a stronger rival than Fritz (nominative/accusative)

Notice that the apparently parallel situation in (208) does not arise due to the alternation between (204) and (196), since (204) is inapplicable here, but through different parallelizations in accordance with (196). This corresponds exactly to the required interpretation of the SSC.

(208)(a) Hans kennt ihn länger als dich
Hans knows him longer than you (accusative)

(b) Hans kennt ihn länger als du
Hans knows him longer than you (nominative)

(c) Hans kennt ihn länger als Fritz
Hans knows him longer than Fritz (nominative/accusative)

The two conditions (204) and (196) – the latter being extended by the bridge verbs covered in (200) – define the projection of all complement types onto complete sentences, though these are overtly lexicalized only in the parts given by the SSC.[59] In SF this results throughout in expressions of category S/N, due to the introductory operator $\hat{c}_i$. What is thus formulated is by no means a complete theory of degree complements, but certainly a component of such a theory. Before I clarify this somewhat further there are some special remarks to make.

Firstly, it is often assumed – for instance by ZIMMERMANN (this volume) – that degree complements are syntactically either sentences or NPs. In the former case als/wie (*than/as*) is a complementizer and in the latter case a kind of preposition. All non-clausal SSCs which are not of the form als/wie NP are then elliptical sentences. Although this assumption, appropriately interpreted, is compatible with the approach adopted here (I shall return to the syntactic aspect of the SSC below), its content becomes dubious in the light of what we have established so far. Particularly dubious is the distinction between the NP complements and all others. Notice in particular that the SSCs in (207) and (208) either all come under the NP type, but then their different interpretation is not covered, or, in view of this difference, must be classified as elliptical sentences. But this means that a distinction must be made between proper and improper NP complements, which is not very plausible. In addition, the assignment of Case cannot here be determined by the preposition, which is a reason against the PP status of *als/wie* NP. Above all, though, wie NP too must define a degree property in SF and must thus be represented analogously to wie S. This would mean that a special interpretation rule must be formulated for NP complements in order to compensate precisely for what goes to make up the postulated special status of wie NP.[60] Without prejudice to the format of the SSC, I shall therefore assume, in accordance with the preceding analysis, that in LF all degree complements (including lexically incomplete ones) are sentences. Special assumptions for NP complements thus become superfluous. It must be stressed, incidentally, that the two conditions (196) and (204) have nothing to do with the format of the complements but with the distinction between attributive and non-attributive APs.

Secondly, it is clear that the projection of the complements depends on the syntactic environment and function of the APs they belong to. In this regard it is therefore necessary to depart from the strategy applied so far of treating APs independently of distinctions between predicative, attributive and adverbial functions. But one point then has to be made clear: the context-relatedness of the AP determines the syntactic projection of the complement, it is irrelevant, however, to further interpretation. That is, the role of the AP as a predicate or as a modifier can be analysed just as it has been so far. Presupposing completed complements, the analysis can continue to be demonstrated using predicative APs without restrictions on generality.

Thirdly, I have not yet specified which level of representation the conditions (196) and (204) refer to. The following observation is relevant here: (204) refers explicitly to Case agreement and (196) is sensitive to Case if the SSC is an NP, as (208) shows. Therefore, these conditions must refer to a level on which the NPs are Case-marked. In the framework of REST the S-structure is thus the most likely level. This consideration leads up to some general remarks about the status of the conditions (196) and (204).

In accordance with the approach adopted so far the two conditions can be regarded either (A) as filters or (B) as rules of construal in CHOMSKY's sense (1981).

In the case of (A) all complements must be fully specified in the S-structure as $\bar{S}$, and the various SSC types only differ in that the 'missing' constituents are not lexically provided with PF representations (in the lexical specification only the SF and not the PF of the given LE would be inserted). Then (196) and (204) filter out those structures in which the required correspondences are not fulfilled.

Only an S-structure which fulfils the conditions is mapped onto LF and comes in for SF interpretation.

In the case of (B) the S-structure representations for the degree complements only contain those constituents which directly underlie the SSC. These structures are then mapped by (196) and (204) onto LF representations, which are completed in the required way, that is, the conditions define the output in LF, given SSC as input.

It is not clear to me whether the two alternatives sketched here are empirically distinct. What is important is that in both cases independent conditions or rules must determine which SSC formats are permissible, since (196) and (204) only specify how the SSCs must be supplemented by the items projected, not what the SSCs themselves are like. In this respect the following kinds of difference must be covered:

(209)(a) Hans ist jetzt größer als er letztes Jahr war
Hans is now taller than he was last year

(b) *Hans ist jetzt größer als letztes Jahr war
Hans is now taller than was last year

(c) Fritz kann den Ball so weit werfen wie er den Speer $\left\{\begin{array}{l}\text{werfen kann}\\ \text{*werfen}\\ \text{wirft}\end{array}\right.$

Fritz can throw the ball as far as he $\left\{\begin{array}{l}\textit{can throw}\\ \textit{throw}\\ \textit{throws}\end{array}\right\}$ *the javelin*

(d) *Fritz$_i$ wirft den Ball so weit wie er$_i$ den Speer
Fritz$_i$ throws the ball as far as he$_i$ the javelin

(e) Fritz$_i$ wirft den Ball so weit wie er$_j$ den Speer
Fritz$_i$ throws the ball as far as he$_j$ the javelin

It is by no means a trivial task to derive the relevant properties of permissible SSCs from a general theory of ellipsis. In any case it is clear why the two conditions (196) and (204) on their own do not represent a complete theory of degree complements.

Both in the framework of (A) and of (B) the syntactic form als/wie NP appears to be one of many formats of permissible incomplete SSCs, in (A) only in the surface structure and in (B) in the S-structure also.

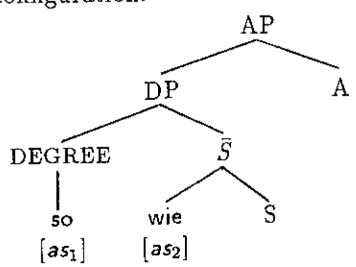
As a useful result for further discussion let us put on record that degree complements generally appear in SF as expressions of category S/N with the general form $\hat{c}_i$ [... c_i ...]. Of most interest are the adjectives and Pro$_A$s contained in the complement sentence.

7.2 Equative Constructions

I shall discuss the equative before the comparative because it is simpler and syntactically more transparent. In particular the equative in German (and in most languages – cf. WURZEL (1987)) is not expressed morphologically but is derivable compositionally from the components *as*, adjective and complement clause.[61]

As to the syntactic structure, I assume, like ZIMMERMANN (this volume), the following configuration:

(210)



In AP, A is the head, of which DP is the internal argument. In DP *so* is the head with the internal argument $\bar{S}$, which has the properties discussed in 7.1 and appears in SF as an expression of category S/N. Consequently so must θ-mark the complement clause, in other words have an internal θ-role $\hat{W}$, where W, as stipulated earlier, is a variable of category S/N which ranges over the SF of degree complements. Since $\bar{S}$ is regularly extraposed DP contains de facto only a trace of the complement, but this transfers the θ-marking to the coindexed complement.[62] I shall leave aside these technical details and shall treat $\bar{S}$ simply as the argument of so. DP in turn is θ-marked by A through $\hat{c}$, and must therefore be an expression of the same category as c in SF. It follows that the lexical SF of so must be a functor which takes an argument of category S/N to form an expression of category N. I shall explain the semantic property of this functor after summarizing the observations so far in the following lexical entry for so:

(211) /so/; DEGREE, [__ X] ; $\hat{W}$[αc[W c]]

I shall leave open here the question how the syntactic category DEGREE is to be incorporated into a well founded system of syntactic categories. The subcategorization [__ X] for the time being allows any complement. The conditions discussed in the preceding section guarantee that, whatever the nature of X in the S-structure, in LF a structure of the category $\bar{S}$ with the complementizer wie is given. Only the SF of this structure fulfils the conditions related to the θ-marking by $\hat{W}$ in SF. In borderline cases X can be empty, then $\hat{W}$ is replaced by ∃W in accordance with (9), where W represents a degree property given by the context. Examples of this are:

(212)(a) Eva ist áuch so groß
Eva is júst as tall

(b) Ich brauche kéin so langes Lineal
I don't need such a long ruler

A special case of empty X occurs in the case of the deictic so_k in (176) discussed above. We shall see immediately that (211) provides exactly the right preconditions for interpreting it.

The expression [αc [W c]], which occurs again in the comparative and is relevant far beyond gradation, is of special importance for the theory presented here. The operator αc was defined under (3) in 2.1 and means 'every c'. Thus [αc [W c]] is a quantificational expression which refers to every c with the property W. The range of interpretation for c in the context of degree adjectives is automatically restricted to intervals of the particular scale in question. But for the present [α c [W c]] is nothing but a summary of all cs to which W applies. The role of this expression in the theory of gradation is another point where my analysis differs from previous ones. I shall look briefly at more conclusions which arise from this assumption at the end of this section.

I propose to show that the relevant properties of the equative follow from the assumptions made so far and from (211). Let us consider first of all sentences like (213) with an explicit standard complement clause, whose SF is given in (214):

(213) Der Tisch ist so hoch wie das Brett lang ist
The table is as high as the board is long

(214) [$\hat{c}_i$ [[QUANT MAX B] ⊃ [0 + c_i]]]

As pointed out earlier, $\hat{c}_i$ is not the internal θ-role of the adjective lang, but the SF of wie_i. The v-conditions guarantee the value 0 for v, since c_i is not ∃-quantified. If the complement clause is θ-marked by so, then (214) is substituted for W in (211) in accordance with (13), and (215a) results as the SF for so – wie das Brett lang ist (*as – as the board is long*).

(215)(a) [αc [[$\hat{c}_i$ [[QUANT MAX B] ⊃ [0 + c_i]]] c]]

(b) [αc [[QUANT MAX B] ⊃ [0 + c]]]

(215b) is SF-equivalent to (a) and is produced by lambda conversion. (215) is an expression of the category N, which refers to any interval that is covered by [QUANT MAX B]. Since intervals are ordered, (215) thus represents, so to speak, the path on the scale from 0 to the limit [QUANT MAX B]. (215) is the SF of the DP θ-marked by hoch and is thus substituted for c in the SF of hoch in accordance with (13). If, finally, the subject is marked by the external θ-role of hoch, we obtain (216) as the SF of (213):

(216) [[QUANT VERT T] ⊃ [0 + [αc [[QUANT MAX B] ⊃ [0 + c]]]]]

The v-conditions guarantee the value 0 for v in the matrix adjective too. Intuitively, (216) says that [QUANT VERT T] covers the parth from 0 to [QUANT MAX B], which correctly reflects the meaning of (213). VERT and MAX must, however, induce the same scale, which can easily be done in CS because they both presuppose unidimensional space intervals.

Let us consider next the corresponding construction with –Pol-A. In (217) the projected complement contains the Pro_A for kurz (*short*), which for the time being can be identified with the SF of kurz (the peculiarity of Pro_A mentioned above only takes effect in the comparative, where I shall explain it). Hence (217) has the SF representation (218):

(217) Der Tisch ist so kurz wie das Brett
The table is as short as the board

(218) [[QUANT MAX T] $\subset$ [N_C – [αc [[QUANT MAX B] $\subset$ [N_C – c]]]]]

From SMC1 it follows here that v must assume the value N_C both in the matrix adjective and in the complement adjective. The double norm-relatedness observed in 4.3 in sentences like (217) has thus been derived formally. Put very simply, (218) says that the length of the table is just as far below the norm as the length of the board. It will be useful to put this somewhat more precisely. The expression (219) contained as a part in (218) refers to the path from N_C downwards as far as the limit [QUANT MAX B]:

(219) [αc [[QUANT MAX B] $\subset$ [N_C – c]]]

We can see that while the interpretation of the complement produces an interval from D_0 in the case of +Pol-A, namely (215), it does not do so in the case of –Pol-A. (218) says that [QUANT MAX T] is contained in the initial interval of N_C that remains after the path (219) has been subtracted.

That the intervals involved are on the same scale is guaranteed in (217) by the identity of the dimension. The apparently identical value for the two N_Cs is less trivial. It presupposes a contextually determined common class norm as a basis on which the two reference points are measured. In (217) this condition is relatively easy to fulfil, because the two relata are definite NPs, and Brett in any case hardly has an inherent class norm regarding MAX. There are other, more complicated cases:

(220) Der Stift ist so kurz wie ein Streichholz
The pencil is as short as a match

Here the complement NP has generic reference. That is, the comparison class C does not depend on the inherent length norm of matches. I shall not follow up this aspect of the problems discussed in 4.2 and shall assume that the matching of norms is done in CS.

It is clear from the examples considered so far that [αc [W c]] defines in the context of +Pol-A a path from 0 to the limit fixed in W, and in the context of –Pol-A a path from N_C downwards to the limit. Precisely the interpretation intended for deictic so as a special case of (211) is thus derivable if we assume that its SF is supplemented by a complement k which functions as a place holder for a value specified deictically. The SF for so_k is then as follows:

(221) [αc [k c]], where Int(k) is the deictic specification of a scale value.

Indirectly k also covers the directionality of the possible gesture mentioned in note 45, since k contains the limit of a path.

The analysis of (213) and (217) explains why only the equative of –Pol-A and not that of +Pol-A is norm-related and why, in addition, there is a double norm-relatedness in (217). From (218) it can also be seen why the norm-relatedness in

the complement has the nature of a presupposition: the operator αc protects it, so to speak, against the sentence negation, as shown by the equivalence stipulated in (3c).

(222)(a) Der Tisch ist nicht so kurz wie das Brett
The table is not as short as the board

(b) $\sim$ [[QD T] $\subset$ [N_C – [αc [[QD B] $\subset$ [N_C – c]]]]]

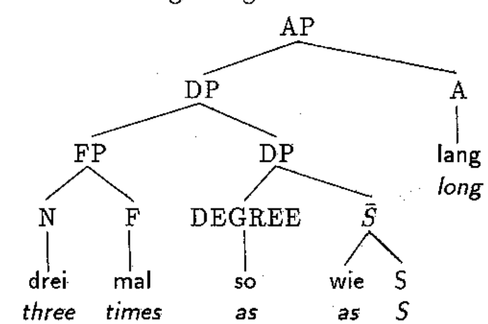
(c) $\exists$c [[[QD B] $\subset$ [N_C – c]] $\wedge \sim$ [[QD T] $\subset$ [N_C – c]]]

(222b) is the regular SF representation of (a) and on the basis of (3c) and of standard equivalences it is SF-equivalent to (c). We can see that only the N_C that comes from the matrix adjective is in the scope of the negation. The representation does not say whether [QD T] lies below N_C. What is required is only that there is a c by which [QD B] falls below the norm but [QD T] does not. (222b) thus determines the correct truth conditions for (a).[63]

The analysis explains furthermore why the equative cannot involve measure phrases. In the analysis of the positive with measurement indication (example (173)) I assumed that measure phrases are θ-marked by $\hat{c}$ and their SFs are consequently substituted for c in the SF of the DA. In the equative this position is occupied by the DP. We shall see that in the comparative this is not the case, so that measure phrases are possible.

This raises the question of the status of factor phrases. Since they are permissible in the equative they cannot occupy the position of the DP. I therefore regard factor phrases FP like *three times*, *one-and-a-half times* as DP modifiers and assume the following configuration:

(223)



where the 'factor' mal (*times*) is the head of the FP and the numeral drei (*three*) its argument. The FP is a modifier, not an argument of the DP so - wie S (*as - as S*), since it cannot be θ-marked by so. Nevertheless, the modification theory sketched in 2.2 under (11) and (12) as a basis for AP would not be applicable to the configuration we now have, because the DP does not contain a θ-role that can absorb the corresponding θ-role of a modifier. Obviously the modification theory is in need of elaboration, and there are various possibilities to explore. The approach I propose is a relatively conservative one based on the following consideration:

(224) If X is a modifier of Y and Y does not have a θ-role that can absorb an external θ-role of X, then X has an external θ-role that θ-marks Y.

In other words, under the conditions given in (224) a modifier is a functor which takes the modified head of the construction as its argument. On the condition that numerals in SF belong to the category N we can then assume the following lexical characterization of the head of FP:

(225) /mal/; F, [Num __]; $\hat{x}[\hat{c}\ [[x \bullet]\ c]]$

I shall again leave aside the general characterization of the syntactic categories F and Num. $\hat{x}$ is the internal θ-role of mal (*times*), and marks the numeral argument. $\hat{c}$ θ-marks the modified DP. Factor phrases then have the following representation:

(226) drei mal *three times*: $\hat{c}\ [[3 \bullet]\ c]$

The interpretation of '•' is iterative concatenation, as indicated in 5.3, and corresponds de facto to multiplication. The categorization is (N/N)/N.

The assumptions just made are provisional, but nevertheless well founded. At least they give a reasonable syntactic and semantic characterization even for expressions like drei mal sieben (*three times seven*), if we let c range not only over intervals but over numbers too. Let us now look at the function of FP in equative constructions. Since (226) takes the DP as its argument, we obtain the following representations:

(227)(a) Der Tisch ist dreimal so lang wie das Brett
The table is three times as long as the board

(b) $[[\mathrm{QD\ T}] \supset [0 + [[3 \bullet]\ [\alpha c\ [[\mathrm{QD\ B}] \supset [0 + c]]]]]]$

(228)(a) *Der Tisch ist dreimal so kurz wie das Brett
The table is three times as short as the board

(b) $[[\mathrm{QD\ T}] \subset [N_C - [[3 \bullet]\ [\alpha c\ [[\mathrm{QD\ B}] \subset [N_C - c]]]]]]$

(227) requires no comment – the value 0 for v follows from the v-conditions. (228) is more interesting. First of all SMC1 requires that v assumes the value N_C in both places. Further, though, 0EC requires the value 0 for the first v, because 3 is an instance of NUM and therefore rules out N_C. But this makes (228b) unacceptable. Furthermore we can see why (228) does not allow any detour interpretation on the model of *3m short*: even if the matrix adjective is interpreted ambivalently in the sense explained in (174) above, we do not get a reading compatible with the v-conditions, because the argument of [3 •] cannot be the initial part of a scale as it can in a measure phrase.[64] This explains why (228) is more anomalous than (174).

Finally I shall show that the analysis also makes the right predictions for negation:

(229)(a) Der Tisch ist nicht dreimal so lang wie das Brett
The table is not three times as long as the board

(b) $\sim[[\mathrm{QD\ T}] \supset [0 + [[3 \bullet]\ [\alpha c\ [[\mathrm{QD\ B}] \supset [0 + c]]]]]]$

(c) $\exists c\ [[\mathrm{QD\ B}] \supset [0 + c] \wedge \sim [\mathrm{QD\ T}] \supset [0 + [[3 \bullet]\ c]]]$

The equivalence (c) shows that (229) is true if [QD B] covers a value c but [QD T] does not cover three times c (here too constituent negation has to be kept separate).

Items such as *approximately, almost, at least* and *at most* are obviously also degree modifiers with similar properties to FP. There are three reasons why I shall not go into them any further. Firstly it would go far beyond the bounds of the topic of gradation to analyse them exactly; secondly they do not show any special interaction with the v-conditions: *at least as short, at most three times taller than* have unchanged properties regarding norm-relatedness; thirdly and most importantly, *at least* and *at most* are operators which have a scope in SF that covers the whole AP.[65] In this respect they are related to the so-called degree particles *only, also, even*, which also have a local focus and a non-local scope (cf. KARTTUNEN AND PETERS (1979) for an analysis of this phenomenon, albeit in a different formal framework than the one adopted here). It is impossible here to go into the complex conditions that this involves for SF.

The analysis of the equative is based essentially on the compositional contribution of so resulting from (211). Its core is the 'limit expression' [αc [W c]].[66] I shall now show that it is not an ad hoc stipulation for the degree operator so but explains how it is related to the comparison so in (230).

(230)(a) Hans ist so, wie$_i$ du ihn dir e$_i$ vorgestellt hast
Hans is as you imagined him

(b) Der Kuchen schmeckt so, wie$_i$ man es erwarten konnte
The cake tastes as was to be expected

(c) Eva ist nun mal so
That is what Eva is like

(d) Fritz ist in dieser Hinsicht so wie$_i$ seine Frau (e$_i$ ist)
Fritz in this respect is like his wife (is)

Like the degree so, the comparison so governs a (possibly empty) complement, whose structure is in addition subject directly to condition (196) if we include AP as a possible categorization of e$_i$. This is because the comparison so (as_1 – see (209c), (e) and (210)), like the corresponding comparison wie (as_2), is the head of an AP, not of a DP. The comparison so must consequently be classified as an adjective which can occur predicatively and adverbially (its attributive counterpart, incidentally, is solch (*such*)). Thus besides its internal θ-role it has an external one for the relatum. This leads to the following parallel lexical entries:

(231)(a) /so/; DEGREE [__ X]; $[\hat{W}\ [\alpha c\ [W\ c]]]$ (= (211))

(b) /so/; A; [__ X]; $[\hat{W}' [\underline{\hat{x}}$ [[αP [W' P]] x]]]

The entries show that for W there is a corresponding variable W' and for c a variable P. P ranges over properties and belongs to the category S/N. Correspondingly W' is not a property of individuals but of properties, and must hence be categorized as S/(S/N). Consequently [αP [W' P]] refers to all properties which have the property W', for example in (230d) to all the (relevant) properties of Fritz's wife. The external argument is the carrier of all these properties thus qualified. The effect of (231b) is illustrated in (232):

(232)(a) Hans ist so wie$_i$ [$_S$ du bist e$_i$]
Hans is like you (are)

(b) [[αP [P DU]] HANS]

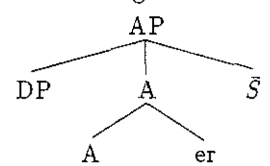
(c) $\forall$P [[P DU] $\rightarrow$ [P HANS]]

(b) is the compositionally derived SF of (a), and (c) is the SF-equivalent conversion which shows that (231b) determines precisely the correct truth conditions. Since W' does not determine a degree property, [αP [W' P]] is not a path either: as distinct from an interval set, a property set is not inherently ordered.[67] It would seem natural to conflate the two entries for so in (231) by suitable generalizations, which, incidentally, would give more clues to the nature of the category DEGREE. I shall not pursue this, but shall come back to comparable parallels regarding viel (*much*) in 8.2. Here I merely wished to demonstrate that the analysis of the equative is well founded.

7.3 Comparative Constructions

The comparative as a grammatical construction is more complex than the equative. It penetrates more deeply into the structure of the adjectives involved, firstly by the effect it has in the SF representations, and secondly, because of its corresponding tendency to morphologize.[68] The comparative morpheme is not the head of a DP but an adjunct to the adjective, together with which it governs a DP and a complement clause. In German the combination of an adjective with a comparative morpheme is a lexical process, and I assume therefore that forms like länger (*longer*) and kürzer (*shorter*) are generated in the lexicon, though they are transparent in LF regarding their compositional properties. I base the discussion below on the following LF structure:

(233)



The stipulations in 7.1 apply to $\bar{S}$; DP will be qualified later, but can, as hitherto, be occupied by measure phrases. The function of the suffix -er is crucial. The basic idea, as mentioned before, is that in the comparative the comparison

variable v is specified by the complement clause. To guarantee this, [$_A$ A er] must have the following properties:

(234) [[$_A$ läng] er]; A, [(DP) __ X];
$[\hat{W} [\hat{c} [\underline{\hat{x}}$ [[QUANT MAX x] $\supset$ [[αc_i [W c_i]] + c]]]]]

We see that -er converts a DA from a two-place predicate into a three-place one: the complement clause appears additionally as a new internal argument and is θ-marked by $\hat{W}$; the θ-roles $\hat{c}$ and $\underline{\hat{x}}$ are inherited from the adjective. The SF of the complement clause, as in the equative, is integrated into the limit expression [αc [W c]], which now represents the value of v. Thus CVS cannot be applied to the variable v. On the other hand the corresponding argument expression is still subject to the v-conditions.

Let us consider (234) for the moment as an example of the lexical entry for comparative forms and assume that the Pro$_A$ of the complement clause is still the SF of the corresponding positive (I shall discuss the conditions for this below). Then we get the SF representation (b) – again strictly compositionally – from (235a), and (b) is SF-equivalent to (c):

(235)(a) Der Tisch ist länger als das Brett
The table is longer than the board

(b) $\exists$c [[QD T] $\supset$ [[αc_i [[QD B] $\supset$ [0 + c_i]]] + c]]

(c) $\exists$c [$\forall c_i$ [[QD B] $\supset$ [0 + c_i]] $\rightarrow$ [[QD T] $\supset$ [c_i + c]]]

The value 0 for v in the complement clause follows from CVS. At the same time it is guaranteed that SMC2 (=(170b)) is fulfilled, since [0 + c_i] is necessarily an element of D_0. It is clear that (b) correctly determines the truth conditions for (235): (a) is fulfilled if there is an interval c_i by which [QD T] exceeds [QD B]. The correspondingly negated sentence then says that there is no such c_i. We must note further that although the c of the matrix adjective is $\exists$-quantified, 0EC is not violated, because the value of v is not 0 but c_i, more precisely [αc_i [[QD B] $\supset$ [0 + c_i]]].

If DP is occupied by a measure phrase, this is θ-marked by $\hat{c}$, as in the positive, the result being (236b):

(236)(a) Der Tisch ist zwei Meter länger als das Brett
The table is two metres longer than the board

(b) [[QD T] $\supset$ [[αc_i [[QD B] $\supset$ [0 + c_i]]] + [2 M]]]

It must be noted that although 2 is an instance of NUM, NEC is nevertheless not violated, because v is not specified by N_C. Now we see that NEC says: counting can start at 0 or at some fixed point established by the limit c_i. The analysis thus explains not only that in the comparative – in contrast to the equative – measure phrases are possible (this is a result of the availability of c), but also why, in the positive, measuring always starts at 0 but in the comparative at the limit value coming from the element compared with.

Let us consider next sentences with −Pol-A

(237)(a) *Der Tisch ist niedriger als das Brett kurz ist
The table is lower than the board is short

(b) $\exists c$ [[QUANT VERT T] $\subset$ [[αc_i [[QUANT MAX B] $\subset$ [N_C − c_i]]] − c]]

SMC1 requires that the v of the complement adjective should have the value N_C. But c_i thus cannot be an element of D_0, which for the matrix adjective violates SMC2. Thus the v-conditions explain the deviancy of (237). Clearly this combination of circumstances applies to all comparatives with −Pol-A in the complement. The distinction noted in 4.5 between the following sentences thus has its explanation:

(238)(a) ?Hans ist größer als Eva groß ist (=(87b))
Hans is taller than Eva is tall

(b) *Hans ist kleiner als Eva klein ist (=(89a))
Hans is shorter than Eva is short

(c) ?Hans ist so klein wie Eva klein ist
Hans is as short as Eva is short

(a) and (c) only violate condition (90), which concerns redundant repetition, while (b) violates SMC too.

The question now is how to analyse sentences like Hans ist kleiner als du (*Hans is shorter than you*), which have to have the Pro_A of a −Pol-A in the complement clause but are still not deviant. The distinction mentioned earlier between Pro_A and the SF of the corresponding DA can now be properly established. It is minimal, and only applies to −Pol-A:

(239) If (a) is the SF of a lexical item X, then (b) is the corresponding (X):

(a) [Y = [v − c] ...] (b) [Y = [(v −) c] ...]

For +Pol-A, (X) is identical with the SF of X. In accordance with (239), (kurz) thus consists of the SF in (240):

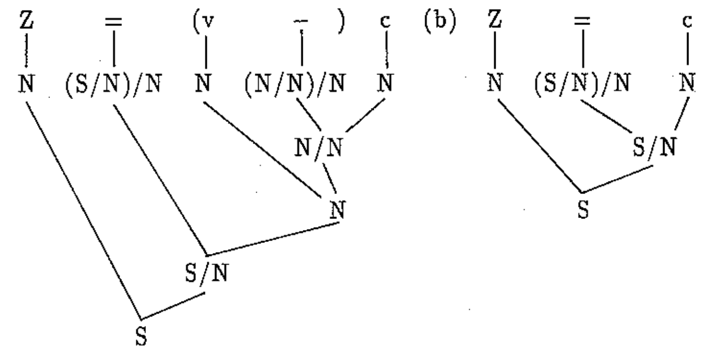
(240) [$\hat{c}$ [$\underline{\hat{x}}$ [[QUANT MAX x] = [(v −) c]]]]

The parentheses are to be interpreted as follows:

(241) *If an* SF *contains an expression (v −) and 'v −' does not allow v to be specified by anything compatible with the v-conditions, then 'v −' is deleted.*

This convention must, of course, be interpreted more generally and be made applicable to any SF configurations (and other restrictions similar to the v-conditions). It must furthermore be guaranteed that the deletion produces well-formed SF structures. In (239) this is the case: the deletion transforms (242a) into (b):

(242)(a) (b)



(239), together with the convention that (X) is in general the SF of X, defines the form of Pro_A for all adjectives. It is unnecessary to extend (239) to +Pol-As, since here no conflict ever arises with the v-conditions, so that (241) would run idle.

(239) thus represents another facet of the marked status of −Pol-As: the brackets indicate the possibility of 'neutralization' under certain conditions. We have seen that these conditions never occur in the equative, which is why I identified Pro_A with the regular SF of the adjective. It is important that the deletability of 'v -' only applies to Pro_A and is not part of the SFs of the adjectives themselves. Otherwise, in cases like (237) the conflict with the v-conditions would not occur, and the sentence would pass as untrue but well formed.

Before I demonstrate the effect of (239) there is one point to clarify. In 6.2 it was established that the SF of a DA contains strictly speaking a '=', and that '$\supset$' and '$\subset$' indicate only the interpretation of '='. This becomes important now, because in the context of (242b) the conditions from (156) are no longer given. In the new context '=' must indeed have another interpretation, as I shall soon show. (156) must therefore be supplemented as follows:

(243)(a)	Int([x = [y [− z]]])	= Int(x) $\subset$ Int([y [− z]])	(=(156b))
(b)	Int([x = [y [+ z]]])	= Int(x) $\supset$ Int([y [+ z]])	(=(156a))
(c)	Int([x = z])	= Int(x) $\supset$ Int(z) $\wedge$ Int(x) $\subset$ Int(z)	

The three interpretations of '=' are ordered according to their complexity: (c) is applied if the conditions for (a) and (b) are not fulfilled. Put differently, this means that, depending on '−' or '+', (a) and (b) select one of the conjuncts from (c), which together mean that x and z include each other, in other words, are equal. Henceforth I shall write '$\subset$' and '$\supset$' or '=' according to whether (a), (b) or (c) applies.

After these prefacing remarks let us consider sentences like (244a), which, on the basis of (239) and (240), are given the SF structure (244b):

(244)(a) Der Tisch ist kürzer als das Brett
The table is shorter than the board

(b) $\exists c$ [[QD T] $\subset$ [[αc_i [[QD B] = c_i]] − c]]

Through the deletion of 'v −' in the Pro_A (b) is well-formed, since c_i now emerges as the value of v in the matrix adjective; c_i is identified as an initial interval and SMC is thus fulfilled. It is important that $[\alpha c\ [[\text{QD B}] = c_i]]$, on the basis of interpretation (243c), no longer represents a path from 0 to c_i but precisely the interval c_i, because only c_i can fulfil the condition of mutual inclusion.[69] It now becomes clear that this leads to the correct truth conditions: (244) says that there is a non-empty interval c by which [QD T] falls short of the limit c_i of [QD B]. If on the other hand '=' were interpreted as '⊃', as in the case of +Pol-A, in other words if $[\alpha c_i\ [\text{W}\ c_i]]$ referred to a path, then there would have to be an interval c, which is contained in every part of the path. But this could only be the empty interval, and then (244) would no longer mean that the table is shorter than the board. (The empty interval is independently precluded by (152).)

This explains at the same time why the comparative is not norm-related, either in the case of +Pol-A or in the case of −Pol-A: in the matrix adjective the place for N_C is occupied by the complement clause, and in the complement adjective v has the value 0 for +Pol-A in accordance with CVS and for −Pol-A it is deleted by (240).

The analysis also explains why measure phrases are permissible in the comparative even with −Pol-A: since N_C does not occur in SF, NEC cannot be violated. As in +Pol-A, the measure phrase replaces the variable c, and the value is subtracted from the value c_i specified by the complement, which produces exactly the right truth conditions.

It can be seen then that the intricate properties of comparatives, notably with −Pol-A, can be derived from the interaction of independently motivated assumptions, given in addition only the minimal assumption (239) about Pro_A; and even this can be regarded as non-arbitrary, since it should be derivable from a general theory of markedness in SF. What (239) does is to substantiate the statement made in (xvii) that Pro_A is not generally identical with the SF of the matrix adjective.

At the same time the analysis of Pro_A produces a somewhat more systematic basis for the interpretation of measure phrases with −Pol-A: the contamination in the SF-assignment for sentences like (245a) results from the recourse to (kurz), so that (175) should be replaced by (245b):

(245)(a) *Das Brett ist fünf Meter kurz (=(174))
The board is five metres short

(b) $[[\text{QD B}] = [5\ \text{M}]] \wedge \exists c\ [[\text{QD B}] \subset [N_C - c]]$

Of course (b) is still not a regular SF of (a). The aim here was simply to show that the neutralization of the −Pol character inherent in the Pro_A of −Pol-As forms the bridge for the detour interpretation.[70]

We can deduce directly from the analysis thus given the statement made in point (v) that größer and kleiner are in a certain sense converse relations, or more precisely that (246) is true if and only if (247) is true (which does not emerge from previous analyses because of their inadequate treatment of −Pol-A).

(246)(a) Der Tisch ist länger als das Brett
The table is longer than the board

(b) $\exists c\ [[\text{QD T}] \supset [[\alpha c_i\ [[\text{QD B}] \supset [0 + c_i]]] + c]]$

(c) $\exists c\ [\forall c_i\ [[[\text{QD B}] \supset [0 + c_i]] \rightarrow [[\text{QD T}] \supset [c_i + c]]]]$

(247)(a) Das Brett ist kürzer als der Tisch
The board is shorter than the table

(b) $\exists c\ [[\text{QD B}] \subset [[\alpha c_j\ [[\text{QD T}] = c_j]] - c]]$

(c) $\exists c\ [\forall c_j\ [[[\text{QD T}] = c_j] \rightarrow [[\text{QD B}] \subset [c_j - c]]]]$

What has to be proved is that (246) and (247) are fulfilled under the same conditions (for simplicity's sake I shall write b and t for Int([QD B]) and Int([QD T]), since these are intervals):

(248) There is a c, such that for all c_i and c_j:

(a) $(b \supset c_i) \rightarrow (t \supset c_i \circ c)$
Int of (246c)

(b) $(t \supset c_j) \wedge (t \subset c_j) \rightarrow (b \subset c_j \circ I(c))$
Int of (247c)

(c) $(t \supset b \circ c)$
by (a) definition of '⊃' and '∘'

(d) $(t \supset c_k \circ c) \rightarrow ((t \subset c_k \circ c) \rightarrow (b \subset c_k))$
by (c) for $c_j = c_k \circ c$

(e) $(t \supset c_k \circ c) \rightarrow (b \subset t \circ c)$
by (d) and definition of '⊂' and '∘'

(f) for all c_k with $(t \supset c_k \circ c)$:
$(t \supset b \circ c) \leftrightarrow (b \subset t \circ c)$ QED

The premise in (f) requires that the table should be longer than the difference between table and board, and thus that the board has a real extension. Clearly this condition, which ultimately follows from (kurz), is always fulfilled.

In the comparative, as in the equative, the complement can be empty:

(249) Der Tisch ist kürzer
The table is shorter

In such cases the property of Pro_A, which in −Pol-A defines a value and not a path, must nevertheless have its effect. This becomes clear when we consider (249) in the context *The board is short, but ....* This means that in (249) the complement in LF is not simply empty, and the θ-role $\hat{W}$ of kürzer ∃-quantified, but that a projected complement of the form (250) is formed, where the specification of certain positions in '...' can be fixed by contextual clues.

(250) Der Tisch ist kürzer (als ... Pro_A ...)
The table is shorter (than ...)

I shall not go into the technical details.

A projected complement is also involved in sentences like

(251) Hans wird größer
Hans is getting taller

The information for the projection of the complement is derived from interaction with the SF of werden (*become*). I cannot follow up this interesting aspect, because it presupposes an elaborate theory of werden and of the SF of inchoatives in general.

A special case of an empty surface complement are attributive comparatives of the form (252):

(252)(a) Das ist ein längeres Brett
That is a longer board/ That is a longish board

(b) Dann kam ein jüngerer Mann herein
Then a younger man came in/
Then a youngish man came in

Sentences like these, as we see, have two interpretations. One involves a contextually determined complement and can be reduced to the case already discussed, except that here it is not (196) but (204) that is relevant to the projection of the complement. *A longer board* then means *a longer board than that one*. In the second interpretation länger does not have a contextual complement and has a meaning difficult to paraphrase, in German or by translation, and would not truly be rendered by *rather, fairly* or *somewhat* as modifiers either. Two points have to be borne in mind for this reading: firstly, it is only possible for attributive APs, and not for predicative or adverbial APs, as is clear from (249), and secondly it is obviously linked to certain contextual conditions. I shall leave this point aside and only discuss the question what the SF of such constructions is when they have the interpretation in question.

What our analysis predicts is that (252a) holds if the board in question is longer than some other unspecified board, as the following SF for ein längeres Brett, which is deducible from the assumptions made so far, shows:

(253) εx [[B x] $\wedge\exists$c [[QD x] $\supset$ [αc$_i$ [$\exists y$ [[B y] $\wedge$ [[QD y] $\supset$ [0 + c$_i$]]]]] + c]]

This analysis at least does not make any false statement. Whether or not it is underdetermined depends solely on the choice of the board y being used for comparison. However, this choice must be made in connection with certain contextual conditions, as I have said above: what must be given is a y which is not above average (otherwise lang (*long*) would be more appropriate) but which nevertheless lies within a middle area (otherwise it would have to be specified).

It seems to me that the reading in question must not, in fact, be further specified in SF.

All the comparatives considered so far are subject to the assumptions discussed in 7.1 for complements. But the latter do not cover sentences like:

(254)(a) Das Haus ist höher als zehn Meter
The building is taller than ten metres

(b) Er kennt sie länger als drei Jahre
He has known her for longer than three years

(255)(a) *Das ist ein höheres Haus als zehn Meter
That is a taller house than ten metres

(b) *Er kennt sie eine längere Zeit als drei Jahre
He has known her for a longer time than three years

(256)(a) *Das Haus ist so hoch wie zehn Meter
The building is as tall as ten metres

(b) *Er kennt sie so lange wie drei Jahre
He has known her for as lang as three years

(254) shows that measure phrases can occur as complements. (255) shows that this is not possible with attributive APs, and (256) shows that only the comparative allows measure phrases MP as complements. How can we explain this?

What we can already say descriptively is that an MP clearly cannot be the subject of the projected complement as conditions (196) and (204) would require:

(257)(a) wie$_i$ [$_S$ zehn Meter (e$_i$ hoch sind)] (for (254a) and (256a))

(b) *wie [$_S$ zehn Meter (ein e$_i$ hohes Haus)] (for (255a))

The deviancy of (255) corresponds exactly to that of (257b). Thus (204) explains, without any extra assumptions, why constructions like (255) are deviant: they automatically receive the inadmissible projection (257b). An MP in the complement of an attributive AP can correctly appear only within the subject of the projected predication, as indicated in (258a). For predicative and adverbial APs, on the other hand, the status of an MP in the complement is that indicated in (b) and (c):

(258)(a) Das ist ein höheres Haus als ein zehn Meter hohes Haus
That is a taller building than a ten-metre-tall building

(b) Das Haus ist höher als zehn Meter hoch
The building is taller than ten metres tall

(c) Er kennt sie länger als drei Jahre lang
He has known her longer than three years long

What all three cases make clear is that an MP in the complement of an AP cannot, as in (257), function as the subject of a predication but only as the DP of an adjective (including a projected adjective). But this cannot be accomplished by (196), which for (254a) inevitably produces the projected complement (257a), where the MP is the subject and not a DP, since DP must be occupied by the variable e_i. Because MPs as subjects are not altogether ruled out, as (259) shows, the projection in (257a) is not deviant like the one in (257b).

(259)(a) Zehn Meter sind zu viel
Ten metres is too much

(b) Wie lange dauern drei Stunden?
How long do three hours last?

Thus the assumptions made so far explain the deviancy of (255), but they do not explain the structure of (254) or the oddness of (256).

For cases like (254) a further condition is necessary on projection which takes account of the fact that MP specifies the place of the DP:

(260) Let Z be an MP which is the SSC of an AP with the structure (a). Then for (a) there is a corresponding complement (b) with the conditions (c) and (d):

(a) $[_{AP}$ DP $[_A \ldots]]$
(b) wie$_i$ $[_S$ e_i $[_{AP}$ Z $[_A \ldots]]]$
(c) The position ... in (b) is either occupied identically to that in (a) or it contains the appropriate Pro_A.
(d) e_i is the external argument of the AP in (b).

(260), as distinct from (196) and (204), is local in that it does not depend on the environment of the matrix AP. (260) does not allow any bridge verb construction, and does not have any parallelizing effect (except for Pro_A) and is thus presumably not derivable from any general theory of ellipsis. (260) must therefore be stipulated specially for AP complements.[71] The structural condition in (260) is more special than the one in (196) because in (260) a specific type of complement is required. Thus (260) is prior to (196). This is necessary because otherwise (196) would project the wrong complements of the type (257a).

What is the effect of (260)? Since AP θ-marks the variable e_i, the following SF results for (261) for example:

(261)(a) wie$_i$ $[_S$ e_i $[_{AP}$ drei Meter (kurz)]]

(b) $[\hat{x}_i\ [[\mathrm{QUANT\ MAX}\ x_i] = [3\ \mathrm{M}]]]$

In the Pro_A (kurz) 'v −' must be deleted, otherwise NEC would be violated. (261b) represents the property of being any object which is three metres long. 'Any object' includes, trivially, intervals, the mapping of which onto the corresponding scale is tautologous, though the position as an argument of '=' does require x_i to be an initial interval (we shall soon see that this has consequences). In any case (261b) is a fortiori a property of intervals and thus an instance of W. Thus we get the following SF:

(262)(a) Das Brett ist kürzer als drei Meter
The board is shorter than three metres

(b) $\exists c\ [[\mathrm{QD\ B}] \subset [[\alpha c_i\ [[\mathrm{QD}\ c_i] = [3\ \mathrm{M}]]] - c]]$

We see that the analysis produces the correct interpretation. The structure of (254) is thus covered. But how can equatives like (256) be ruled out? One possibility would be to confine (260) to comparatives. But then there would have to be another stipulation to prevent (196) from applying to sentences like (256).[72] Let us examine, then, what the analysis so far predicts without any additional stipulations:

(263)(a) *Das Haus ist so niedrig wie zehn Meter
The building is as low as ten metres

(b) $[[\mathrm{QD\ H}] \subset [N_C - [\alpha c_i\ [[\mathrm{QD}\ c_i] = [10\ \mathrm{M}]]]]]$

(b) requires that [QD H] should be contained in $[N_C - 10\ \mathrm{M}]$, in other words that the building should be ten metres below the average height. Apart from the fact that this is not a possible reading of (a), (b) violates SMC and (indirectly) NEC. It indirectly violates NEC because what (b) implies is that units of measurement are counted from N_C, and it violates SMC because, as observed above, $[\mathrm{QD}\ c_i]$ must be an element of D_0, and this is incompatible with $[N_C - c_i]$. For (264) the argument is weaker:

(264)(a) *Das Haus ist so hoch wie zehn Meter
The building is as tall as ten metres

(b) $[[\mathrm{QD\ H}] \supset [0 + [\alpha c_i\ [[\mathrm{QD}\ c_i] \supset [0 + [10\ \mathrm{M}]]]]]]$

(264b) does not violate any v-condition and gives meaningful truth conditions for (a) if the sentence is accepted. How, then, is its anomalous status to be explained? The following point must be taken into account: as distinct from the comparative, the complement in the equative specifies the difference variable c of the matrix adjective. The values of c are not generally elements of D_0 but are any segments of the scale. But for reasons already given, $[\mathrm{QD}\ c_i]$ requires that c_i must necessarily be an element of D_0. The appeal to this conflict has two weak points: firstly, although the property of c in question is actually contained in the structure of the DA it can hardly be formulated as one of the explicit conditions of the theory; secondly, in (264) the interval (or the path) in question is actually contained in D_0, so that the (implicit) condition is not violated. However, I see no way of ruling out (264) without other ad hoc assumptions and shall therefore leave the analysis of the MP complements unaltered.

The discussion has so far been based on the assumption that comparative forms are lexical entries of the form (234). This now has to be modified for two reasons. Firstly, the SF of the comparative must be derivable regularly from that of the simple adjective (as was presupposed in point (ii) in 3.1), in other words entries like (234) are not unpredictable structures.[73] Secondly, the structure $[_A$ A -er$]$ in LF must be transparent and the SF of A must be that of the base adjective, otherwise the projection of Pro_A by (196), (204) and (260) could not work. This means that the SF representation of the adjunct -er must be specified in such a way that, combined with the SF of the adjective, it results in the SF given in (234). For the sake of clarity I shall use U as a variable over the SF of DAs (more precisely of gradable adjectives). Thus U is a variable of category (S/N)/N. The lexicon information on -er now contains the following:

(265) /er/; Suffix, $[_A \text{ A } \_\_]$; $[\hat{U}\ [\hat{W}\ [[\hat{v}\ \text{U}]\ [\alpha c_i\ [\text{W } c_i]]]]]$

Some comments are necessary here.

Firstly, I have given (265) in the form of a lexical entry. In fact, -er is a suffix which serves to construct lexical items. The status of the information contained in (265) must be more exactly specified within the theory of the structure of the lexicon, in which various levels of word formation are distinguished to which the affixes with their characteristic properties are assigned (cf. e.g. KIPARSKY (1982) and the discussion in PESETSKY (1985)). I cannot enter into a systematic discussion of this aspect here,[74] and I shall not comment on the relevant problems any further.

Secondly, -er appears to have two θ-roles $\hat{U}$ and $\hat{W}$ the status of which deserves some explanation. (Notice that $\hat{v}$, to which I will come immediately, is prefixed to U directly and thus cannot belong to the θ-grid of -er.) As -er constitutes, according to general principles of German word structure, the head of the word it directly belongs to, $\hat{U}$ is an internal θ-role of -er in the strict sense: it θ-marks the word-internal complement of the suffix. The status of $\hat{W}$ is more complicated. If we assume that -er, being the head of its A, is also the head of the AP headed by this A, $\hat{W}$ would also count as an internal θ-role or -er. More naturally, though, $\hat{W}$ is not considered as a θ-role of -er in the proper sense, but rather as a contribution of *-er* to the θ-grid of the affixed adjective, where $\hat{W}$ then functions as a proper internal θ-role, as indicated in (234). These considerations have to be given a systematic place within a more principled theory of affixation, which I cannot go into here. The following example illustrates what I have said so far:

(266)(a) $[_A\ [_A \text{ lang}]\ [_{Suf} \text{ er}]]$

(b) $[[\hat{c}\ [\hat{x}\ [[\text{QUANT MAX } x] = [v + \text{c}]]]]_j\ [\hat{U}_j\ [\hat{W}\ [[\hat{v}\ \text{U}_j]\ [\alpha c_i\ [\text{W } c_i]]]]]]$

(c) $[\hat{W}\ [[\hat{v}\ [\hat{c}\ [\hat{x}\ [[\text{QUANT MAX } x] = [v + \text{c}]]]]]\ [\alpha c_i\ [\text{W } c_i]]]]$

(d) $[\hat{W}\ [\hat{c}\ [\hat{x}\ [[\text{QUANT MAX } x] = [[\alpha c_i\ [\text{W } c_i]] + \text{c}\ ]]]]]$

(a) is the LF representation, and the PF assigned to it produces the form länger by an umlaut rule. (b) is the corresponding SF, and consists of the SF of lang and the SF of -er. The fact that lang is θ-marked by $\hat{U}$ is shown by the index j. From (b) we get (c) by lambda conversion in accordance with (13), hence (c) is

equivalent to (b). $\hat{W}$ is now an internal θ-role which marks the complement. The step from (c) to (d) is also made by lambda conversion: $[\alpha c_i\ [\text{W } c_i]]$ is substituted for the variable v bound by $\hat{v}$ in (c). This conversion is word-internal: it makes the complement an instance of v and thus produces the SF of (234) which we have been working with so far. This leads to the third point: the step from (266c) to (d) is a formally correct conversion, but one which is based on an illegitimate presupposition, namely the binding of v in the DA by the abstractor $\hat{v}$. This comes about by joining -er to the adjective whereby $\hat{v}$ enters into a binding relation which did not exist before. This sort of binding is not permitted in general, but it poses no problem in the present context, because there is no danger of confusing variables, and I shall leave the indicated SF representation unaltered.[75] In any case the effect of the comparative morpheme consists in associating the comparison variable v with the complement clause.

Now that the lexical treatment of the comparative has been reconciled with the transparency of the word structure in LF, the projection of the complement clauses can easily be adjusted. First of all, in the structure (a) of the conditions (196), (204) and (260), $[_A\ \ldots\ ]$ has to be replaced by $[_A\ \ldots\ (\text{er})]$, in order to relate the projected adjective of the complement clause to the corresponding adjective base also in the comparative. Furthermore, in the comparative $\bar{S}$ is not dominated by DP but is the direct complement of the adjective. This requires a modification, that I shall indicate for (196):

(267) Let Z be an SSC dominated by AP in the structure (a). Then a projected complement (b) corresponds to (a):

(a) $[_S \ldots [_{AP}$ (DP) $[_A \ldots (\text{er})]$ (Z) $] \ldots]$

(b) wie$_i$ $[_S \ldots [_{AP}$ e_i $[_A \ldots \emptyset\ ]$ $\emptyset\ ] \ldots]$

(c) and (d) as in (196).

Z and -er are of course not projected into the complement clause – this is marked by $\emptyset$. If they do not occur in the matrix AP, then Z must be a complement governed by so and thus part of the DP. Corresponding modifications apply to (204) and (260). I shall not spell these out.

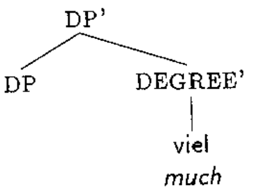
Another question is the origin of the subcategorization features in (234) which allow a DP and a complement for länger. Like the extended θ-grid they must be the product of the process which combines DA and -er. The formal settlement of this question must be left to the theory of lexical processes, but in conclusion one point concerning the content of the subcategorization of the comparatives remains to be discussed. It concerns the qualification of DP mentioned above.

The positive and the comparative have overlapping but not identical possibilities for realizing the degree phrase. The most important cases have the following distribution:

(268)(a)	zwei Meter hoch *two metres high*	(a')	zwei Meter höher *two metres higher*
(b)	sehr hoch *very high*	(b')	viel höher *much higher*
(c)	wie hoch *how high*	(c')	wie viel höher *how much higher*
(d)	so groß *so tall*	(d')	so viel größer *so much taller*

To keep the cases illustrated apart I shall call the degree phrase in the comparative DP'. I assume the following LF structure for them:

(269)



DEGREE' is the head of DP' and θ-marks DP. The corresponding features of viel (*much*) and the parallelism of viel and sehr (*very*) will be discussed in 8.1. For the time being we may put on record the following features of DP':

Like DP, DP' must have an SF of category N which represents a scale interval, in other words may replace c in DA. The fact that the θ-role $\hat{c}$ of the DA in the comparative marks a constituent DP', and not DP, is purely syntactic and is not derivable from SF, since the SF of DP' and of DP have completely parallel functions for the comparative and the positive, respectively. Consequently, DP in (234) must be replaced by DP'. Thus the subcategorization feature [(DP) __] of the DA, when -er is affixed, must be replaced by [(DP') __ ($\bar{S}$)]. Some further consequences of the properties of DP' will be discussed in section 9.[76]

In order to take account of the parallels between (268a) and (b), we must choose between two solutions for measure phrases:

(270)(a) MP is an instance of DP or DP'. The configuration $[_{DP'}$ MP viel$]$ is excluded on all levels.

(b) MP is an instance of DP but not of DP'. In the configuration $[_{DP'}$ MP viel$]$, viel is deleted in the surface structure.

The choice between (a) and (b) is at the moment arbitrary, and I shall therefore leave it open. (We shall see in 8.1 that the consequences of (270a) do not pose any problems for SF: the interpretation of 3 Meter viel (*3 metres much*) would be the same as for 3 Meter.)

7.4 The Superlative

The basic idea behind all the accounts of the superlative known to me is the assumption that (271a) and (b), given the appropriate choice of P, have the same truth conditions:

(271)(a) Hans ist am kleinsten/ der kleinste (P)
Hans is shortest/ the shortest

(b) Hans ist kleiner als alle anderen (P)
Hans is shorter than all others

This idea can be incorporated into the above theory of the comparative without any difficulty, and I shall now outline the means of doing so.

Everything points to the fact that in German the superlative, just like the comparative, should be treated lexically, in other words -st, like -er, is a lexical suffix. It changes the θ-grid of the adjective: -st absorbs the θ-role $\hat{c}$ for the internal argument and thus also eliminates DP from the subcategorization frame. In German the special form am A + st + en (e.g. am kleinsten in (271a)) must be taken into account for predicative APs and for adverbial APs. I shall leave the latter aside because it is irrelevant to LF and SF.

To produce the interpretation indicated in (271), am kleinsten must be based on the following lexical information:

(272) [[klein] st]; A, [__];

$$[\underline{\hat{x}}\ [\exists c\ \underbrace{[\forall y\ [[[P\ y] \wedge [y \neq x]] \rightarrow}_{\text{st}} [[\mathrm{QD}\ x] \subset \underbrace{[[\alpha c_i\ [[\mathrm{QD}\ y] = c_i]]}_{\text{v}} - \mathrm{c}]]]]]]$$

In order to make the analogy and the differences between the superlative and the comparative clearer I have specially marked the relevant parts in the SF of kleinst-. The expression marked by v replaces the corresponding variable of the adjective, as it does in the comparative, and hence it has the properties which the complement clause produces in the comparative: it is based on the SF of the corresponding Pro_A, and for −Pol-A 'v −' is therefore deleted as a consequence of SMC2. Accordingly, the superlative suffix must firstly introduce the parts marked with v and secondly produce the premises labelled 'st' and the $\forall$-quantification of the variable y. These premises say that y ranges over all the elements of a set characterized by P which are not x. If the external θ-role $\underline{\hat{x}}$ of (272) θ-marks the subject Hans, so that both occurrences of x in (272) are replaced by HANS, the result is the SF of (271a), which says there is an interval c by which [QD HANS] is below [QD y] for all y's in P which are not HANS.

For the formulation of the SF of -st, which together with any DA produces representations of the form (272), I shall again use U as a variable for the SF of DA and at the same time use (U) to represent the SF which is the corresponding Pro_A, i.e. indicates the possibility of deleting 'v −'. Then the SF of -st has the following form:

(273) $$[\hat{U}\ [\underline{\hat{x}}\ [\exists c\ [\forall y\ [[[P\ y] \wedge [y \neq x]] \rightarrow [[[[\hat{v}\ U]\ \underbrace{[\alpha c_i\ [[(U)\ c_i]y]]]}_{\text{v}}\ c]\ x]]]]]]$$

The part labelled by v is an argument to $[\hat{v}\ \mathrm{U}]$ and is hence substituted for v in the SF of the DA.[77] The variables c_i and y are bound by the θ-roles of the Pro_A, and the variables c and x by the θ-roles of the adjective. It is easy to work out that if the SF of a DA is substituted for U then (272) is produced by step-by-step lambda conversion.

The characterization of the reference set identified by P entails a number of interesting questions. I shall merely raise three points.

Firstly, in the case of an attributive AP, P is determined by the SF of the head noun. Here the conditions operating are similar to those for determining the comparison class for N_C: das längste Brett (*the longest board*) requires that the reference set should be boards, but the set is restricted according to the given context of interpretation. SZABOLCSI (1985) shows that there are quite intricate scope relations at work:

(274) Von wem hast du das beste Bild gemacht?
Who did you take the best photo of?

(274) has two readings. In one of them P is a set of photos, and the question is about whom the best of them depicts. In the other reading the sentence asks who, from a set of persons, has been photographed the best. Here P is the set of photos of different people.

Secondly, as the second reading of (274) shows, the determination of P can be embedded within a framework which is analogous to the projection of the complement clause in the comparative but is not realized in LF. This is illustrated for (275a) by the paraphrase (275b):

(275)(a) Hans springt am höchsten (von allen P)
Hans jumps the highest (of all P)

(b) Hans springt höher als alle anderen P (hoch springen)
Hans jumps higher than all other P (jump high)

Thirdly, specifications of P can, syntactically, appear in various forms:

(276)(a) Hans ist der größte (von allen)
Hans is the tallest (of all)

(b) Hans ist der größte (in seiner Gruppe)
Hans is the tallest (in his group)

(c) Hans ist der größte (den ich kenne)
Hans is the tallest (I know)

Both for syntactic and semantic reasons these specifications can not be analysed as complements that are governed by the adjective. The variable P in (272) can therefore also not be bound by a θ-role $\hat{P}$.

I must leave these problems of the superlative at that and assume that they must be treated similarly to the specification of C. I shall thus regard P and C for the time being as context-dependent parameters in SF and CS respectively.

7.5 Second Interim Balance

The facts discussed in sections 3 and 4, insofar as they do not apply to EAs, can be derived from the analysis presented so far, and follow for the most part from the effect of the v-conditions. To this extent the following points can be regarded as explained:

The distribution of measure phrases in the positive and the comparative (point (vii)), the possibility of factor phrases in the equative (viii), their exclusion in the equative of −Pol-As (xvi) and the distribution of norm-relatedness in DAs altogether (xiii). A special case of this is statement (xviii) that adjectives occurring in the surface of the complement of comparatives must be +Pol-As (and p-contrastive). (−Pol-As in this position violate SMC2.)

Still to be added is the derivation of the dual nature of the equative and the comparative (vi), which in the case of −Pol-A is, however, subject to the restriction that there is norm-relatedness in the equative, but not in the comparative. Both these properties, the duality and the restriction, follow from the analysis given. What must be shown first of all is that (277) and (278) are true under the same conditions (I shall use the same notational conventions as in (248)).

(277)(a) Das Brett ist länger als der Tisch
The board is longer than the table

(b) $\exists c\ [[\mathrm{QD\ B}] \supset [[\alpha c_i\ [[\mathrm{QD\ T}] \supset [0 + c_i]]] + c]]$

(c) $\exists c\ [\forall c_i\ [[[\mathrm{QD\ T}] \supset [0 + c_i]] \rightarrow [[\mathrm{QD\ B}] \supset [c_i + c]]]]$

(d) $\exists c\ (\forall c_i\ ((t \supset c_i) \rightarrow (b \supset c_i \circ c)))$

(278)(a) Der Tisch ist nicht so lang wie das Brett
The table is not as long as the board

(b) $[[\mathrm{QD\ T}] \supset [0 + [\alpha c_i\ [[\mathrm{QD\ B}] \supset [0 + c_i]]]]]$

(c) $\sim \forall\ c_i\ [[[\mathrm{QD\ B}] \supset [0 + c_i]] \rightarrow [[\mathrm{QD\ T}] \supset [0 + c_i]]]$

(d) $\sim \forall\ c_i\ ((b \supset c_i) \rightarrow (t \supset c_i))$

(e) $\exists\ c_i\ ((b \supset c_i) \wedge \sim (t \supset c_i))$

Since b and t must be elements of D_0, in other words, must have a common initial part, (278e) can only be fulfilled if there is an interval c such that for all common initial parts c_k:

(279) $\exists\ c\ (\forall c_k\ ((t \supset c_k) \rightarrow (b \supset c_k \circ c)))$

Thus the CS-equivalence of (277) and (278) is derived. Next I shall show that (280) follows from (281):

(280)(a) Das Brett ist kürzer als der Tisch
The board is shorter than the table

(b) $\exists c\ [[QD\ B] \subset [[\alpha c_i\ [[QD\ T] = c_i]] - c]]$

(c) $\exists c\ [\forall c_i\ [[[QD\ T] = c_i] \rightarrow [[QD\ B] \subset [c_i - c]]]]$

(d) $\exists c\ \forall c_i\ ((t \supset c_i) \wedge (t \subset c_i)) \rightarrow (b \subset c_i \circ I(c)))$

(e) $\exists c\ \forall c_i\ ((t \supset c_i) \rightarrow ((c_i \circ I(c) \subset b) \rightarrow (c_i \subset t))$

(281)(a) Der Tisch ist nicht so kurz wie das Brett
The table is not as short as the board

(b) $\sim [[QD\ T] \subset [N_C - [\alpha c_i\ [[QD\ B] \subset [N_C - c_i]]]]]$

(c) $\sim \forall\ c_i\ [[[QD\ B] \subset [N_C - c_i]] \rightarrow [[QD\ T] \subset [N_C - c_i]]]$

(d) $\sim \forall\ c_i\ ((b \subset N_C \circ I(c_i) \rightarrow (t \subset N_C \circ I(c_i)))$

(e) $\sim \forall\ c_i\ ((N_C \circ I(c_i) \supset b) \rightarrow (N_C \circ I(c_i) \supset t))$

(f) $\exists\ c_i\ ((N_C \circ I(c_i) \supset b) \wedge \sim (N_C \circ I(c_i) \supset t))$

(280e) holds if and only if there is a c_k which contains all c_i which t contains, and which contains b but not t (c_k contains $c_i \circ c$ for any c_i). This means that (280e) is equivalent to (282a). The premise of (282a) is fulfilled for any choice of c_k, because b and t are elements of D_0 and consequently c_k cannot contain b without also containing all c_i contained in t. Thus the validity of (282b) follows from (282a):

(282)(a) $\exists c_k\ \forall c_i\ (((t \supset c_i) \wedge (c_k \supset c_i)) \rightarrow ((c_k \supset b) \wedge \sim (c_k \supset t)))$

(b) $\exists c_k\ ((c_k \supset b) \wedge \sim (c_k \supset t))$

It is now clear that (281f) is a special case of (282b), namely for $c_k = N_C \circ I(c_i)$, which corresponds to the condition that the board is short. Thus (280) follows from (281). The converse is only true if, in addition to (280), the condition (283) holds, which restricts the selection of c_k in (282b) to $N_C \circ I(c)$:

(283)(a) Das Brett ist kurz
The board is short

(b) $\exists c\ [[QD\ B] \subset [N_C - c]]$

(c) $\exists c\ (b \subset N_c \circ I(c))$

The proof for the two other pairs with negation in the comparative instead of in the equative is analogous. Thus point (vi) is derived in a qualified form.

Except for point (xx) all the facts from sections 3 and 4 not yet explained are related to the nature of EA and will therefore be dealt with in section 10. Here I will show that (xx) follows plausibly from the theory as developed so far. What has to be explained are the properties of sentences like:

(284)(a) *Hans ist größer als Fritz nicht ist
Hans is taller than Fritz is not

(b) ?Hans ist so groß wie Fritz nicht ist
Hans is as tall as Fritz is not

While (b) is somewhat anomalous, it is nevertheless interpretable: it is always fulfilled when (285) is fulfilled:

(285) Hans ist größer als Fritz
Hans is taller than Fritz

(284a) on the other hand is deviant in a special way: it is incomprehensible. Previous analyses fail here in two ways. Firstly, they analyse (284a) either as tautologous or as contradictory or they assign it a logical structure which does not realize a proposition. These properties are illustrated by the sentences in (286):

(286)(a)	Hans is the man he is	(tautologous)
(b)	Hans is a man who is not a man	(contradictory)
(c)	Hans is the man he is not	(propositionless)

I shall not go into the details, but it is clear that all the sentences are comprehensible in a way that (284a) is not. Secondly, none of the existing theories accounts for the difference between negated complements in the comparative and in the equative.

Let us look first at (284a):

(287)(a) *Hans ist größer als Fritz nicht ist (=(284a))

(b) $\exists c\ [[QD\ H] \supset \underbrace{[[\alpha c_i\ [\sim [[QD\ F] \supset [0 + c_i]]]]}_{v} + c]]$

We can see that the expression indicated by v refers to all intervals that are not contained in [QD F]. This is the whole scale above [QD F]. But there can be no c that can be added to this path. Thus (287) represents an antinomy in that it requires that the interval [QD H] be longer than any interval, i.e. that it contains itself as one of its parts. This characterizes adequately the status of (287a). In addition to that, (287b) violates condition SMC2 since the intervals which are not (improper) initial parts of [QD F] do not define any element of D_0 as a limit.

The same antinomy occurs for –Pol-As:

(288)(a) *Hans ist kleiner als Fritz nicht ist
Hans is shorter than Fritz is not

(b) $\exists c\ [[QD\ H] \subset \underbrace{[[\alpha c_i\ [\sim [[QD\ F] = c_i]]]}_{v} - c]]$

The instantiation of v here refers to any interval that either does not include [QD F] or is not included by it, i.e. to every interval. This means that [QD H] is shorter than any interval, in other words it is shorter than itself. (288) too violates SMC, this time SMC1, since c must also be deduced from d_o.

The fact that the same antinomy does not occur for (284b) follows from our analysis of the equative:

(289)(a) ?Hans ist so groß wie Fritz nicht ist
Hans is as tall as Fritz is not

(b) $[[\text{QD H}] \supset [0 + \underbrace{[\alpha c_i\, [\sim [[\text{QD F}] \supset [0 + c_i]]]]]}_{\text{c}}]$

Since the expression that refers to any interval that is not contained in [QD F] here instantiates c and not v, no antinomy occurs: nothing is added to c. (289) does imply, though, that Hans is an indefinite amount taller than Fritz: [QD H] covers the whole scale. This does not necessarily imply that Hans is infinitely tall: the range of values of αc_i is always defined by the context.[78] But it explains the dubiousness of sentences like (289). At the same time it becomes clear that (284b), while not equivalent to (285), does imply it: if (289) is fulfilled there is always a certain interval c by which [QD H] exceeds [QD F], as the comparative requires.

Now the argumentation for (290) is obvious and I shall not present it in detail.

(290)(a) ?Hans ist so klein wie Fritz nicht ist
Hans is as short as Fritz is not

(b) $[[\text{QD H}] \subset [N_C - [\alpha c_i\, [\sim [[\text{QD F}] \subset [N_C - c_i]]]]]]$

(290) means that Hans is an indefinite amount below N_C, but Fritz is not.

We have now derived all the relevant properties of negated complements without any extra assumptions. The logic of the argumentation is valid for all complements:

(291)(a) *Der Tisch ist höher als er nicht breit ist
The table is taller than it is not wide

(b) *Hans ist größer als man es sich nicht vorstellen kann
Hans is taller than one cannot imagine

(c) *Er braucht ein dickeres Buch als dieses nicht ist
He needs a thicker book than this one is not

(d) *Der Fluß ist schmaler als keine fünfzig Meter
The river is narrower than not fifty metres

Since the complement clauses always define a negative degree property, the antinomy always shows up for the same reasons.

(292)(a) ?Der Tisch ist so hoch wie er nicht breit ist
The table is as tall as it is not wide

(b) Hans ist so groß wie man es sich nicht vorstellen kann
Hans is as tall as one cannot imagine

(c) ?Er braucht ein so dickes Buch wie dieses nicht ist
He needs a book as thick as this one is not

(292b) is less dubious than the other sentences – for reasons which are derivable: the indefiniteness mentioned, which causes the difference interval to run through the whole scale, is here legitimized semantically by the bridge verb.

Quantification is only necessary for complements like the ones in (293), which contain a negation but must be regarded as perfectly normal:

(293)(a) Der Tisch ist so groß wie kein anderer
The table is as large as no other (= larger than any other)

(b) Eva springt so hoch wie niemand sonst
Eva can jump as high as nobody else (= higher than anybody else)

(c) Das ist ein so breiter Fluß wie ich noch keinen gesehen habe
That is as wide a river as I have never seen one before (= a wider river than (any) I have ever seen before)

The crucial point here is the occurrence of quantifiers like kein (*no*) and niemand (*nobody*). Their effect will be discussed in 8.3.

I shall end this interim balance with a note on the adjective anders (*other/different*), which has a number of points in common with the comparative. A certain link is provided by the analysis outlined in 7.2 of so (as_1) and wie with adjectival status (as_2) (cf. (231)). In the same way that so as the head of an AP is the counterpart to the equative, anders as the head of an AP can be thought of as the counterpart to the comparative.

While the adjectival so induces the sameness of properties, anders, analogously, determines their differentness. Anders shares with the comparative the greater complexity compared with so. I shall first explain the SF of anders through the SF of the sentences into which it enters, where P is again a variable of the category S/N.

(294)(a) Hans ist anders als (wie_i) [$_S$ Eva (ist)]

(b) $\exists P\ [[P\ \text{HANS}] \wedge \sim [P\ \text{EVA}] \wedge [[\alpha P_i\ [P_i\ \text{EVA}]] \neq P]]$

(c) $\exists P\ [\forall P_i\ [[P_i\ \text{EVA}] \rightarrow [[P\ \text{HANS}] \wedge \sim [P\ \text{EVA}] \wedge [P_i \neq P]]]]$

As usual, (b) is the SF of (a), and (c) is an SF-equivalent conversion. It seems at first as if the third conjunct in (b) is superfluous and anders must simply bring about the conjunction of the first two conjuncts. But there are two reasons against this: firstly, it is precisely the third conjunct that is the link between the adjectival anders and other lexical items of the same base;[79] secondly, it could not be explained without the third conjunct why negated complements of anders produce the same antinomy as those of comparatives:

(295)(a) *Hans ist anders als du nicht gedacht hast
Hans is different than you did not think

(b) *Hans singt anders als Fritz nicht singt
Hans sings differently than Fritz does not sing

(c) *Ich habe ein anderes Buch als du nicht brauchst
I have a different book than you do not need

Just as in the case of the comparison so I assume that the complement clauses of anders specify a property of properties, and thus have the category S/(S/N) in SF and can replace a variable W'. The lexical entry for anders then is (296):

(296) /ander/; A, $[\_\bar{S}]$; $[\hat{W}'\ [\underline{\hat{x}}[\exists \mathrm{P}[[\mathrm{P}\ x] \wedge \sim[\mathrm{W'\ P}] \wedge [[\alpha \mathrm{P}_i\ [\mathrm{W'\ P}_i]] \neq \mathrm{P}]]]]]$

It is easy to see that (294b) comes from (296) if x is replaced by HANS, and W' by $[\hat{P}\ [\mathrm{P\ EVA}]]$. Furthermore, it can easily be shown that anders and comparison so are in a way dual to each other, in other words that (294) and (297) are true under the same conditions:

(297)(a) Eva ist nicht so wie Hans (cf. (232))
Eva is not like Hans

(b) $\sim [[\alpha\ \mathrm{P}\ [\mathrm{P\ HANS}]]\ \mathrm{EVA}]$

(c) $\sim [\forall\ \mathrm{P}\ [[\mathrm{P\ HANS}] \rightarrow [\mathrm{P\ EVA}]]]$

How does the antinomy in sentences like (295) arise? I shall explain the main point using the following example:

(298)(a) Hans ist anders als Eva nicht ist
Hans is different than Eva is not

(b) $\exists \mathrm{P}\ [[\mathrm{P\ HANS}] \wedge \sim [\sim[\mathrm{P\ EVA}]] \wedge [[\alpha\ \mathrm{P}_i\ [\sim [\mathrm{P}_i\ \mathrm{EVA}]]] \neq \mathrm{P}]]$

(c) $\exists \mathrm{P}\ [\forall \mathrm{P}_i[\sim[\mathrm{P}_i\ \mathrm{EVA}] \rightarrow [[\mathrm{P\ HANS}] \wedge [\mathrm{P\ EVA}] \wedge [\mathrm{P}_i \neq \mathrm{P}]]]]$

The conversion (c) shows that (298) is fulfilled if there is a property P of such a kind that for all the properties that Eva has they are different from P and P is a property of Hans and Eva. This is not simply a contradiction which requires that P should apply and not apply to Eva at the same time. The crucial point is that P must, so to speak, be outside the set of all properties, just as c is outside the set of intervals in the comparative. This arises analogously to the comparative: $[\alpha \mathrm{P}_i\ [\sim [\mathrm{P}_i\ \mathrm{EVA}]]]$ refers to every property that Eva does not have. For Hans a property has to be found which is neither one of Eva's properties nor one of those which she does not have. Incidentally, the parallels between anders and the comparative can also be demonstrated in SF. To illustrate this we may consider the sentences in (299a), for the SF equivalents of which the conversions (b) and (c) apply:

(299)(a) Hans ist anders/größer als Eva
Hans is different from/taller than Eva

(b) $\exists \mathrm{P}\ [\forall \mathrm{P}_i[[\mathrm{P}_i\ \mathrm{EVA}] \rightarrow [[\mathrm{P}_i \neq \mathrm{P}] \wedge [\mathrm{P\ HANS}] \wedge \sim [\mathrm{P\ EVA}]]]]$

(c) $\exists \mathrm{c}\ [\forall \mathrm{c}_i[[[\mathrm{QD\ EVA}] \supset [0 + \mathrm{c}_i]] \rightarrow [\exists \mathrm{c}_k\ [[\mathrm{c}_k \supset \mathrm{c}_i + \mathrm{c}] \wedge$
$[[\mathrm{QD\ HANS}] \supset [0 + \mathrm{c}_k]] \wedge \sim [[\mathrm{QD\ EVA}] \supset [0 + \mathrm{c}_k]]]]]]$

In both cases the premise and the first conjunct of the conclusion define the property relevant to the difference. The last two conjuncts say that this property applies to Hans but not to Eva.[80] This indicates a connection which goes beyond the domain of gradation and motivates the role of the expression $[\alpha \mathrm{c}\ [\mathrm{W\ c}]]$ again from a different angle.

8 Problems with Quantifiers

8.1 The Semantic Form of the Degree Constituent 'viel'

In this section I shall pick up some problems which I have so far skirted, and I shall begin with the element viel (*much*), which I introduced in (269) as the head of DP' (= 'degree-viel'). Its structure must be determined with a view to the adjectival viel, which will be discussed in 8.2.

Of the analysis of viel the following parts are already given. Firstly, in LF, viel is the head of DP' and has an optional internal argument of the category DP. Secondly, DP', as an internal argument, is θ-marked by the comparative of adjectives and in SF it must be an expression of category N which is permissible as a substitution for c, in other words represents a scale value. Thus in SF viel must be an expression of category N/N which maps a scale value into a scale value. Thirdly, viel and wenig (*little*) form a pair of antonyms characterized by the typical +Pol/−Pol properties. This last point suggests a largely parallel structure between viel/wenig and the DAs.

Practically without any arbitrary additional assumptions we thus have the following lexical entries:

(300)(a) /viel/; DEGREE', [(DP) __]; $[\hat{c}[\varepsilon x[[\mathrm{QUANT}\ x] \supset [v + \mathrm{c}]]]]$
(b) /wenig/; DEGREE', [(DP) __]; $[\hat{c}[\varepsilon x[[\mathrm{QUANT}\ x] \subset [v - \mathrm{c}]]]]$

The analysis of DEGREE' into syntactic features which systematically account for the categorial generalizations, must again be left aside here. There are two differences to explain between (300) and the schema of the DAs. The first is that viel has no external argument and thus no θ-role $\underline{\hat{x}}$; in its place there is an operator εx, which together with its argument forms an expression of the category N. The second difference is the absence of the dimension component **DIM** in (300), which means that QUANT is applied directly to x. This is possible according to the stipulations made in 6.2 for QUANT, but it has consequences for the character of x, which I will now discuss.

The basic intuitive idea, which also applies to adjectival viel, is that viel indicates a gradation without specifying any particular dimension, in other words it does not contain any instance of **DIM**. This means that x in (300) is a variable over any quantifiable entities that can be projected onto a scale. I shall generalize accordingly the interpretation of QUANT introduced only syncategorematically in (154):

(301) Int ([QUANT x]) = P(Int(x)), where P is a projection which maps Int(x) onto a scale $\mathbf{D}_k$.

Thus x ranges over any entities gradable by scale – not only dimensions of objects but for example over sets of objects or of masses too. For degree-viel x ranges over the amounts of differences. How this is arrived at and what consequences it has may be illustrated by an example. I presuppose here that all the assumptions made so far, especially the v-conditions, remain valid. Let us consider the SF of (302):

(302)(a) Hans ist viel kleiner als Eva
Hans is much shorter than Eva

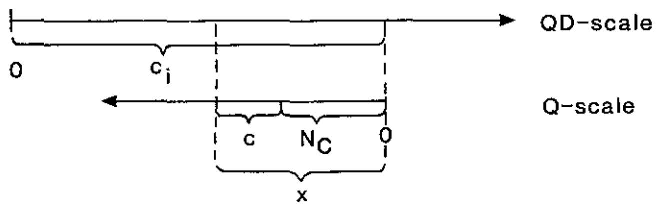
(b) $[[\text{QD H}] \subset \underbrace{[[\alpha c_i\,[[\text{QD E}] = c_i]]}_{\text{v}} - \underbrace{[\alpha x[\exists c[[\text{Q } x] \supset [N_C + c]]]]]]}_{\text{c}}$

Intuitively, (302b) means that [QD H] is below [QD E] by an above-average amount. To elucidate this I have indicated how v and c are instantiated in the matrix adjective kleiner. Regarding the former no comment is needed. The fact that the latter comes about in a regular, compositional way can be seen in the following: viel has no degree complement in (302), so $\hat{c}$ is replaced in accordance with (9) by $\exists$c with narrow scope.[81] Thus c in viel is $\exists$-quantified, and consequently 0EC requires the value N_C for v. So much for the formal derivation. Now what does αx refer to?

According to (302b) x is an entity which on the scale $\mathbf{D}_k$ has a value which includes [N_C + c]. The scale is not specified for a particular dimension, but it follows from the binding of viel by the θ-role $\hat{c}$ of the matrix adjective that it is a scale on which values of difference from [QD H] are measured.

This means that x refers to a quantum of an amount of difference, i.e. to a parasitic entity, so to speak. The scale onto which x is projected is not the scale of height induced by QD but a scale for measuring differences on it. Only the value fixed on this second scale is connected by '–' with the value c_i on the QD scale. What is taking place here is a case of the scale stacking mentioned at the end of 5.1. It can be demonstrated for our purposes as follows:

(303)



The fact that when x is concatenated with c_i the direction of the Q scale is reversed follows from the inversion operation I, which is induced by the '–' of the matrix adjective. The explanation thus given for x in (300) and all the consequences commented on follow from the assumptions made so far and from the generalized interpretation of QUANT in (301).

Finally we have to settle the interpretation of the norm value N_C of the Q scale, which is not identical with the N_C of the QD scale. The minimal assumption is that the comparison class C is to be derived as hitherto, but now the formation of the norm must necessarily refer to the Q scale (which is formed relatively to the QD scale), and this means that N_C is the average amount of difference for the class C regarding the dimension D. In other words N_C on the Q-scale is the average value by which for the class C one object can be above or below another regarding the dimension D of the primary QD scale. I shall show that this interpretation, which does not make any ad hoc assumption necessary, easily explains the widely accepted view that the very tall individuals are the tall among the tall.

In (286b) I noted the correspondence between viel größer (*much taller*) and sehr groß (*very tall*). Thus (300a) gives all the clues for the following lexical entry of the degree element sehr:

(304) /sehr/; DEGREE; $[\varepsilon x\,[\exists c\,[[\text{QUANT } x] \supset [v + c]]]]$

Because of the regular $\exists$-quantification of c, v automatically assumes the value N_C. The whole SF in (304) is an expression of the category N and provides the analysis of the abbreviation SEHR in (178). The representation given there for (178a) is now as follows:

(305)(a) Das Brett ist sehr lang (= (178a))
The board is very long

(b) $[[\text{QUANT MAX B}] \supset [N_C^1 + [\varepsilon x[\exists c[[\text{QUANT } x] \supset [N_C^2 + c]]]]]]$

(c) $\exists x[\exists c[[[\text{QUANT } x] \supset [N_C^2 + c]]] \wedge [[\text{QUANT MAX B}] \supset [N_C^1 + x]]]$

I have given the equivalence (c) to show that x is the facto $\exists$-quantified. This means that the instantiation of c in lang does in fact meet the precondition for 0EC and that v must consequently assume the value N_C. This gives the grounds for the contrastive interpretation of sehr lang in (178) that were left open at the time.

I have distinguished the two norm values in (305) by using superscript indices in order to refer to them. The indices themselves do not have any systematic status, because the N_Cs are defined by their place on the scales. In the sense explained above, N_C^2 indicates the standard value for the distance from N_C^1 by which a member of the class C is long. Abbreviated somewhat: a board is long if it covers the interval [N_C^1 + N_C^2]. (305) then means that [QUANT MAX B] covers the interval [N_C^1 + [N_C^2 + c]], in other words that the board is long among the long ones.

Sehr for its part can quite regularly be an argument of viel, whose θ-role $\hat{c}$ is then not converted into $\exists$c, as in (302), but binds the SF of sehr. In sehr viel größer (*very much taller*), accordingly, three scales are stacked: the QD scale of groß, the Q scale of viel and the Q scale of sehr. Clearly both Q scales must provide a derived value for N_C, because both in sehr and in viel in this combination the difference variable c is $\exists$-quantified. The stacking of scales, i.e. providing a segment of a scale with the properties of a scale of its own, is thus a productive operation in CS, and the recursion of this operation is only limited by practical external conditions.

Incidentally (305) does not cover all the occurrences of sehr: in sentences like (306) sehr must be an adverbial modifier, analogously to adjectives like hinterlistig (*cunning*(*ly*)), hoffnungsvoll (*hopeful*(*ly*)) or PPs like mit großer Anstrengung (*with a great deal of effort*). In this use sehr can govern a DP, as (306c) shows:

(306)(a) Er liebt sie sehr
He loves her very much

(b) Sie haben das Buch sehr gelobt
They praised the book highly

(c) Er ärgert sich viel zu sehr, um unbefangen zu sein
He is much too angry to be impartial

Thus we get the following lexical entry for adverbial sehr:

(307) /sehr/; Adv, [(DP) __]; $[\hat{c}\ [\hat{x}[[\text{QUANT}\ x] \supset [v + c]]]]$

Adv indicates a syntactic specialization of A, which excludes the attributive and predicative use of sehr. If DP is empty, $\hat{c}$ is replaced by $\exists$c, and v, on account of 0EC, assumes the value N_C. What (304) and (307) have in common is obvious. The essential difference is only that adverbial sehr has two θ-roles, while degree sehr has none at all.[82]

There is a particular problem connected with the comparative of viel and wenig. For the degree units this comparative does not appear to emerge regularly by attacking the comparative -er to the base units in (300), as it does in the case of adjectival viel. The reasons are indicated by the following pattern of distribution:

(308)(a) mehr/weniger als 10 Meter lang
more/less than 10 metres long

(b) *mehr/weniger als 10 Meter kurz
more/less than 10 metres short

(c) mehr/weniger als 10cm größer als Hans
more/less than 10cm taller than Hans

(d) mehr/weniger als 10cm kleiner als Hans
more/less than 10cm shorter than Hans

(e) *mehr als Hans groß/größer/klein/kleiner
more than Hans tall/taller/short/shorter

(f) *weniger als Hans groß/größer/klein/kleiner
less than Hans tall/taller/short/shorter

(309)(a) weniger groß/klein als Hans
less tall/short than Hans

(b) *mehr groß/klein als Hans
more tall/short than Hans

(c) 10cm weniger groß als Hans
10cm less tall than Hans

(d) ??10 cm weniger klein als Hans
10cm less short than Hans

(e) *weniger/mehr größer als Hans
less/more taller than Hans

The picture is a confusing one at first sight, but becomes less so in the light of the following observations. The combination mehr/weniger als MP (*more/less than* MP) shows the characteristic distribution of MP. Mehr als and weniger als here act like adjuncts to measure phrases, analogously to *approximately*, *almost* etc. No further complements can come after als (*than*). This is shown by (308). Also, there is a more or less regular comparative to wenig (*little*), which can govern a DP' and a complement, though this weniger is the head of a DP, not of a DP' like the positive wenig: it is only the complement to the positive, not to the comparative of a DA. There is no comparative of viel (*much*) to correspond to this comparative of wenig. This is shown in (309). Thus three cases are to be distinguished, which I shall regard as primary lexical items. Of these, the comparative weniger is transparent, but, as we shall see, this is not important.

The entries for mehr/weniger with an MP complement require some provisional syntactic arrangements, pending clarification within a theory of syntactic categories. I shall assume that the items must have an obligatory complement als MP (*than* MP) and θ-mark the MP, because als is semantically empty here as in comparative complements. They are thus the head of a phrase which for its part must be of category MP, and I shall therefore categorize them here as M. The SF they form too must have the properties of an MP, i.e. the form [**NUM** X], where the instance of **NUM** comes from the complement MP. We thus have the following entries:

(310)(a) /mehr/; M, [__ als MP]; $[\hat{x}[x + [\varepsilon x_i\ [\text{QUANT}\ x_i]]]]$

(b) /weniger/; M, [__ als MP]; $[\hat{x}[x - [\varepsilon x_i[\text{QUANT}\ x_i]]]]$

$[\varepsilon x_i[\text{QUANT}\ x_i]]$ refers, as it has done so far, to any interval of a scale. It is concatenated to the value of x specified by the MP. The result then replaces the difference variable c of the governing DA and thus produces the usual effects of NEC, since it has the numerical value of the MP as its first element. So much for the origin of the data in (308).[83] I shall illustrate their effect by the following pair of sentences, which do not have the same SF but are both valid under the same conditions:

(311)(a) Das Brett ist länger als drei Meter (cf. (262))
The board is longer than three metres

(b) $\exists \mathrm{c}\ [[\mathrm{QD\ B}] \supset [[\alpha x_i\ [[\mathrm{QD}\ x_i] \supset [0 - [3\ \mathrm{M}]]]] + \mathrm{c}]]$

(c) $\exists \mathrm{c}\ [\forall x_i\ [[[\mathrm{QD}\ x_i] \supset [0 + [3\ \mathrm{M}]]] \rightarrow [[\mathrm{QD\ B}] \supset [x_i + \mathrm{c}]]]]$

(312)(a) Das Brett ist mehr als drei Meter lang
The board is more than three metres long

(b) $[\mathrm{QD\ B}] \supset [0 + [[3\ \mathrm{M}] + [\varepsilon x_i\ [\mathrm{Q}\ x_i]]]]$

(c) $\exists x_i\ [[\mathrm{Q}\ x_i] \wedge [[\mathrm{QD\ B}] \supset [0 + [[3\ \mathrm{M}] + x_i]]]]$

The same equivalence can be demonstrated between (262) and (313b)

(313)(a) Das Brett ist kürzer als drei Meter (= (262))
The board is shorter than three metres

(b) Das Brett ist weniger als drei Meter lang
The board is less than three metres long

For the weniger that is comparative in the narrower sense we have the following lexical entry, which shows an obvious similarity to (234) for länger:

(314) /wenig + er/; DEGREE, [(DP) __($\bar{S}$)];
$[\hat{W}\ [\hat{x}\ [\varepsilon x\ [[\mathrm{QUANT}\ x] \subset [[\alpha \mathrm{c}_i\ [\mathrm{W\ c}_i]] - \mathrm{c}]]]]]$

As a matter of fact, (314) derives compositionally from (300b) and the comparative morpheme (265), if we allow U to range over the SF of (300b). In other words, (314) follows from the given premises. Two things are to be noted, though. Firstly, (314) is the head of a DP in an AP, so that the complement clause is subject to the projection conditions discussed in 7.1 with regard to the matrix adjective and receives the corresponding Pro_A where necessary, not the Pro element of wenig (this is the reason why the degree weniger need not be compositional in LF). Secondly, the DP of which weniger is the head is θ-marked by the $\hat{c}$ of the matrix adjective. These two points turn constructions with weniger into an analogue to the equative. To put this differently, weniger, as the head of DP, brings a comparative SF into the position of c. (315) illustrates the effect:

(315)(a) Das Brett ist zwei Meter weniger lang als der Tisch
The board is two metres less long than the table

(b) $[[\mathrm{QD\ B}] \supset [0 + \underbrace{[\varepsilon x\ [[\mathrm{Q}\ x] \subset \underbrace{[[\alpha \mathrm{c}_i\ [[\mathrm{QD\ T}] \supset [0 + \mathrm{c}_i]]]}_{\mathrm{v}} - [2\mathrm{M}]]]]]}_{\mathrm{c}}$

The instantiation of the comparison variable of wenig is indicated by v and that of the difference variable of lang by c.

Let us consider finally cases like 10cm weniger klein (*10cm less short*) (=(309d)). They should be dubious for reasons similar to those accounting for 10cm klein, in other words as a result of violating NEC. The compositional SF is regularly as follows:

(316)(a) ??Hans ist 10cm weniger klein als Fritz (Pro_A ist)
Hans is 10cm less short than Fritz is

(b) $[[\mathrm{QD\ H}] \subset [\mathrm{N}_C - [\varepsilon x\ [[\mathrm{Q}\ x] \subset [[\alpha \mathrm{c}_i\ [[\mathrm{QD\ F}] \subset [\mathrm{N}_C - \mathrm{c}_i]]] - [10\ \mathrm{cm}]]]]]$

The v in $[v - 10\mathrm{cm}]$ is not specified by N_C but by the limit defined by $[\alpha \mathrm{c}_i\ [[\mathrm{QD\ F}] \subset [\mathrm{N}_C - \mathrm{c}_i]]]$. But unlike the limit in regular comparatives this one is dependent on N_C. To make a violation of NEC out of this, the condition must be appropriately reformulated. It seems reasonable to me to leave NEC in the form given in (166) and to classify (316) simply as an indirect violation. The clearer deviancy of weniger als 10cm klein as opposed to 10cm weniger klein would thus be convincingly explained.

Let us notice finally that cases like (317) do not come under the instance of mehr discussed here:

(317)(a) Hans ist mehr dick als groß
Hans is more fat than big

(b) Eva ist mehr anmutig als schön
Eva is more graceful than beautiful

It is not difficult to see that there is no grading of dimensions here. Also, DAs are treated here in a secondary way as EAs. What this means will be explained in section 10.

8.2 Adjectival 'viel' and 'wenig'

The adjectives viel (*much*) and wenig (*little*), which I have so far studiously avoided, are in a sense the gradation items par excellence: they give a scale evaluation without any particular dimension. They are regular adjectives (though with some non-trivial additions) which can occur predicatively, attributively and adverbially:

(318)(a) Das war zu viel
That was too much

(b) Das wenige Geld war bald verbraucht
The little money was soon spent

(c) Er liebt sie so wenig wie er seine Frau Pro_A geliebt hat
He loves her as little as he loved his wife

The basic assumptions as to their structure are already fixed. The lexical entries given in (319) are related to those in (300) in almost exactly the same way as those of the comparison so to those of the degree so.

(319)(a) [viel]; A, [(DP) __]; $[\hat{c}\ [\hat{\underline{x}}\ [[\text{QUANT}\ x] \supset [\text{v} + \text{c}]]]]$

(b) [wenig]; A, [(DP) __]; $[\hat{c}\ [\hat{\underline{x}}\ [[\text{QUANT}\ x] \subset [\text{v} - \text{c}]]]]$

All the stipulations made so far apply to (319) without modification. The lexicon-internal comparative formation takes place regularly by means of (265). One idiosyncrasy to notice is the suppletive realization of [[viel] er] by mehr (if this suppletion is bound directly to (319a) this explains at the same time why mehr cannot have an SF analogous to (314)). In LF mehr, just like weniger, must be compositionally transparent, since the projection of the complement clauses must have access to the corresponding Pro_A, as can be seen from (318c). In addition, (307) already takes account of the fact that adverbial viel is represented by sehr.

All the components necessary for generalizing the gradation theory to cover viel and wenig are now given. To make it do so effectively, we have to settle two interrelated problems concerning the qualification of the adjectival nature of viel and wenig. The first has to do with the range of values assignable to the variable x in (319), i.e. with the external argument of the adjectives, and the second with the quantifier status which viel and wenig apparently have, at least in (ad)nominal position. Both problems go considerably beyond the scope of gradation and are closely related to fundamental questions of the theory of noun phrases and of quantifiers. The following considerations and assumptions are therefore provisional and are only intended to give some clues as to the interlocking of the various theories.

The values assignable to the variable x, as mentioned in 8.1, are entities which can be projected onto a scale by QUANT. Hence they are bound to a scale type (which in the case of the DAs is explicitly stipulated by the instance of **DIM**). In the case of degree-viel the context determines the scale stacking and thus the character of the Q-scale onto which x is projected as a scale of the amounts of difference. In the case of adjectival viel there is no scale stacking given. The value specifying x must therefore take the necessary determinants from the relatum.

In the adverbial use of viel (i.e. sehr and wenig), according to stipulations made earlier, $\hat{x}$ is absorbed by the instance variable of the verb, for instance in example (318c) by the $\hat{y}$ in (320):

(320) $\hat{y}\ [y\ [\text{INST}\ [x_i\ [\text{LOVE}\ x_j]]]]$

According to this, what is measured quantitatively in verbs are the instances of the state or process specified by the verb. Thus the SF of the verb also fixes the kind of quantitative evaluation and the kind of scale. Verbs with an inherent dimension of intensity – whatever that is when we look closely – therefore directly determine a particular type of scale. Examples of this are *love, laugh, complain, push*. In other cases quantification applies to the temporal extent or the frequency of the instances, as in the case of *work, sleep, swim*. In these cases the positive is

usually realized by viel rather than sehr (*he coughs a lot (= often)/he is coughing a lot (= badly)*).[84] There are a large number of imponderables to be cleared up here, but I think the approach indicated is promising.

Let us look at adnominal viel somewhat more closely. What has to be covered here are the classical cases of mass nouns as in viel Wasser (*much water*) and plurals such as viele Leute (*many people*). Cresswell (1976) has made the proposal of treating mass nouns semantically as two-place rather than one-place predicates, the second argument representing a quantity and the first the referent. *Water* then means: 'x is a quantum y of water'. This makes the mass nouns parallel to the DAs, but poses all sorts of difficulties, and is incompatible with the idea of modification adopted here. I shall therefore base myself on a different and widely accepted observation on the mass nouns: it is characteristic that every part of a reference instance of a mass noun again fulfils the condition imposed by the mass noun. Put more simply: each part of water is, again, water. If this borderline is crossed, then we are no longer dealing with a part of a reference instance: an individual leaf is not part of a given reference instance of *foliage* (although it is part of an instance of *leaves*). This conclusion is expressed by the following SF constant:

(321) For X and Y of category N, $[\text{X}\ [\sqsubset\ \text{Y}]]$ is an expression of category S

(322) Int $(\sqsubset) = \subset$

$[\text{X} \sqsubset \text{Y}]$ thus means: X is a subset of Y. The interpretation of '$\sqsubset$' is practically identical with '$\subset$', except that the arguments do not range over scale segments but over quantities of the total defined by Y. I shall leave aside the generalizations that this allows concerning the structure of CS. I shall represent '$\subset$' and '$\sqsubset$' differently to avoid confusion.[85] The characteristic property of mass nouns can now be represented as follows:

(323) A reference instance x has the property P if:
$\forall y\ [[y \sqsubset x] \rightarrow [\text{P}\ y]]$

If WATER specifies such a property, then we get lexical entries like the following for mass nouns:

(324) [Wasser]; N; $[\hat{\underline{x}}\ [\text{WATER}\ [\alpha x_i\ [x_i \sqsubset x]]]]$

The expression $[\alpha x_i\ [x_i \sqsubset x]]$ is the characteristic feature of mass nouns. Its structural similarity to $[\alpha c\ [\text{W c}]]$ is no coincidence, except that it does not define a path, because the subsets of x are unordered. On the other hand, we can easily see that x can be projected by QUANT onto the quantity scale of cardinality. Thus, using the modification notation from (12) we get the following SF for viel Wasser:

(325) $\hat{x}\ [[\text{WATER}\ [\alpha x_i\ [x_i \sqsubset x]]] \wedge \exists c\ [[\text{QUANT}\ x] \supset [\text{N}_C + \text{c}]]]$

Presupposing the projection conditions for complement clauses set up in 7.1, we can now derive the correct SF for sentences like (326) quite regularly:

(326)(a) Er trinkt mehr Bier als (er trinkt Pro_A) Wein
He drinks more beer than (he drinks) wine

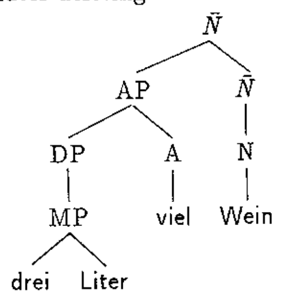
(b) Hier ist mehr Wasser als dort (ist Pro_A Wasser)
Here there is more water than (there is water) there

(c) Er hat so viel Geld wie er braucht (Pro_A Geld)
He has as much money as he needs (money)

(d) Das ist so wenig Sand wie ich dachte (das ist Pro_A Sand)
That is as little sand as I thought (that is sand)

A certain problem arises for measure phrases like drei Liter (*three litres*), fünf Kilo (*five kilos*) etc., which have no θ-role to make them suitable as adnominal modifiers but are expressions of the category N. There are two possible ways to a solution. The first consists in postulating the LF structure (327) for drei Liter Wein and later deleting viel:

(327)



This would require generalization of the deletion in (270b) to cover all instances of viel. (By analogy, all comparatives with MPs like 10m länger (*10m longer*) should then have a degree viel in their LF, which is perfectly compatible with its analysis). The second way would be not to postulate any hidden instances of viel, but rather to modify the SF of mass nouns as follows:

(328) [Wasser]; N, [(MP) __]; $[\hat{c}\ [\hat{\underline{x}}\ [[\text{WATER}\ [\alpha x_i\ [x_i \subseteq x]]] \wedge [[\text{QUANT}\ x] \supset \text{c}]]]]$

This revives in a limited form the second argument of the mass nouns as proposed by CRESSWELL. The SF of Wasser in a sense contains the SF of viel, though without the variable v, so that there can be no norm-relatedness without an explicit viel. For this alternative the filter version would have to be generalized to apply to adjectival viel. Both solutions involve certain redundancies, but are otherwise compatible with all the assumptions made so far. I shall leave the decision open, but for the purpose of illustration I shall use the form (324).

The parallelism between mass nouns and the plural provides many important clues regarding the SF of the plural. In harmony with most analyses of the plural I view the reference of *leaves* or *people* as a set. For the time being the only difference between the plural and mass nouns is that the property represented by a mass noun refers to (all) subsets and that represented by the plural refers to the elements of the set which provides the external argument. As a first approximation the plural morpheme can thus be given the following SF:

(329) [Plural]; $[\hat{P}\ [\hat{\underline{x}}\ [\text{P}\ [\alpha x_i\ [x_i \in x]]]]]$

Here P is a variable of category S/N, which is specified by the SF of the pertinent nominal expression, 'ϵ' is the usual element set relation and is interpreted as such in CS. (We still have to account for the condition that the cardinality of x is greater than 1, a problem to which I will return shortly.) Applied to a noun like Blatt (*leaf*) with the (simplified) SF representation $[\hat{\underline{x}}\ [\text{LEAF}\ x]]$, (329) produces the result:

(330) [Blätt + er]; N; $[\hat{\underline{x}}\ [\text{LEAF}\ [\alpha x_i\ [x_i \in x]]]]$

Here, just as for in mass nouns, x is a variable of category N which refers to a set (thus with the help of the plural, sets are categorized as individuals). Hence x can be projected by QUANT onto the scale of cardinality. Analogously to (325) for viel Wasser we get (331) for viele Blätter:

(331) $\hat{\underline{x}}\ [[\text{LEAF}\ [\alpha x_i\ [x_i \in x]]] \wedge \exists \text{c}\ [[\text{QUANT}\ x] \supset [\text{N}_C + \text{c}]]]$

An intricate problem involved in the theory of NPs is the syntactic status of [Plural]. In PF [Plural] is usually realized as an affix – often accompanied by phonological processes such as umlaut – to the noun and the attributes and determiners congruent with it. This suggests the view of [Plural] as a feature of NP which 'percolates' to the head of the NP, to the head of the modifiers and to the determiner (I cannot go into the relevant principles here, which are by no means trivial). The morphosyntactic domain of congruence, however, is not identical with the scope of [Plural] in LF. Let us look at this problem a little more closely.

I have so far treated viel as a regular modifier which combines with the head of the NP just like other attributes. Viel grünes Wasser (*much green water*), for example, gets the following SF:

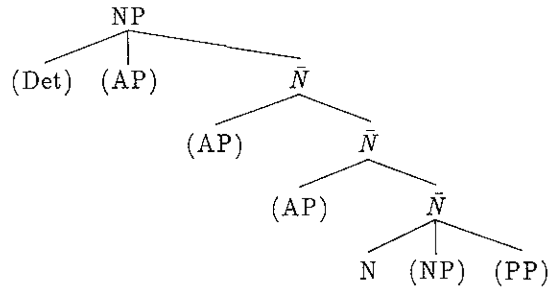
(332) $\hat{x}\ [[\text{WATER}\ [\alpha x_i\ [x_i \subseteq x]]] \wedge [\text{GREEN}\ x] \wedge \exists \text{c}\ [[\text{QUANT}\ x] \supset [\text{N}_C + \text{c}]]]$

This leads to the right result for mass nouns because each subset of x has the same properties as x – except for quantity. This does not apply in the same way to count nouns. The properties of subsets of the overall set are also properties of the overall set itself in the case of homogeneous sets, but the properties of the elements in general are not.[86] In viele dünne Blätter (*many thin leaves*), dünn modifies the individuals and viel modifies the set. To put it technically: viel must have x from (330) as its argument, but dünn must have x_i. Neglecting the internal structure of groß (*large*), the SF of wenige große Blätter (*few large leaves*) must therefore have something like the following SF:

(333) $\hat{\underline{x}}\ \underbrace{[[\hat{x}_j\ [\text{LEAF}\ x_j] \wedge [\text{LARGE}\ x_j]]}_{\text{P}}\ [\alpha x_i\ [x_i \in x]] \wedge$
$\wedge \exists \text{c}\ [[\text{QUANT}\ x] \subset [\text{N}_C - \text{c}]]]$

The x_j can be made to disappear by lambda conversion. Then LEAF and LARGE both have the argument introduced by [Plural]. P marks the SF of the constituent modified by [Plural]. To produce this result, the LF of an NP must have two domains of modification, of which the inner one is θ-marked by [Plural]. It would go far beyond our present scope to motivate this division by independent syntactic arguments. It is conceivable that the outer domain of modification is that of the NP specifier, but this requires further exploration. I shall make the following provisional assumption for the structure of NP:

(334)



The instance of $\bar{N}$ directly dominated by NP dominates the expression which is marked by [Plural] in LF, say by adjoining [Plural] to this category as a feature. The effect of [Plural] in SF is that the θ-role $\hat{P}$ of the plural morpheme (329) θ-marks the corresponding instance of $\bar{N}$, thereby 'pluralizing' the external argument of N and of all modifiers dominated by $\bar{N}$.

Given this proviso, everything dominated by $\bar{N}$ belongs to the inner domain of modification, while the outer modification domain of NP lies outside $\bar{N}$. The syntactic behaviour of attributive viel and wenig can now be described by the following conditions:

(335) If viel/wenig is the head of AP then:

(a) AP is not dominated directly by $\bar{N}$, and

(b) if $\bar{N}$ is modified by AP, then either $\bar{N}$ is marked by [Plural] or the head of $\bar{N}$ is a mass noun.

This formulation is provisional and should be derivable from general principles in the framework of a properly elaborated theory of NPs. From (335a), together with the assumption that [Plural] is dominated directly by NP, it follows that viel never occurs within the domain of [Plural], and from (b) it follows that the external argument of viel refers to a set.

According to (335) the LF domain of [Plural] is not coextensive with its morphosyntactic domain of agreement because this also assigns the plural marking to viel and to the determiner.

We now see a further aspect of the slight difference between mass nouns and the plural of count nouns: the characteristic feature of the former is word-internal, whereas the plural is a property of the inner domain of modification, and in a lexical account of inflectional morphology it must be appropriately raised, for example in the way discussed by PESETSKY (1985).[87] Mass nouns like Vieh (*cattle*) and Laub (*foliage*) transform, so to speak, a plural, word-internally, into a mass noun. Compare for example, (330) with (336):

(336) [Laub]; N; $[\underline{\hat{x}}$ [LEAF $[\alpha x_i\ [x_i \in [\alpha x_j\ [x_j \subset x]]]]]]$

Collective nouns like Gruppe (*group*), Komitee (*committee*), Menge (*set*), Ensemble (*ensemble*), Haufen (*heap*) define the word-internal plurality of an item according to the following schema:

(337) [Gruppe]; N; $[\underline{\hat{x}}\ [[\mathrm{Q}\ x] \wedge [\mathrm{P}\ [\alpha x_i\ [x_i \in x]]]]]$

Q represents the property of the whole and P the property of the elements. In Gruppe both are largely indeterminate. Rather, they are parameters to be specified in CS.

Given the assumptions about the plural and mass nouns and the condition (335) the following acceptability distribution and the SF structure of the various cases can be derived:

(338)(a)	viele Blätter	viel Laub	*ein vieler Haufen
	many leaves	*much foliage*	*a much heap*
(b)	große Blätter	*großes Laub	ein großer Haufen
	large leaves	*large foliage*	*a large heap*
(c)	rote Blätter	rotes Laub	ein roter Haufen
	red leaves	*red foliage*	*a red heap*

Ein vieler Haufen violates (335), since Haufen is neither a mass noun nor a plural, and großes Laub is deviant, since Laub does not fulfil the dimensional requirement of groß.[88]

I have mentioned that the cardinality of x must be greater than 1. This condition is linked with the possibility of modifying the plural by numerals greater than 1. This would suggest that we should assign the plural a second internal argument and should formulate (329) finally as follows:

(339) [Plural]; Suffix, [(Z) $\bar{N}$__]; $[\hat{n}[\hat{P}[\underline{\hat{x}}\ [[\mathrm{P}\ [\alpha x_i\ [x_i \in x]]] \wedge [[\mathrm{QUANT}\ x] \supset \mathrm{n}] \wedge [\mathrm{n} \supset 2]]]]]$

Here n is a variable over numerical values, $\hat{n}$ is replaced by $\exists$n if the NP does not contain a numeral Z. To rule out expressions like fünf viele Blätter (*five many leaves*) the filter condition (270b) must be extended to cover numerals (which occur as part of MP). Here too an alternative can be constructed which introduces numerals as an argument of viel and deletes this in the surface structure. I shall not spell out this version.

The distinction between inner and outer modification, important for placing [Plural], has rather far-reaching consequences. Examples like (340) show clearly that the θ-marking of NP arguments by a lexical predicate is sensitive to this distinction:

(340)(a) Viele junge Arbeiter haben die Resolution unterschrieben
Many young workers have signed the resolution

(b) Die Jungen werden den Mädchen helfen
The boys will help the girls

(c) Hans legt die Bleistifte in die grünen Schachteln
Hans is laying the pencils into the green boxes

The signing in (a) must be ascribed to the individual workers, not to the set, which is formed by the plural and evaluated quantitatively by viele. The case exemplified by (b) is less clear: here either the groups or their members could be meant. The traditional way of discussing this problem is to distinguish between collective and distributive interpretations, a distinction often noted in connection with alle (*all*). The relations set up between pencils and boxes in (c) can similarly be interpreted as collective or distributive. Technically, this means that in the collective interpretation the coindexing brought about by θ-marking applies to the external argument of the NP and in the distributive interpretation it applies to the external argument of $\bar{N}$ in accordance with (7). The correct formulation of this condition must be given on the basis of an appropriate theory of the structure of NPs.[89] I shall indicate the result in a simplified form by means of an example:

(341)(a) Viele Kinder schwimmen
Many children swim

(b) $[\varepsilon x_i\ [[\text{MANY}\ x_i] \wedge [\text{CHILD}[\alpha x_j\ [x_j \in x_i]]]]]\ [\hat{\underline{x}}_i[\text{SWIM}\ x_i]]$

(c) $[\varepsilon x_i\ [[\text{MANY}\ x_i] \wedge [\text{CHILD}[\alpha x_j\ [x_j \in x_i]]]]]\ [\hat{\underline{x}}_j[\text{SWIM}\ x_j]]$

MANY is an abbreviation of the regular SF of adjectival viel without a degree complement, i.e. with norm-relatedness.

The difference between inner and outer modification is directly related to the second problem mentioned above regarding adjectival viel, namely its quantifier property. The subject is a complex one and the literature on it is immense, hence it cannot be dealt with adequately here. Nevertheless I shall discuss one consideration which seems to be instructive regarding the status of viel/wenig and which is closely linked with the observations just made.

Most theories of quantifiers combine two aspects of quantification without distinguishing them systematically. I shall provisionally call them the *referential* and the *quantifying* function. The referential function is obviously carried by the NP specifier when the NP is in referential position. It is qualified by the determiner (or the absence thereof) regarding the type of reference. The quantifying function is nothing but modification regarding the outer domain of modification. The difficulty which leads to an insufficient distinction being made has two sources. In the first place, in many languages unspecified particular reference is not indicated: the determiner constituent of the NP remains empty. If such a reference instance is then quantified, the corresponding modifier seems to carry out both functions. This is typically the case in constructions like wenig Brot (*little bread*), viele Kinder (*many children*), mehr Leute (*more people*). Secondly, there are expressions which apparently take on both functions and have set the course for the treatment of the whole problem. This seems to apply to jeder (*each/every*), manche (*several*), einige (*some*). I cannot enter into an argumentation for this point of view here, but I shall illustrate the idea by some examples:

(342)(a) ein Blatt εx_i [LEAF x_i]
a leaf

(b) Blätter εx_i [LEAF $[\alpha x_j\ [x_j \in x_i]]$]
leaves

(c) jedes Blatt $\alpha x_i\ [[x_i \in x] \wedge [\text{LEAF}\ x_i]]$
each leaf

(d) alle Blätter $\alpha x_i\ [[x_i \in x] \wedge [\text{LEAF}\ [\alpha x_j\ [x_j \in x]]]]$
all (the) leaves

(e) viele Blätter $\varepsilon x_i\ [[\text{MANY}\ x_i] \wedge [\text{LEAF}\ [\alpha x_j\ [x_j \in x_i]]]]$
many leaves

The actual specification of reference is carried out exclusively by εx_i or αx_i. The free variable x in (c) and (d) is a parameter to be fixed in CS by the reference domain. The lexical entries for the specifiers, if they are to be treated as adjuncts, must be something like this:

(343)(a) /ein/; Det; $\hat{P}\ [\varepsilon x[\text{P}x]]$

(b) /jeder/; Det; $\hat{P}\ [[\alpha x \in x_r] \wedge [\text{P}x]]$

(c) /alle/; Det; $\hat{P}\ [[\alpha x_i \in x] \wedge [\text{P}x]]$

The standard conversion produces the usual interpretation of the universal quantifier for jeder and that of the (non-plural) existential quantifier for ein. The definite article must be distinguished from ein by stipulating the given reference relation. If the determiner constituent is empty, the θ-role for the external argument of the NP is replaced by εx as specified in (10) without further modification.

These rather provisional conjectures say nothing about what other reference specifications might be like. What I wanted to make clear is that viel and wenig are modifiers of outer modification domains, and they do not per se specify any reference instance. Alle, jeder, manche, einige, der (*the*), dieser (*this*) introduce reference instances, alle, manche, einige with an outer modification at the same time. This clears up the ambivalent status of viel and wenig, which VON STECHOW (1985) and others have observed: they are modifiers without any reference capacity but with an outer modification domain.

8.3 The Scope of Quantifiers in Degree Complement Clauses

In the discussion of complement constructions I have so far avoided quantified NPs, because they entail a problem which requires separate treatment.

A sentence like (344a) applies in the same situation as (344b), that is if it is true for every girl that Hans is taller than she is:

(344)(a) Hans ist größer als alle Mädchen
Hans is taller than all the girls

(b) Alle Mädchen sind kleiner als Hans
All the girls are shorter than Hans

However, under the analysis developed so far (344a) gets an SF which only requires that Hans should be taller than the shortest girl. If we abbreviate the SF of alle Mädchen to $[\alpha x[\mathrm{M}\ x]]$ (neglecting the plural and the specific reading of alle as opposed to jede (*every/each*) does not affect the point at issue), then for (344a) we get the regular SF (345a):

(345)(a) $\exists \mathrm{c}\ [[\mathrm{QD}]\ \mathrm{H} \supset [[\alpha \mathrm{c}_i\ [[\mathrm{QD}\ [\alpha x\ [\mathrm{M}\ x]]] \supset [0 + \mathrm{c}_i]]] + \mathrm{c}]]$

(b) $\exists \mathrm{c}\ [\forall \mathrm{c}_i\ [\forall x\ [[\mathrm{M}\ x] \rightarrow [[\mathrm{QD}\ x] \supset [0 + \mathrm{c}_i]]]] \rightarrow [[\mathrm{QD}\ \mathrm{H}] \supset [\mathrm{c}_i + \mathrm{c}]]]]$

The standard equivalence (345b) makes the problem clear: the interval c_i, which must be exceeded by [QD H], must be covered by all [QD x], in other words even by the shortest girl. This means that the universal quantifier and the condition [M x] in the complement clause have too narrow a scope. The correct SF of (344a) must be SF-equivalent to (346), and it is not important whether $\exists$c has wide scope or is within the scope of $\forall x$. Both versions give the correct truth conditions.

(346) $\exists \mathrm{c}\ [\forall x\ [[\mathrm{M}\ x] \rightarrow \forall \mathrm{c}_i\ [[[\mathrm{QD}\ x] \supset [0 + \mathrm{c}_i]] \rightarrow [[\mathrm{QD}\ \mathrm{H}] \supset [\mathrm{c}_i + \mathrm{c}]]]]]$

In order to derive this structure the quantified phrase alle Mädchen in LF should have wider scope than the quantifier $\alpha \mathrm{c}_i$, which is introduced with the formation of the comparative, and this is where the problem lies.

The Q-raising in LF discussed by MAY (1977) holds out the prospect of a solution. The operation raises a quantified NP into a position in which it has the sentence it is contained in as its scope. For our problem such an operation must be required to take the quantified phrase into the matrix sentence, that is, to extract it from the complement clause, because a quantifier which stays in the complement clause is in the scope of $\alpha \mathrm{c}_i$ after the SF of the complement clause has been substituted for W in $[\alpha \mathrm{c}_i[\mathrm{W}\ \mathrm{c}_i]]$. So if Q-raising in LF has the required properties for independent reasons, the problem is solved without any extra assumptions, since the SF of sentences like (344a) then has the correct wide scope for $[\alpha x\ [\mathrm{M}\ x]]$.[90] What makes the solution questionable is the fact that Q-raising is presumably S-bound, in other words it cannot cross a sentence boundary (cf. for example CHOMSKY (1981, p. 144)). The situation is controversial, and I shall therefore outline a solution that would be independent of Q-raising.

Assuming it is an inherent property of $[\alpha \mathrm{c}_i\ [\mathrm{W}\ \mathrm{c}_i]]$ that the instances of c_i are formed relative to the carrier of the instances, $[\alpha \mathrm{c}_i\ [\mathrm{W}\ \mathrm{c}_i]]$ defines a path on the scale for each individual. If several individuals are identified in its domain, then $[\alpha \mathrm{c}_i\ [\mathrm{W}\ \mathrm{c}_i]]$ defines for each of them the appropriate scale path. This amounts to a stacked quantification which relativizes the inner quantifier to the outer one. The formal representation of this can be that $\alpha \mathrm{c}_i$ is related to a quantor within its domain by a common index. This may be expressed by the following stipulation:

(347) $[\alpha_j\ \mathrm{c}_j\ [\mathrm{X}]]$ assigns the index j to the first universal or existential quantifier in X.

For the ensuing binding of the operators there are the following SF-equivalences:

(348)(a) $\mathrm{P}\ [\alpha_j\ x\ [\forall_j\ y\ [[\mathrm{Q}\ y] \rightarrow [\mathrm{R}\ xy]]]] \equiv$
$\forall y\ [[\mathrm{Q}\ y] \rightarrow [\forall x\ [[\mathrm{R}\ xy] \rightarrow [\mathrm{P}\ x]]]]$

(b) $\mathrm{P}\ [\alpha_j\ x\ [\exists_j\ y\ [[\mathrm{Q}\ y] \wedge [\mathrm{R}\ xy]]]] \equiv$
$\exists y\ [[\mathrm{Q}\ y] \wedge [\forall x\ [[\mathrm{R}\ xy] \rightarrow [\mathrm{P}\ x]]]]$

The effect of the quantifier indexing in (347) is thus the same as that of Q-raising, except that it is not defined as a property in LF but as an intrinsic property of degree complements in SF. I have already relied on the scope effect brought about by this quasi raising when I formulated the superlative. Presupposing (348), the special conditions of the superlative can also be formulated as part of the complement clause suppleted by -st. (273) would then have to be replaced by (349):

(349) $[\hat{U}\ [\exists \mathrm{c}\ [[\hat{v}\ \mathrm{U}]\ [\alpha_j\ \mathrm{c}_i\ [\forall_j\ y\ [[[\mathrm{P}\ y] \wedge [y \neq x]] \rightarrow [[(\mathrm{U})\ \mathrm{c}_i]\ y]]]]]]]$

The assumption of (347) is not implausible, but it does require a somewhat unusual stipulation of quantifier relativization. It would therefore be a more interesting solution if it could be shown that Q-raising, which is independently needed, has the required properties. I must leave this alternative open, and shall just comment on three other points which apply equally to both alternatives.

Firstly, the raising discussed is apparently only necessary for universal quantification, not for existential quantification. We can easily see that for (350) the SF yields the same result with or without raising.

(350) Hans ist größer als einige Mädchen
Hans is taller than some girls

To see this we simply have to replace $\forall x$ by $\exists x$ and the first '$\rightarrow$' by '$\wedge$' in (345b) and (346). The reason why both representations specify the correct conditions is that the shifting of the scope does not alter the fact that for some x [QD H] exceeds the limit c_i set by [QD x].[91] But this cannot further be generalized: as I showed in the preceding section, viel and wenig do not involve the universal quantification but the existential quantification of a set. Nevertheless in sentences like (351) the complement NP must have wide scope:

(351) Hans ist größer als viele Mädchen
Hans is taller than many girls

The raising of embedded quantifiers in complement sentences must therefore be generally valid.

Secondly, everything said so far about the comparative applies equally to equative constructions. A predictable side-effect occurs:

(352) Hans ist so groß wie alle Mädchen
Hans is as tall as all the girls

The sentence does not require, but it does suggest, that all the girls are equally tall. The reason for this effect can be seen when the SF of (352) is equivalently converted:

(353) $\forall x$ [[M x] $\rightarrow \forall \mathrm{c}_i$ [[[QD x] $\supset$ [0 + c_i]] $\rightarrow$ [[QD H] $\supset$ [0 + c_i]]]]

The preferential interpretation of '$\supset$', that [QD H] does not exceed c_i, is only possible if all x from [QD H] cover the same interval c_i.

Thirdly, sentences like (354) have the character of antinomies as discussed in 7.5.

(354)(a) Hans ist größer als kein Mädchen
Hans is taller than no girl

(b) Er kennt sie länger als er niemanden sonst kennt
He knows her longer than he knows anybody else

This is only possible if kein (*no*) and niemand (*nobody*) are analysed as existential quantifiers within the scope of sentence negation, and if Q-raising applies only to the quantifier, but not to the negation incorporated in the surface. In other words the negation must remain part of the complement clause in order to produce the antinomy described earlier.[92] It is not important, incidentally, whether the negation has wide scope over an existential quantifier or, after equivalent conversion, is within the scope of a universal quantifier:

(355)(a) $\forall x$ [[M x] $\rightarrow \exists$c [$\forall \mathrm{c}_i \sim$ [[QD x] $\supset$ [0 + c_i]] $\rightarrow$ [[QD H] $\supset$ [c_i + c]]]]

(b) $\exists x$ [[M x] $\wedge \exists$c [$\forall \mathrm{c}_i \sim$ [[QD x] $\supset$ [0 + c_i]] $\rightarrow$ [[QD H] $\supset$ [c_i + c]]]]

(a) and (b) produce the same antinomy: it makes no difference whether an interval outside the scale is sought for one or for all the individuals for comparison.

Consider finally the corresponding cases in the equative:

(356)(a) Hans ist so groß wie kein Mädchen
Hans is as tall as no girl

(b) $\forall x$ [[M x] $\rightarrow$ [$\forall \mathrm{c}_i$ [$\sim$[[QD x] $\supset$ [0 + c_i]] $\rightarrow$ [[QD H] $\supset$ [0 + c_i]]]]]

I have already explained in 7.5 why negated complements in the equative do not produce an antinomy but are not very informative. Although (356b) is fulfilled if there is an interval c_j that is covered by [QD H], but not by [QD x] for any x, which corresponds to the comparative reading Hans ist größer als alle Mädchen (*Hans is taller than all the girls*), this is not the truth condition that (356b) represents. Rather, the domain of variation of [QD x] limits more clearly the part of the scale in which such a c_j could lie. This is no doubt why (356) seems less dubious than Hans ist so groß wie Erna nicht ist (*Hans is as tall as Erna is not*).

Incidentally, the quantifier raising in (356b) has been applied after a regular shift of the negation in the complement clause. Otherwise (356b) would not be correctly interpreted. This suggests that the scope relations of quantifier and negation may be changed under raising only by equivalent conversion, so that for the comparative too (355b) (and not (a)) is the conversion to be applied to the SF of (354a).

9 More Degree Items

9.1 The Structure of 'zu' and 'genug'

In this section we shall derive some corollaries from the theory developed so far. First I shall consider combinations like **groß genug** (*tall enough*) and **zu groß** (*too tall*). The whole spectrum of characteristic properties of these combinations can be derived if they are analysed as analogues to the equative and the comparative respectively. The starting point is the following.

A **genug** and **zu** A govern essentially the same optional complements, notably infinitives with **um zu** (*to*) and PPs with **für** (*for*). These complements define a criterion which I shall for the present call K. This criterion (which does not have to be specified explicitly) specifies the variable v in the case of **zu** (like the complement of the comparative) and the difference variable c (like the complement of the equative) in the case of **genug**. As a first approximation we thus get the following analyses:

(357)(a) **Hans ist zu klein** $\exists$c [[QD H] $\subset$ [K – c]]
Hans is too short

(b) **Hans ist klein genug** [[QD H] $\subset$ [N_C – K]]
Hans is short enough

(c) **Hans ist nicht zu groß** $\sim$ [$\exists$c [[QD H] $\supset$ [K + c]]
Hans is not too tall

(d) **Hans ist nicht groß genug** $\sim$ [[QD H] $\supset$ [0 + K]]
Hans is not tall enough

From this starting point the following properties follow straight away:

Firstly: **zu** allows measure phrases and other DPs, while **genug** does not, since with **genug** the variable c is specified by K. With **zu** MPs are possible, because K does not violate 0EC.

Secondly: **zu** can never be norm-related, because v is specified by K.

Thirdly: with –Pol-A **genug** must be norm-related, because otherwise SMC would be violated.

Fourthly: **zu groß** and **zu klein** are contrary if K is the same. This is the same as with **groß** and **klein** in the positive, except that K occurs here instead of N_C. On the other hand **groß genug** and **klein genug** are not contrary, since for example the conjunction of (357b) and the negation of (357d) is not contradictory: there can be a K which satisfies both conditions.

Fifthly, **zu** and **genug** – with the well-known provisos – are dual to each other. Thus (a) and (d) are equivalent, and (b) and (c) are equivalent on condition that Hans is short. The proof is similar to that in the comparative and the equative.

It now has to be shown how the representations assumed are brought about compositionally and how K must be sharpened.

I assume to begin with that in SF the complements that are either explicit or have to be supplemented contextually determine a proposition P. For **um zu** with the infinitive the proposition is explicitly determined by LF. For complements like groß genug für diesen Zweck (*tall enough for this purpose*) P must be constructed by interpretation rules. I shall not go into the intricate problems involved, because they are not important here. P defines a condition for a limit (both upper and lower) regarding the dimension specified in the governing adjective. The specification of K for **genug** can then be formulated as follows:

(358)(a) Hans ist klein genug
Hans is short enough

(b) $[[\text{QD H}] \subset [\text{N}_C - \underbrace{[\alpha c_i\ [\text{P} \rightarrow [[\text{QD H}] \subset [\text{N}_C - c_i]]]]]]}_{\text{K}}$

(c) $\forall c_i\ [[\text{P} \rightarrow [\text{QD H}] \subset [\text{N}_C - c_i]] \rightarrow [[\text{QD H}] \subset [\text{N}_C - c_i]]]$

The expression indicated by K defines the distance of [QD H] from N_C when P is fulfilled, and the sentence says that this is indeed the distance of [QD H]. Thus K specifies a limit which must be reached – as an upper limit in the case of +Pol-A and as a lower limit in the case of –Pol-A – for the property defined by A genug to be fulfilled.

For zu A the situation is more complicated, as it is in the comparative. In this case K specifies a limit (upper and lower) which is not exceeded if P is valid, and zu A indicates that the limit actually is exceeded.

(359)(a) Hans ist zu klein
Hans is too short

(b) $\exists c\ [[\text{QD H}] \subset \underbrace{[[\alpha c_i\ [\text{P} \rightarrow [\sim \exists c_j[[\text{QD H}] \subset [c_i - c_j]]]]]}_{\text{K}} - c]]$

(c) $\exists c\ [\forall c_i\ [\text{P} \rightarrow [\sim \exists c_j\ [[\text{QD H}] \subset [c_i - c_j]]]] \rightarrow [[\text{QD H}] \subset [c_i - c]]]$

The limit which must not be passed (either upwards or downwards) if P is fulfilled is c_i: P requires that there should be no c_j that passes c_i. zu A says that there is such an interval, namely c.[93]

The representations in (358) and (359) show that K is made up of the condition P and what follows from it regarding the dimension given by the adjective. K must therefore be derived in an appropriate way from P and the SF of the adjective. Only P is defined by the complement, while the SF of the adjective does not come from the complement clause as it does in the comparative and the equative. Incidentally, the possibility of deleting 'v –' associated with the Pro_A of –Pol-As is not involved here. With zu the variable v in the suppleted adjective SF is substituted by c_i, a proper interval which is in accordance with the v-conditions.

To produce SF representations of the form (358b) and (359b) the following lexical entries must be assumed:

(360)(a) [genug]; [A __ (X)];
$[\hat{U}\ [\hat{P}\ [\hat{x}\ [[\text{U}\ [\alpha c_i\ [\text{P} \rightarrow [\alpha c_i\ [[\text{U}\ c_i]\ x]]]]]\ x]]]]$

(b) [zu]; [(GP') __ A(X)];
$[\hat{U}[\hat{c}[\hat{P}\ [[\hat{x}\ [[\hat{v}\ \text{U}]\ [\alpha c_i\ [\text{P} \rightarrow [\sim \exists c_j[[[[\hat{v}\ \text{U}]\ c_i]\ c_j]\ x]]]]]]\ x]]\ c]]$

In both cases X is the optional complement that is θ-marked by $\hat{P}$. U is again a variable for the SF of the adjectives. (b), like the comparative, contains the (avoidable) illegal binding of the variable v by $\hat{v}$ – in fact twice: once in the matrix adjective and once in the (suppleted) complement adjective. In order to make the structure of the SFs in (360) somewhat more transparent, I shall present them again in a simplified form by using K for the criterion in the case of **genug** and K' for the one in the case of **zu**:

(361)(a) **genug**: $[\hat{U}\ [\text{U K}]]$

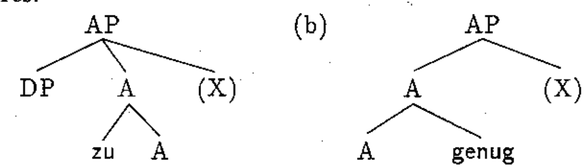
(b) **zu**: $[\hat{U}\ [\hat{c}\ [[v\ \text{U}]\ \text{K'}]\ \text{c}]]$

where K and K' contain both P and the second occurrence of U with the corresponding conditions on variables. But we can see that K occupies the place of c and K' that of v.

The intricacy of the SFs in (360) must not be allowed to obscure the fact that they are only made up of well founded components and do not contain any arbitrary stipulations.

Finally the syntactic status of **zu** and **genug** must be clarified. For obvious reasons both of them must θ-mark the adjective. But since they can be neither modifiers in the true sense nor the heads of phrases, it seems reasonable to regard them as lexical adjuncts like -er and -st. Regarding **zu** it seems to me natural to assume that it is a kind of prefix which enriches the θ-grid of the adjective by $\hat{P}$, just as -er adds the θ-role for complement clauses. Regarding **genug** a suffix status is not so easy to justify. But a closer look reveals that this too is not implausible: the occurrence of **genug** has a fixed position, it must always immediately follow the adjective and it rules out any other inflectional endings (and thus any attributive use too). The special nature of **genug** is thus purely lexical and is covered without any extra rules. I therefore assume the following LF structures:

(362) (a) (b)



I must leave open the question of the relation between **genug** and the related adjectival **genügend** (*sufficient(ly)*).

9.2 Complex Gradation

The various possibilities of syntactic combination between items and constructions of gradation produce complex interlocking relations. Using two cases which exemplify this I shall show that the theory proposed here predicts the correct properties.

(363) Der Tisch ist 10cm zu lang, um kürzer zu sein als das Brett
The table is 10cm too long to be shorter than the board

The complement clause of (363) defines the condition on which the criterion K' of zu is based. In LF it has a PRO-subject that is controlled by the subject of the matrix sentence, in other words is coreferential with der Tisch. This is conveyed by the following LF and SF structures:

(364)(a) um $[_S$ PRO kürzer zu sein als wie$_i$ $[_S$ das Brett ist e_i Pro$_A]]$

(b) $\exists c\ [[\text{QD T}] \subset [[\alpha c_i\ [[\text{QD B}] = c_i]] - c]]$

For the sake of simplicity I have represented by T the PRO in SF that is coreferential with der Tisch. T represents a variable coindexed with the reference instance of der Tisch. (364b) now functions as condition P in the SF of (363), which then is as follows:

(365) $[[\text{QD T}] \supset [[\alpha c_j\ [\exists c\ [[\text{QD T}] \subset [[\alpha c_i\ [[\text{QD B}] = c_i]] - c]] \rightarrow$
$\sim \exists c_k\ [[\text{QD T} \supset [c_j + c_k]]]] + [10\ \text{CM}]]]$

The following conversion makes the fulfilment conditions somewhat more transparent:

(366) $\forall c_j\ [\exists c\ [\forall c_i\ [[[\text{AD B}] = c_i] \rightarrow [[\text{QD T}] \subset [c_i - c]]] \rightarrow$
$\sim \exists c_k\ [[\text{QD T}] \supset [c_j + c_k]]] \rightarrow [[\text{QD T}] \supset [c_j + [10\ \text{CM}]]]]$

In other words [QD T] exceeds every c_j by [10 CM]. But from the premise of the criterion it follows that there is no c_k by which [QD T] exceeds c_j if (364b) is fulfilled. That is, c_j is the upper limit of the segments of [QD T] which are covered by [QD B]. We can see that the intricate truth conditions of (363) are correctly derived. I have taken for granted the effects of the v-conditions.

Sentences like

(367) Hans hat genug Wasser, um mehr zu haben als er braucht
Hans has enough water to have more than he needs

are quite analogous, but I shall not demonstrate this. It is clear on the other hand that the um-zu infinitive here is the complement to A genug, where A must be adjectival viel, which functions as the external modifier of Wasser. In order to cover this fact, we must either assume that a viel that is present in LF is deleted in PF, as in the case of one of the versions of mass noun analysis, or a corresponding component must be adopted into the SF of genug, as in the other version of mass nouns. This, however, would be a second, adjectival lexical entry of genug which would not coincide with the quasi-suffix (360a). In both cases it must be assumed that the combination viel genug is ruled out. It looks as though this should happen through the same condition (270) which rules out MPviel. What this repeated occurrence of the 'invisible' viel implies, independently of how it is treated technically, is that the SF of viel is a kind of general set piece for the organization of SF representations. Indeed, $[[\text{QUANT}\ x] = [v + c]]$ provides a

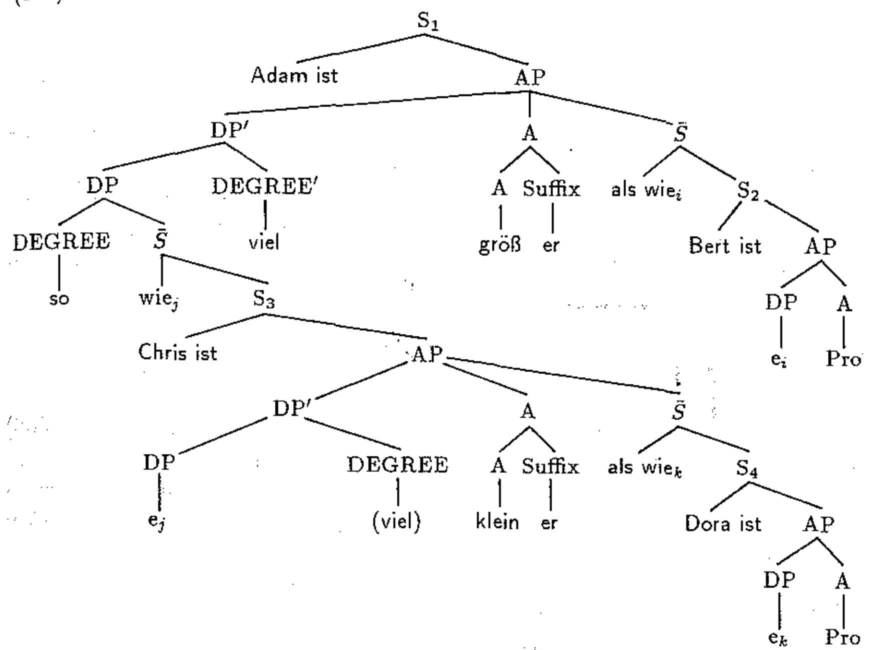
hinge relating an element x to a scale value c – relative to the v-conditions. We shall come across this hinge mechanism again in the analysis of EAs.

Finally I should like to give an example of the recursive interlocking of comparative and equative.

(368) Adam ist so viel größer als Bert wie Chris kleiner ist als Dora
Adam is as much taller than Bert as Chris is shorter than Dora

Here the amounts of difference in two comparative constructions are brought into one equative relationship. The total construction defines a complex property of Adam. The projected LF structure of (368), slightly simplified, is (369):

(369)



The basis of projection for S_4 is S_3, for S_2 it is S_1, and for S_3 it is also S_1, but with a different domain, and this means after the projection of S_2. The Pro$_A$ in S_2 thus corresponds to **groß** in S_1, the Pro$_A$ in S_4 to **klein** in S_3 and (viel) in S_3 is the Pro$_{\text{DEGREE}}$ corresponding to viel in S_1. It has wholly parallel properties to Pro$_A$.

To make the corresponding SF somewhat clearer, I shall abbreviate [QUANT DIM ADAM] as A, and correspondingly for Bert, Chris and Dora, I shall use B, C and D. What the SF expresses is that the difference between A and B is a scale segment c_j which covers the difference between C and D. c_j is measured upwards on the QD scale and the difference between C and D downwards on the QD scale. The two differences are projected onto the Q scale by viel and thus become comparable. The compositionality derived SF of (369) is (370):

(370) $[\mathrm{A} \supset [[\alpha c_i \underbrace{[\mathrm{B} \supset [0 + c_i]]]}_{\mathrm{S}_2} + [\alpha x\ [[\mathrm{Q}\ x] \supset$

$\supset [0 + \underbrace{[\alpha y[[\mathrm{Q}\ y] \supset [0 + [\alpha c_j[\mathrm{C} \subset [[\alpha c_k\underbrace{[\mathrm{D} = c_k]]}_{\mathrm{S}_4}\ - c_j]]]]]]]]]]}_{\mathrm{S}_3}$

I shall not carry out the standard conversion, because the many quantifiers involved would not make it any clearer than (370). The structure of (370) can be made more transparent by shortening the limits defined by S_2 and S_4 to $\mathrm{B}c_i$ and $\mathrm{D}c_k$ and by summarizing the projection onto the Q scale effected by viel and its pro-element as one operator Q. This reduces (370) to the form:

(371) $[\mathrm{A} \supset [\mathrm{B}c_i + \mathrm{Q}\ [\mathrm{C} \subset [\alpha c_j\ [\mathrm{D}c_k - c_j]]]]]$

We see that the proposed theory allows us to derive the correct SF. There is one interesting side effect I should finally like to point out.

(368) expresses a comparison between two comparatives which is produced by the DP' so viel ... wie. For general reasons of parallelism of projection with S_1, the complement clause S_3 must contain the pro-element viel, which, like all Pro_As, cannot be realized in PF:

(372) *A ist so viel größer als B wie*viel* C kleiner ist als D
A is as much taller than B how much C is shorter than D

The fact that the underlined instance of viel in (372) actually does occur in (368) as a pro-element and that this is not an artifact of the theory can be demonstrated indirectly as follows. (373) is deviant, although the sentence does not seem to be ruled out on conceptual grounds. It could mean that the height of A covers precisely the difference between B and C:

(373) ?Adam ist so groß wie Bert kleiner ist als Chris
Adam is as tall as Bert is shorter than Chris

In (373) there is no antecedent for $\mathrm{Pro}_{\mathrm{DEGREE}}$. Nor would it be grammatically possible, since only größer and not groß allows a DP' so viel ... wie (*as much ... as*). On the other hand a comparative is only correct with DP':

(374)(a) Wieviel ist Bert kleiner als Chris?
How much is Bert shorter than Chris?

(b) *Wie ist Bert kleiner als Chris?
How is Bert shorter than Chris?

(373) is thus deviant for the same reasons that (374b) is ungrammatical. The fact that (373) sounds less strange than (374b) is probably an effect of reinterpretation by analogy with sentences like (368), which is not possible for (374). The fact that (368) does not have the same defect as (373) is evidence that the pro-element

in SF predicted by the theory is in fact present. This corresponds conceptually to the condition that the comparison of differences actually does require an overlying Q scale. It is not specified in the SF of (373), but it is introduced as a detour strategy, which results in the semi-grammaticalness of the sentence.

10 The Semantic Form of Evaluative Adjectives

10.1 The Structure of the Lexical Entries

It now has to be shown how the differences between DA and EA established in section 4 are derived within the theory developed here, and which specific properties of EA these differences follow from. The empirical evidence shows clearly that there are real differences between DAs and EAs, and what remains to be done is to show, with as few extra primary assumptions as possible, that they follow from the general theory of gradation. I shall first explain the necessary assumptions and then show how they explain the data exemplified.

Whereas DAs are characterized by the structural schema explained in section 6.1, I assume to begin with that there is no such specific schema for EAs. With respect to their denotation, EAs are thus to be regarded as one-place[94] predicates which differ from DAs in that their internal structure does not show them to be a uniform class in SF. This does not mean of course that they do not have an internal structure but only that this structure does not have a characteristic form for all EAs (I shall return to certain aspects of this structure in 10.2). Nor does it mean that the internal structure cannot be one of class-forming schemata. A plausible example is presented by the colour adjectives, which have a common schema something like (375), with instances as in (376):

(375) $[\hat{x}\ [[\mathrm{COLOUR}\ \mathbf{T}]\ x]]$, where $\mathbf{T}$ is a metavariable ranging over constants of the category N which represent instances of the (cardinal) colour values. COLOUR is a constant of category (S/N)/N, which assigns a value of $\mathbf{T}$ to an individual x.

(376)(a) [grün]; A; $[\hat{x}\ [[\mathrm{COLOUR\ GR}]\ x]]$
green

(b) [farb + ig]; A; $[\hat{x}\ [\exists y\ [[\mathrm{COLOUR}\ y]\ x]]]$
colour + ed

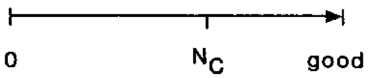
A different common schema can be assumed for adjectives indicating emotional states, such as lustig (*jovial*), traurig (*sad*), froh (*happy*), ärgerlich (*annoyed*), etc. What is important here is only that such suspected common structures are not the characteristic property of the EAs as such.

So far I have not introduced any substantial extra assumption. It is, so to speak, the null hypothesis not to assume any specific structural schema. But this null hypothesis too has an empirical and, I think, well founded basis. There is in fact no overall class of GAs as a lexical class: there is no structural basis for a borderline between absolute and gradable adjectives. Besides clearly non-gradable adjectives like *dead, quadrangular, pregnant*, there are many which are partially gradable (such as the colour adjectives) and others that are canonically gradable, such as *beautiful, comfortable, gentle*. We shall be following up the consequences of this minimal assumption.

Given this starting point an EA is, for the time being, nothing but the specification of a condition P (of varying complexity) which an individual must meet if an EA correctly applies to it. The first substantial assumption that is necessary concerns the fact that EAs can make the fulfilment of this condition gradable and the form in which this happens.

One possible proposal would be to regard P as a 'debit-value', a kind of prototypical standard, the fulfilment of which is expressed by the adjective. Gradation would then refer to different distances of individual instances in relation to the value defined by P. This idea can be illustrated by gut (*good*) on the following type of scale:

(377)



x ist gut would then hold for an individual x if its value lay above N_C on the scale of quality (regarding a class C), and not otherwise. I shall not set out in detail the form in which this idea would be carried out, because it leads to a whole series of difficulties. One of these is the question whether the limit GOOD is always fulfilled for a given class C, what the stipulation that it cannot be exceeded means, and how both N_C and the 'debit-value' can be specified for a class C. While rather artificial but at least possible answers to these questions could be developed, the relations between *good/better/bad/worse* lead to insoluble complications. I shall therefore develop a different solution that can be carried out with fewer stipulations.

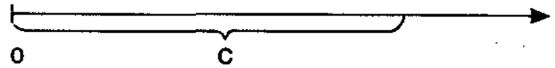
I base my proposal strictly on the null hypothesis that EAs specify primarily an ungraded condition P. If they are not provided with a degree complement they are one-place predicates which are either true or false. This condition can be parametrized, that is their truth does not need to be context-free: *good as a doctor* is different from *good as a chess player* (cf. the discussion in 4.2). The possibility of grading is associated with two conditions which correspond to each other: in LF a DP occurs (normally explicitly) and in CS reference is made to a comparison class C. This reference is obligatory, even if C is not syntactically determined. EAs are only gradable relative to a class C (this is an important difference between EAs and DAs, where C only comes into play if N_C occurs and this is, as we have seen, ruled out in many constructions either syntactically or by the v-conditions. The relation between the occurrence of DP and C must be set up by SF. The basic idea is the following.

The condition P specified by an EA becomes gradable relative to a class C as the individuals of C are ordered relative to each other regarding the degree to

which they fulfil P.[95] More precisely, then, we should say that P is not graded but rather that an ordering is set up for the elements x of C with regard to P. Lacking a better term, we might call this ordering the intensity of P for x.

At this point, where EAs come in for grading, the concept of degree becomes relevant which CRESSWELL (1976) assumed to be the basis of gradation as such: elements of C which are indistinguishable with regard to P are of the same degree. The elements of C then induce an ordering relationship to which the gradation of the EAs refers. This ordering relationship is projected onto a canonical scale, which, as already shown in (133b), can be illustrated thus:

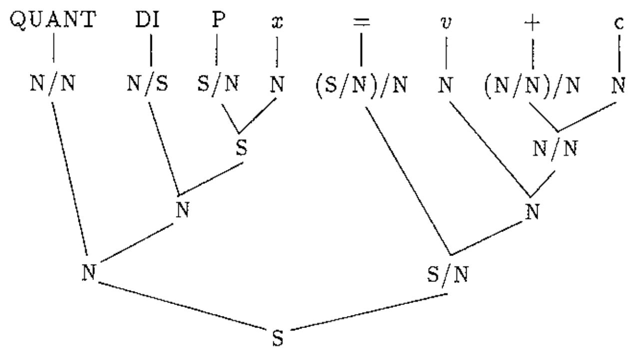
(378)



The zero point, as we can easily see, forms the boundary for the individuals which do not have the property P in C. We shall see that this has systematic consequences. On a scale induced by an EA there is no norm value N_C. Instead, the zero point is C-dependent, which is not the case with DAs. I shall therefore symbolize it as 0_C.

Apart from class-dependence there are a number of properties that 0_C and N_C have in common, including the fact that 0_C, like N_C, does not have to be regarded as a sharply defined value (as distinct from 0_C, 0 in DAs is a uniquely determined value that is independent of the comparison class). The range which C has on the scale has a lower limit determined by 0_C, but it has no specified upper limit, just as the range of C has no specific limit in the case of DAs. Thus the questions raised in connection with (377) do not apply: there is no upper limit for C that always has to be fulfilled and may never be exceeded. There is only one value to specify, and that is the relative zero point 0_C.

The idea just outlined now leads to more formal assumptions. If P is a predicate which allows differing degrees of intensity of a property, then an ordering of instances [P x] is formed relative to a class C with respect to the elements x of C.[96] This ordering is projected onto a canonical scale $\mathbf{D}_k$. This is done, as hitherto, through the function QUANT. Since the arguments of QUANT must be expressions of category N, the ordering must assign to the instances [P x] a value which can be an argument of QUANT. I shall express this by a functor DI (for degree of intensity), so that the graded occurrence of a property P has the following representation in SF:

(379)


P is the metavariable (that I have already discussed) over predicates graded according to intensity. All the other items in (379) have been defined except DI, for which I specify the following interpretation:

(380) Let C be a set of instances in CS and Int(X_i) a predication related to x_i for Int(x_i) of C. Then:

(a) Int ([DI X_i]) = Int (DI) (Int (X_i)) = n_i where n_i is the place value of Int(x_i) in an ordering relation on C regarding the instances of X_i;

(b) Int ([QUANT [DI [$\sim X_j$]]]) = d_o for all Int(x_j) from C.

Thus DI assigns to the elements of C a (relative) place in an ordering induced by P (we are thus not dealing with degrees of truth or a transition from a two-valued to an n-valued or fuzzy logic). The fact that the values of [DI X] can be projected onto a canonical scale at the same time defines strict properties of the ordering relation.[97] We shall see, incidentally, that the scale type needed is $\mathbf{D}_k$, in other words it does not involve an inversion operation I, because gradation for EA generally has only '+'. On the basis of (380b) the projection of the values of DI onto $\mathbf{D}_k$ is stipulated in such a way that the value of all x of C which do not have the property relevant to ordering is the C-dependent zero point of the scale. In the following I shall regard 0_C in SF as a constant, as has been the case with 0 so far, with the interpretation Int(0_C) = d_o, where d_o is the empty initial interval of $\mathbf{D}_k$, and 0 of $\mathbf{D}_k$ is fixed relative to C (I shall qualify this stipulation somewhat in 10.2).

We have now interpreted the only new element that has to be postulated for the SF of EAs. The assumptions made are minimal, since the scale type and scale projection of the canonical case of the DA remain valid. However, in (379) not only the elements are introduced but also their configuration: the framework into which [DI [P x]] is inserted is the SF of viel, which has been argued in detail. The operation which makes EAs gradable is thus nothing else than the combination of (viel) with [DI [P x]], where [$\hat{x}$ [P x]] is the primary lexical SF of the gradable EAs. Accordingly one could regard the transfer of any adjective into an EA as an invisible morphological affixation in PF with the following affix:

(381) /$\emptyset$/ ; Affix; [$\hat{P}$[$\hat{c}$ [$\hat{x}$ [[QUANT [DI [P x]]] = [v + c]]]]]

where P is a variable of category S/N which ranges over the SF of adjectives.[98] The combination of (381) with a suitable adjectival lexical item adds to it a θ-role for degree constituents. If we assume, for the sake of simplicity, that (382a) is the entry for faul (*lazy*), then (381) forms its gradable extension (382b):

(382)(a) [faul]; A; [$\hat{x}$ [LAZY x]]
(b) [$\hat{c}$ [$\hat{x}$ [QUANT [DI [LAZY x]] $\supset$ [v + c]]]]

Whether the transition from (a) to (b) is indeed an optional morphological process invisible in PF or whether it has some other formal status must be decided in the framework of a more detailed theory of the lexicon. I shall assume in the following that the characteristic property of EAs is that apart from the standard entry of the type (382a) they provide optionally an SF of the form (b) as output from the lexicon. I shall call (a) the base reading or B-reading, and (b) the gradable or G-reading of an EA.

Let us now examine the behaviour of the EAs regarding the v-conditions (only the G-reading is relevant here). I have already mentioned three points: firstly, all EAs are +Pol-As, since (381) can only introduce '+'. The effect of the v-conditions on −Pol-As is thus irrelevant. This applies particularly to SMC. In addition this always makes Pro_A in EAs identical with the complete SF of their G-reading. Secondly, EAs do not have any norm-value. Thirdly, instead of 0 they have the value 0_C for v. The last two points have consequences for the v-conditions.

Since EAs always assume the value 0_C for v, it might seem most reasonable to replace v in (381) by 0_C from the outset. However, this is ruled out because of zu A, the comparative and the superlative, which require an explicit specification for v that is different from 0_C. Thus lexically v must still be a variable that is only specified depending on the SF context. For this purpose (i) and (ii) of the CVS (168) must be supplemented by another condition:

(383) If X in [QUANT [DI Z] = [X + Y]] is a free variable, then:
X $\rightarrow$ 0_C

(383), like the variable-specification (168), operates on the SFs derived from the LF, not in the lexicon. Since (383) is structurally more restricted than (168), it is ordered before (168) on the basis of general conditions on the organization of **G**. There is no alternative for the specification of v in the context of (383), and therefore the specification of v is not conditional as in(168). Henceforth CVS indicates all the conditions in (383) and (168).

We have now brought together all the extra conditions that apply to EA, except for the antonymy relations to be discussed in 10.2. They consist in the introduction of the constant DI referring to the ordering relation over C and the introduction of 0_C by CVS. All other assumptions, notably the v-conditions, remain unchanged. What remains to be demonstrated is that the properties discussed in section 4 can be derived from them.

Let us recall first that the common formal properties of EAs are not primary but only obtain on the basis of an extension introduced by (381), i.e. in the G-reading. This makes their formal membership in one single class dependent on the inherent gradability of the B-reading. To the extent that this is dependent on interpretation, the EAs do not form a structurally set class. In the G-reading all EAs are of the type +Pol-A, that is, the structural schema of the G-reading does not define any pairs of antonyms. Thus if any antonymy occurs in EA it must already be established in the B-reading (there will be more to say on this in 10.2). This explains the relative lack of systematicity noted in point (xi) in the antonymy relation in EAs compared to DAs. It then follows from the interpretation of DI and (383) that EAs cannot be norm-related but are C-related instead, as was observed in point (x). We now have to see how the C-relatedness mediated by 0_C makes the EAs contrastive.

The crucial point here is the fact that the B-reading of the EAs corresponds to the contrastive interpretation that the DAs have in the positive. This can be shown as follows:

(384)(a) Anton ist faul
Anton is lazy

(b) [LAZY A]

(c) $\exists$c [[QUANT [DI [LAZY A]]] $\supset$ [0_C + c]]

(385)(a) Anton ist nicht faul
Anton is not lazy

(b) $\sim$ [LAZY A]

(c) $\sim$ $\exists$c [[QUANT [DI [LAZY A]]] $\supset$ [0_C + c]]

(b) is the SF of (a) on the basis of the B-reading, and (c) is the SF on the basis of the G-reading. In accordance with (380b) (b) and (c) are fulfilled under the same conditions for any C since c with existential quantification cannot refer to d_o (cf. (152)). It is now easy to see that 0_C has the effect of contrastiveness for the EAs, just as N_C has for the DAs. I shall return to this correspondence in 10.3. The equal validity of (b) and (c) shows at the same time that the condition (380b) is not an arbitrary stipulation but the only well founded mapping between the DI ordering and the D scale. Thus we have derived the observation made in point (xii) that contrastiveness in BAs is not based on N-relatedness but on C-relatedness.

The scale reference defined for DI also accounts for the fact that EAs can have the scale value 0 if the property expressed by the adjective does not apply, whereas in the case of DA the scale value is always a positive interval, even with −Pol-A and in negated sentences.

In this connection we have to examine the effect of 0EC, the condition that guarantees that +Pol-As are contrastive if c is an $\exists$-quantified variable, thus ruling out 0 for v. It might appear that this question is irrelevant as far as EAs are concerned, because in this case they assume the B-reading, so that (384b) and not (384c) is the real SF for (a) and 0EC does not come into consideration. However, this is not sufficient, because on the one had combinations like *very good* or *how lazy* indicate a DP and thus require a G-reading, but on the other hand they are contrastive. In fact 0EC remains valid: in the context in question this condition rules out 0 but not 0_C, which in SF is a constant different from 0 despite the fact that Int(0) = Int(0_C) = d_o. This is not an artifact, but is motivated by the different origins of the scales determined by **DIM** and [DI P]. As we have already seen, however, EAs are nevertheless contrastive in the relevant sense. Incidentally, if, as speculated above, 0EC has a foundation in the maxim 'Be relevant' (see (182)), then this speculation is not weakened here: EAs in the positive without a DP are automatically contrastive and thus non-redundant, as (384) shows. It also remains true that by way of scale stacking *very good* selects the good among the good, in other words the instances for which the distance from C_0 is above the average distance valid for C.

What has been said so far reveals another aspect of the difference between DAs and EAs, namely that +Pol-A and −Pol-A refer to the same QD scale but with different directions of value concatenation, while all EAs, whether Pos-A or Neg-A, induce the same direction of concatenation, but each on its own scale, which, by analogy with the QD scales, I shall call QAP scales (with regard to the B-reading P of each particular adjective).

Thus point (ix) is derived in all its aspects: antonymous DAs have a different scale reference on the same scale, and antonymous EAs have the same scale reference on different scales.

Let us now consider the effect of v-conditions in the equative and the comparative.

(386)(a) Hans ist dümmer als Fritz (Pro_A ist)
Hans is more stupid than Fritz (is)

(b) $\exists$c [[Q DI STUPID H] $\supset$ [[αc_i [[Q DI STUPID F] $\supset$ [0_C + c_i]]] + c]]

Like a +Pol-A, dumm (*stupid*) in the comparative retains the complete form of the Pro_A. The value for v in the complement adjective does not violate SMC2, since [0_C + c_i] defines an element of D_0. Unlike a +Pol-A the construction here is nevertheless contrastive, because 0_C sets up the C-relatedness which, as shown above, makes the EA contrastive. Since 0_C in (386b) is in the scope of αc_i, the contrastiveness remains even when there is negation: like the N-relatedness of the −Pol-A in the equative it has the presuppositional character described in 7.2. The demonstration for the equative is analogous:

(387)(a) Eva ist nicht so klug wie Hans
Eva is not as clever as Hans

(b) $\sim$ [[Q DI CLEVER E] $\supset$ [0_C + [αc_i [[Q DI CLEVER H] $\supset$ [0_C + c_i]]]]]

Although klug (*clever*) is a Pos-A, the equative is contrastive on account of 0_C. The first instance of 0_C is right within the scope of negation, while the second is 'shielded' by αc_i. Thus it follows from (387) that Hans is clever but not necessarily that Eva is clever, and this is quite parallel to the negated equative of the −Pol-As.

Because of the parallelism shown in 9.1 between equative/comparative and genug/zu the latter have the same distribution of contrastiveness. Similarly the superlative of BAs is contrastive, because, as in the comparative, the Pro_A induces an instance of 0_C. This does not generally apply, however, to Pos-A. Cf. (391) below and the additional discussion in 10.2.

Furthermore, the duality of the equative and comparative in 7.5 applies also in the case of EAs:

(388)(a) Hans ist dümmer als Eva
Hans is more stupid than Eva

(b) Eva ist nicht so dumm wie Hans
Eva is not as stupid as Hans

(389)(a) Fritz ist nicht klüger als Erna
Fritz is not cleverer than Erna

(b) Erna ist so klug wie Fritz
Erna is as clever as Fritz

Since both the equative and the comparative of EAs are contrastive, the conditions under which the equivalences are valid are somewhat different than in the case of DA. The sentences in (388) are equivalent if Eva is stupid, which follows from (a) but not from (b). The sentences in (389) are equivalent if Erna is clever, which follows from (b) but not from (a). These are empirical facts. They can be derived from the observation just made on contrastiveness, and I shall not demonstrate this here.

From the proposed analysis of the EAs it also follows that the comparative for Pos-A and Neg-A does not produce a converse relation, even if the adjectives are antonyms:

(390)(a) Eva ist schöner als Helga
Eva is prettier than Helga

(b) Helga ist häßlicher als Eva
Helga is uglier than Eva

The converse relation of the comparative of DAs is based essentially on the fact that SMC2 eliminates the norm-relatedness in the complement adjective. However, since SMC2 does not preclude 0_C, and contrastiveness thus remains intact, the sentences in (390) are not equivalent (even if schön and häßlich are related to a unified scale in the manner described in 10.2 below). Rather, they are mutually

exclusive, since schön and häßlich are contrary, and it follows from (a) that Eva and Helga are pretty and from (b) that they are both ugly. Here too the empirical findings can be derived from the theory without any problems.

Let us now consider how measure and factor phrases behave. In 7.2 I showed that NEC excludes factor phrases in the equative from −Pol-A (cf. (228) and comment), thus deriving point (xvi). The supplement to this statement is the observation made under (82) in 4.4 that this exclusion does not work for EA: dreimal so gut (*three times as good*) and dreimal so schlecht (*three times as bad*) are equally acceptable. We now see that this observation follows directly from the analysis of EA: NEC does not take effect, because v is never instantiated by N_C. Factor phrases are thus possible with Pos-As and Neg-As. Thus, all the phenomena stated in (xvi) are now accounted for.

Measure phrases are possible in the comparative and in the zu-constructions of EAs if suitable measurement units are established:

(391)(a) Hans ist drei Punkte besser als Peter
Hans is three points better than Peter

(b) Peter ist zwei Punkte schlechter als Fritz
Peter is two points worse than Fritz

(c) Adam ist zwei Punkte zu schlecht, um zugelassen zu werden
Adam is two points too bad to be accepted

It is beyond doubt that these sentences are acceptable and, with points introduced as measurement units, interpretable. Theoretically it follows directly from the analysis of the comparative and from the fact that NEC is not violated: the variable v is specified by the complement clause, so the number expression of the measure phrase is permissible. There is another, more complicated point: since the variable v in the complement adjective is occupied by 0_C as a result of (382), all comparatives and zu-constructions for EAs are contrastive. This applies empirically to (b) and (c) but apparently not to (a). The reason for this will be sought in 10.2.

According to the analysis so far, EAs ought to allow measure phrases not only in the comparative but also in the positive, if measurement units are defined. Sentences like (392), though, are obviously deviant even if those in (391) are wholly interpretable:

(392)(a) *Hans ist drei Punkte gut
Hans is three points good

(b) *Fritz ist zwei Punkte schlecht
Fritz is two points bad

The difference between (391) and (392) is not derivable from the analysis so far: the condition that number expressions (and thus measure phrases also) in SF cannot be concatenated with N_C is satisfied in both cases, since in (392) v is not occupied by N_C but by 0_C. Of course cases like (392) could be ruled out by an ad hoc condition, but this would be unsatisfactory, as it would, of course, not explain the empirical facts. It appears to be more interesting to modify NEC: if we assume that the relevant criterion for number expressions were not the occurrence of N but dependence on C, then NEC would have to be reinterpreted as a condition that rules out the concatenation of NUM with X_C, where X is either N or 0. However, the modified condition would also rule out all the factor phrases in the equative of the EAs. Hence this cannot be the correct solution, and NEC must be left unaltered. I will show in the next section that the impermissibility of (392) does not follow directly from the v-conditions but from the nature of measurement units, which is connected with the reason for which (391a) is not contrastive. I shall call the phenomenon in question 'scale adjustment' and will analyse it in 10.2.

With the exception of scale adjustment, the whole spectrum of the properties of EAs and the differences between DAs and EAs have now been derived from the theory which has been developed for DAs and maintained for EAs and from the null hypothesis on the lexical character of EAs with one additional assumption. This additional assumption concerns the constant DI, the effect of which in CS is explained by (380) and in SF by (383). The incorporation of DI into the G-reading of the EAs takes place through the indpendently motivated SF structure of viel.

10.2 Antonymy in Evaluative Adjectives

We have seen that the null hypothesis regarding the lexical nature of EAs, together with DI, provides the correct results. This means, however, that each EA induces its own QAP scale: klug/dumm (*clever/stupid*) do not refer to a common QA-CLEVER scale like *long/short*, which occupy a common Q-MAX scale. For the time being this takes account of the different degree of systematization of antynomy in DAs and EAs. However, two questions remain open. Firstly, how is the unquestionable empirical fact to be accounted for that EAs are subject to the classification so far called Pos-A and Neg-A, in other words that they form pairs of opposites (albeit not throughout)? Secondly, what effect does this pair-formation have on gradation?

The first question obviously requires an analysis of the internal structure of the B-reading of the EAs and thus goes far beyond the scope of the present enquiry. I shall therefore develop only some parts of a possible answer that will suffice to be able to discuss the second question adequately.

A minimal requirement for pairs of opposites of the kind in question is that they should be related by implications of the following kind:

(393)(a) $[\text{PRETTY } x] \rightarrow \sim [\text{UGLY } x]$
(b) $[\text{STUPID } x] \rightarrow \sim [\text{CLEVER } x]$

I shall leave the question aside whether such postulates are to be assumed to be part of the SF component or whether their validity should be derived from the internal structure of the predicates.[99] It is more important that these postulates firstly do not cover the Pos-Neg opposition, because they apply correspondingly to groups like colour adjectives, which are contrary but do not produce opposites,

and that secondly they do not specify which element is Pos and which is Neg.

A heuristically useful approach to elucidating, if not to solving, these problems is to consider prefixing with un, which, as mentioned in 4.1, often serves to form Neg-As. In pairs like bequem/unbequem (*comfortable/uncomfortable*), treu/untreu (*faithful/unfaithful*) etc. the formation of opposites is clear and the Neg-A is indicated morphologically.

The following proposal is limited to what the canonical function of the adjectival prefix un could mean as understood in pretheoretical terms. I shall leave out of consideration the German adnominal un, as in Unglück (*accident* (Glück = (piece of) good fortune)), Unvernunft (*unreasonableness*) etc. and the many interesting idiosyncracies which allow unklug (*'unclever'*) as well as dumm (*stupid*), unfroh (*'unglad'*) as well as traurig (*sad*) or ungut (*'ungood'*) as well as schlecht (*bad*), but do not allow *unfleißig (*'unindustrious'*) besides faul (*lazy*), or *unheftig (*'unviolent'*) besides sanft (*gentle*), and many others. Likewise, the German intensifying un, as un Unmasse (*huge masses*) or Unsumme (*enormous sum*) has nothing to do with the canonical function envisaged.[100]

Of course un has to do with negation, but is not identical with it. (394a) implies (b) but note vice versa:

(394)(a)	Eva ist unglücklich *Eva is unhappy* Karl ist unsachlich *Karl is unobjective* Diese Arbeit ist ungesund *This work is unhealthy* Peter ist ungeschickt *Peter is clumsy*	(b) Eva ist nicht glücklich *Eva is not happy* Karl ist nicht sachlich *Karl is not objective* Diese Arbeit ist nicht gesund *This work is not healthy* Peter ist nicht geschickt *Peter is not adroit*

The divergence between un and nicht varies according to the adjective. In cases like (395), (a) and (b) are almost or fully equivalent:

(395)(a)	Fünf ist eine ungerade Zahl *Five is an odd ('uneven') number* Es ist unmöglich, daß er geht *It is impossible that he will go* Die Leitung ist undicht *The pipe leaks (is not water-tight)* Das Glas ist unbrauchbar *The glass is unusable*	(b) Fünf ist keine gerade Zahl *Five is not an even number* Es ist nicht möglich, daß er geht *It is not possible that he will go* Die Leitung ist nicht dicht *The pipe is not water-tight* Das Glas ist nicht brauchbar *The glass is not usable*

Leaving lexicalized special conditions apart, we can make the simple observation that un coincides with nicht if and only if A and un-A are contradictory, that is if there is no other possibility between A and un-A or, to put it differently, if for any x, 'x is not A and x is not un-A' cannot be contingent.[101] A first approach to treating these facts may be formulated as follows: Let P be an n-place predicate expression (of any complexity) in SF. For the sake of simplicity I shall write $[\text{P } x]$ for P and its arguments, the extension of the definition to the relevant arguments being simply an exercise in notation.

(396) (a) $[\text{UN } [\text{P } x]] \rightarrow \sim [\text{P } x]$

(b) [SPEC [P x]] → [P x]

(c) [UN [P x]] ≡ [SPEC ~ [P x]]

UN and SPEC are constants of the category S/S, UN represents a qualified negation, a kind of 'opposite-operator'. SPEC represents a specialization operation, which – intuitively – specializes the conditions fixed by [P x] in CS, if this is possible. If it is not, SPEC is turning idle and (a) and (b) become equivalents as in (395). An explicit interpretation of SPEC in CS would require a more highly developed theory of CS. However, I shall illustrate the effect of SPEC below.

The lexical entry for un can thus be formulated as follows:

(397) [un] ; Prefix; [$\hat{P}$ [$\hat{x}$ [UN [P x]]]]

(398)(a) [un + bequem]; A; [$\hat{x}$ [UN [COMFORTABLE x]]]
uncomfortable

(b) [un + möglich]; A; [$\hat{x}$ [UN [POSS x]]]
impossible

The examples in (398) indicate the effect of (397). (a) is a case where UN does not coincide with '~', in other words where [SPEC ~ [BEQUEM x]] differs from ~[BEQUEM x]. For möglich, on the other hand, there is (under normal conditions) no specialization of ~[POSS x] that is not implied by ~[POSS x]. In other words, möglich and unmöglich are contradictory whereas bequem and unbequem are contrary. The analysis of un includes the former as a special case, as was intended.

It is now obvious that for pairs of the type A/un-A implications of the kind indicated under (393) can be derived on the basis of (396a). In addition both the morphology and the SF show which is the Pos-A and which is the Neg-A.

We now also have a partial characterization of what I have called 'inherent gradability': the property P represented by an adjective A is gradable if ~[P x] is not equivalent to [UN [P x]], in other words if specializations can be formed within ~[P x].

Let us now, in the light of this analysis, look at contrary EAs which are not formed by un. Let us assume that (399) gives approximate lexical entries for gut and schlecht, where Q again is the parameter to be specified for the evaluation of x.[102]

(399)(a) [gut]; A; [$\hat{x}$ [[[VALUE Q] POS] x]]

(b) [schlecht]; A; [$\hat{x}$ [[[VALUE Q] NEG] x]]

Here POS and NEG are evaluation components which define the fulfilment of the condition specified by [VALUE Q]. NEG is an evaluation condition in its own right, that is [[[VALUE Q] NEG] x] is not identical with ~[[[VALUE Q] POS] x]. Certainly though, the SF of schlecht is an instance which fulfils [SPEC ~[[[VALUE Q] POS] x]]. From this we can get at least a partial characterization of SPEC.

SPEC is to be interpreted relative to a domain of predication to be derived from the SF of contrary adjectives by replacing the constants in which they differ by an ∃-quantified variable. This would produce (400a) for gut/schlecht, (b) for the colour adjectives and (c) for the polar DAs:

(400)(a) ∃Z [[VALUE Q] Z x]

(b) $\exists x_i$ [[COLOUR x_i] x]

(c) ∃§[[QUANT DIM x] = [v § c]]

The SF of each of gut, grün and groß is a stipulation within the domain (a), (b) and (c), respectively, namely through the assignment of a value for the ∃-quantified variable. If the SF of an adjective is abbreviated by P then it is a sufficient (but not necessary) condition for [UN [P x]], i.e. [SPEC [~ [P x]]], if in P the value for the ∃-quantified variable of the domain of predication is replaced by another value. From this condition we can derive a series of consequences or conjectures.

Firstly we know that only the values '+' and '–' are available for replacing § in the DAs. Thus the SF of *short* is by definition the realization of **unlong* and the SF of *long* is that of **unshort*.

Secondly, in the case of colour adjectives the set of (cardinal) colour values are available for instantiating x_i in (400b), so that the alternative induced by UN is not clearly determined. Therefore, ?*ungreen* does not coincide with any definite colour adjective. If *ungreen* is regarded as an interpretable word, then it covers any choice from the whole range of possible alternatives to GR for instantiating x_i.

Thirdly, it seems to be a reasonable assumption that POS and NEG are the two values available in SF for Z in gut and schlecht and a whole series of other evaluative adjectives such as schön, fleißig, klug each with its own evaluation conditions. If this is correct, then what has been said about lang and kurz applies mutatis mutandis to gut and schlecht. The fact that ungut does not coincide with schlecht is no doubt because the SF of schlecht contains certain specifications of Q which gut does not have (as mentioned in note 102, (399) does not account for the difference between böse (*evil*) and schlecht (*bad*)).[103]

Fourthly, the determination of the Neg-A in a contrary pair can be transferred from the un-prefixing to other instances if we make the following conjecture: if there are exactly two values available for a variable in a domain of predication in SF, then one value is marked and the other is unmarked. It is clear that for DAs the unmarked value if '+'. Likewise POS is unmarked relative to NEG. For the EAs then:

(401) EA is a Neg-A if either

(a) its SF has the form [$\hat{x}$ [UN [P x]]] or

(b) its SF has the form [$\hat{x}$ [P x]] and P contains the marked value for the variable which determines the domain of predication.

An interesting question, which I cannot follow up here, is whether the two conditions in (401) can be conflated, e.g. by postulating for all non-contradictory A/un-A pairs that in A there is an unmarked instance of the domain variable. The lexical entry for bequem (*comfortable*) would then have to have – very roughly – the form:

(402) [bequem]; A; [NP_d __]; [$\hat{x}_1$ [$\underline{\hat{x}}$ [[VALUE [[COMFORT x_1] x]] POS]]]

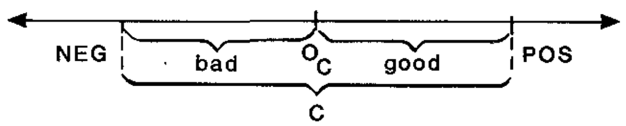
The specialization of '~' in connection with UN would then be equivalent to the substitution of POS by NEG in unbequem. The proper formulation of this speculation, which seems to me to be not implausible, would present the possibility of giving definite characteristic structural schemata for certain classes of EA.

Having arrived at these rough bearings on the character of Pos-A and Neg-A we can proceed to the second question: what effect does this have on gradation?

We can establish first that gradation does not work via the constant which occupies the variable of the predication domain but via the variable c which in the G-reading enters the SF additionally as the carrier of a θ-role (in the DAs this variable is already part of the lexical item). Regarding their predication all EAs are projected onto their respective scale induced by [QUANT [DI [P x]]], and are treated like +Pol-As. Here the non-contradictory interpretation of Pos/Neg pairs is the precondition for the possibility of the G-reading.

The intuitive notion that Pos/Neg pairs induce gradation, but in opposite directions, can now be conceived in such a way that the two scales are in a way joined at their zero point. As a condition for this we can assume that the joined scales represent gradations regarding the same predication domain, in other words they connect a Pos-A with the appropriate Neg-A in accordance with (401). This can be illustrated by the following diagram:

(403)



Predication domain: $\hat{z}$ [[[VALUE Q] Z] x]

The situation thus presented does not really bring a new type of scale into play but only the connection of two canonical scales of the type $\mathbf{D}_k$. Each of them is independent of the other, except that each allows the instances labelled d_o on one scale to be instantiated by positive values on the other.

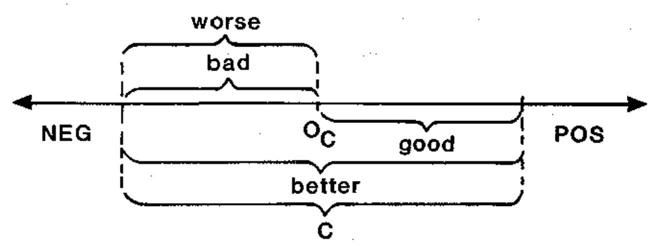
So far the situation defined in 10.1 has not changed, and all the properties derived there remain intact, since the connection of scales outlined in (403) is not represented in SF. And indeed nearly all the properties of the EAs have been derived without reference to the Pos or Neg status. Only the phenomena related to what I have called scale adjustment have been left open. The heart of this problem is revealed by sentences of the following kind:

(404)(a) Hans ist schlecht, aber er ist besser als Fritz
Hans is bad, but he is better than Fritz

(b) ?Hans ist gut, aber er ist schlechter als Fritz
Hans is good, but he is worse than Fritz

Since all comparatives of EAs contain an instance of 0_C, they are, according to the analysis so far, contrastive, they imply the validity of the positive for both terms of the comparison. This is clearly correct for cases like (404b), which are deviant precisely for this reason, but not for (a). Hence Hans ist besser als Fritz cannot generally imply Hans ist gut.[104] In other words schlechter implies schlecht, as I have assumed so far, but besser does not generally imply gut. The situation we have here can be displayed by changing the connection of a POS scale and a NEG scale as follows:

(405)



In other words, on the combined POS/NEG scale the segments overlap for the comparative but not for the positive. The overlap is asymmetrical: besser overlaps with schlecht but schlechter does not overlap with gut.

It will be useful to make the range of this phenomenon, which was illustrated under point (xv) in 4.3, somewhat more precise. As already noted in (xv), it is not invariant for all EAs and all constructions.

(406)(a) ?Hans ist faul, aber er ist fleißiger als Fritz
Hans is lazy, but he is more industrious than Fritz

(b) ?Hans ist fleißig, aber er ist fauler als Fritz
Hans is industrious, but he is lazier than Fritz

(407)(a) ?Eva ist häßlich, aber sie ist schöner als Helga
Eva is ugly, but she is prettier than Helga

(b) *Eva ist schön, aber sie ist häßlicher als Helga
Eva is pretty, but she is uglier than Helga

Various EAs are idiosyncratically resistant to the possibilities of the overlapping shown in (405).

For the interpretation of the following examples it is important to keep the parameter of evaluation constant:

(408)(a) Hans ist schlecht, aber gut genug für diese Rolle
Hans is bad, but good enough for this part

(b) Hans ist schlecht, aber immer noch so gut wie Fritz
Hans is bad, but nevertheless as good as Fritz

(c) ?Hans ist schlecht, aber trotzdem zu gut, um das nicht zu schaffen
Hans is bad, but nevertheless too good not to manage that

(409)(a) ?Hans ist faul, aber fleißig genug für diese Aufgabe
Hans is lazy, but industrious enough for this job

(b) ?Hans ist faul, aber sicher so fleißig wie Fritz
Hans is lazy, but certainly as industrious as Fritz

(c) *Hans ist faul, aber trotzdem zu fleißig, um durchzufallen
Hans is lazy, but nevertheless too industrious to fail

The question marks do not indicate a clear degree of deviancy but rather uncertainty of interpretation. I am therefore assuming that what the theory must set out to determine is not the degrees of grammaticalness but a framework for possible options, the choice depending on contextual conditions.

Before characterizing this framework I shall add here the means by which the simple, non-overlapping situation (403) can be expressed in the theory. What has to be accounted for is the fact that two mutually independent scales can be related to each other if the B-readings of the two EAs involved determine a common domain of predication (or form an A/un-A pair). For the sake of simplicity I shall speak of the POS and the NEG scale. For these let us stipulate the following mapping in CS.

(410) *Let* $\mathbf{D}_k$ *and* $\mathbf{D}'_k$ *be two canonical scales in accordance with (126). Then* J *is a bi-unique mapping of* D *onto* D' *with the following properties:*

(a) $\mathrm{J}(\mathrm{d}_i \circ \mathrm{d}_j) = \mathrm{J}(\mathrm{d}_i) \circ \mathrm{J}(\mathrm{d}_j)$

(b) $\mathrm{J}(\mathrm{d}_i) = \mathrm{d'}_i$ implies $\mathrm{d'}_i \notin \mathrm{D}$

If we imagine the two scales as the positive and negative ray of a straight line with 0_C as its zero point, as shown in (403), then Pos-As and Neg-As which correspond to each other can be projected onto these two parts. J is a kind of reversal operation, but one which differs from the operation defined in (127) in that it does not simply reverse the direction of an interval but assigns its counterpart to the part of the scale which runs in the opposite direction. In SF the scale connection can now be covered by the following equivalence:

(411) *Let* P *be the* B*-reading of an* EA *and* $\bar{P}$ *the* B*-reading of its Neg-A in accordance with (401). Then:*

(a) $[[\mathrm{QUANT\ DI}\ \bar{P}\ x] = [v + \mathrm{c}]] \equiv [[\mathrm{QUANT\ DI\ P}\ x] = \mathrm{K}[v + \mathrm{c}]]$

(b) $[[\mathrm{QUANT\ DI\ P}\ x] = [v + \mathrm{c}]] \equiv [[\mathrm{QUANT\ DI}\ \bar{P}\ x] = \mathrm{K}[v + \mathrm{c}]]$

K is a constant of category N/N, and we may regard its interpretation for the time being as J in accordance with (410). Through (411) the POS scale is simply interpreted as the reflection of the NEG scale around 0_C and vice versa. (412) shows that this produces meaningful relations (I abbreviate the B-reading of **gut** as G).

(412)(a) Hans ist schlechter als Fritz
Hans is worse than Fritz

(b) $\exists \mathrm{c}\ [[\mathrm{Q\ DI\ G\ H}] \supset \mathrm{K}\ [\alpha \mathrm{c}_i\ [[\mathrm{Q\ DI\ G\ F}] \supset \mathrm{K}\ [0_C + \mathrm{c}_i]] + \mathrm{c}]]$

(c) $\exists \mathrm{c}\ [\forall \mathrm{c}_i\ [[\mathrm{Q\ DI\ G\ F}] \supset \mathrm{K}\ [0_C + \mathrm{c}_i]] \rightarrow [[\mathrm{Q\ DI\ G\ H}] \supset \mathrm{K}[\mathrm{c}_i + \mathrm{c}]]]$

We see that on the basis of (411a) the values for **schlecht** are projected onto the (in a sense negative) mirror scale of **gut**.[105] In the same way the values for gut are projected onto the mirror scale of **schlecht** by (411b). The two parts of the scale are organized around 0_C, similarly to the way N_C creates two parts of a scale for the DAs (a parallel which is discussed in more detail in 10.3 below) but with two fundamental differences: firstly, on the combined POS/NEG scale there is no counterpart to the zero point of the dimensional scale, and secondly the Pos-As and the Neg-As are each restricted to their own particular part of the scale, whereas +Pol-As and −Pol-As range over the whole common scale. That is why the comparative of +Pol-As is converse to that of the corresponding −Pol-As, which in general does not apply to Pos-A and Neg-A.

The union of scales thus defined does not alter the analysis in 10.1 but makes explicit the intuition that Pos-As and Neg-As set up opposite orderings. To make the union empirically correct, the interpretation of K must be modified somewhat, since under the definition in (411) Pos-A and Neg-A are no longer contrary but contradictory if Int(K) = J: as long as the scales for **gut** and **schlecht** have no common 0_C, (413) is not contradictory, and the sentence only means that Hans has no value on the POS scale and none on the NEG scale:

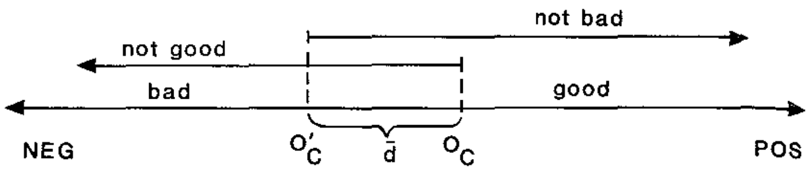
(413) Hans ist nicht gut und er ist nicht schlecht
Hans is not good and he is not bad

By the definition in (411), however, it becomes equivalent to the condition that Hans cannot be assigned any value except d_o, i.e. the empty interval. In order to make (411) acceptable, a buffer zone must be inserted between the zero points of the connected scales, providing the value for indifferent individuals as in the case of (413). The situation here is different from that in *not long and not short*, since N_C is a proper interval but 0_C is not.[106] For this purpose we must specify the interpretation for K as follows:

(414) $\mathrm{Int}([\mathrm{K\ X}]) = \bar{d} \circ \mathrm{J}(\mathrm{Int}(\mathrm{X}))$, if $\mathrm{Int}(\mathrm{X}) \in \mathrm{D}_0$;
$\mathrm{Int}([\mathrm{K\ X}]) \equiv \mathrm{J}(\mathrm{Int}(\mathrm{X}))$ else
where $\bar{d} \notin \mathrm{D}$ and $\bar{d} \notin \mathrm{D'}$.

The choice of $\bar{d}$ is free – the only condition is $\bar{d} \neq d_o$. The scale connections shown in (403) must thus be modified as follows:

(415)



K inserts the buffer $\bar{d}$ before the elements of D'_0. Under this interpretation of K it is precisely $\bar{d}$ that is specified by sentence (413) as the value of Hans. The sentence is contingent, and gut and schlecht are shown to be contrary.

While K only specifies an equivalent transformation of the SF representation which does not change its interpretation, the problem illustrated by (404) - (409) requires a condition emerging from the SF representation which defines the non-contrastive (i.e. non-0_C-related) interpretation of besser and similar items. We know that the phenomenon is asymmetric, occurring as it does chiefly or even exclusively in Pos-As relative to their Neg-As and that it does not hold invariantly for all Pos-As.

I have called the phenomenon in question scale adjustment, by which I mean a kind of suspension of the C-dependent zero point of the scale. Somewhat more precisely it means that 0_C is replaced in the relevant cases by the end point of an adjustment interval δ. To sharpen this let us define, for the POS scale $\mathbf{D}_k$, an adjusted scale $\mathbf{D}^*_k$ with the following properties.

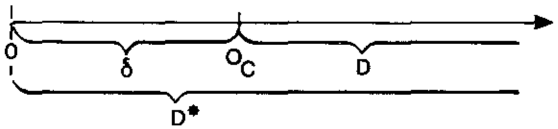
(416) *Let* D^*_k *be a canonical scale for an ordering relation over a gradable property in accordance with (126).* $\mathbf{D}^*_k$ *is an adjustment of* $\mathbf{D}_k$ *regarding* δ, *if:*

(a) $\delta \epsilon \mathrm{D}_0$

(b) for all $d \epsilon \mathrm{D}_0$ there is a uniquely determined $d^* \epsilon \mathrm{D}^*_0$ such that $d^* = \delta \circ d$

The embedding of $\mathbf{D}_k$ in $\mathbf{D}^*_k$ can be represented thus:

(417)



We see that the adjustment interval for an adjusted ordering scale is in a sense analogous to the standard interval N_C on a dimension scale. Therefore the adjustment induced by δ can be regarded as a projection of the POS scale onto an ordering that is independent of the reference class C. In this sense, I will generally

say that a scale is adjusted if it begins with a zero point that is not dependent on C. According to this, dimension scales are always adjusted, and NEG scales are, as a rule, not adjustable. The initial point of an adjusted POS scale, though, differs fundamentally from that of a dimension scale in that it has no interpretation independent of the scale. It is only a component of interpretation which determines the behaviour of scales. The value of δ is correspondingly dependent on interpretation.

The interval δ determines the possible overlap of a POS scale with a NEG scale under the definition of K. This means automatically that $\bar{d}$ must be contained in δ. The intervals within δ are at the same time the inversion I(d') of the NEG scale D'_k that overlaps with the POS scale in δ. Thus for the overlap determined by δ we can derive the converse relation between (418a) and (b), depending however, on the additional condition that Hans and Fritz are bad, since the comparative of Neg-A remains C-related.

(418)(a) Hans ist schlechter als Fritz
Hans is worse than Fritz

(b) Fritz ist besser als Hans
Fritz is better than Hans

Now we can retain in qualified form the observation made earlier that $\mathrm{Int}(0_C) = \mathrm{Int}(0) = d_o$, if we say that d_o is the empty initial interval of D^*_0 if a Pos-A is interpreted on an adjusted scale. The C-dependence is then cancelled by the interpretation, while the N-relatedness in the DAs in the non-contrastive cases is already excluded in SF.

An alternative would be to assign the Pos-A the value 0 instead of 0_C for v in the case of the adjusted interpretation in SF. This would require a corresponding modification of (383). For several reasons I regard the interpretation outlined here as more adequate, and shall now discuss how it can be established in SF.

What we have to find out is to what extent and in what manner the adjusted interpretation is determined by SF. The second part of the question depends on the answer to the first, which contains a number of imponderables.

It is relatively clear that in general only Pos-As allow the adjusted interpretation. It is less clear, though, whether the elements of the group to which this applies are characterized by independently motivated properties of their SF. Let us assume that the relevant adjectives are identifiable by a common property (though its motivation must remain an open question), and let us indicate their lexical SF thus: $[\hat{x}\ [\mathrm{P}^*x]]$. Then we can say that the values formed by $[\mathrm{DI}\ [\mathrm{P}^*x]]$ are available for projection onto an adjusted scale. In other words we are making the adjustability of the scale into a property of the underlying predicate. This seems reasonable to me, even if we cannot go into the formal execution of the idea. What is clear is that P*, according to this conjecture, cannot in general be the B-reading of a Neg-A. Whether the scale adjustment possible on the basis of P* can be actually realized is furthermore dependant on the context. The examples in (404) and (408) show that the comparative, the equative, and genug are contexts which allow adjustment. The superlative and zu are rather more questionable. It seems to me that sentences like those in (419) appear acceptable when zu gut and der beste are interpreted as adjustable, and that this is indeed possible:

(419)(a) Hans ist schlecht, aber er ist trotzdem zwei Punkte zu gut, um vom Wettbewerb ausgeschlossen zu sein
Hans is bad, but he is nevertheless two points too good to be excluded from the competition

(b) Hans ist zwar der beste, aber er ist trotzdem nicht gut
Hans is the best, but he is still not good

If we assume that the framework in which scale adjustment is possible includes these cases, then the following conjecture is plausible: realization of scale adjustment is possible if SF contains a Pro_A that either comes from the projected complement clause or is supplied by the SF of the affixes zu, genug and -st. In other words the occurrence of a second instance of the SF of the matrix adjective is the possible point of entry for scale adjustment. This excludes the positive from adjustment in a plausible way.

Formally, this assumption can be incorporated in a number of different ways. I shall provisionally give the following version:

(420) If X = [QUANT [DI [P$*x$]]], for [αc [X = [0_C + c]]] then Int(X) ϵ D_k^*.

(420) is based on the fact that in SF the Pro_As and only these are always embedded in the framework of αc $[\cdots]$ and are thus formally identifiable.

So that (420) has the right effect regarding the interpretation in CS, two plausible but not self-evident assumptions have to be made concerning the selection of the interpreting scales:

(421)(a) The scale selected by Int(X) is retained for Int(X') if X and X' determine the same scales.

(b) D_k^* is preferred to D_k.

Only (421) gives the guarantee that the adjustment is transferred from the complement adjective to the matrix adjective and the relevant constructions are interpreted throughout without C-relatedness.

The analysis thus given for the scale effects of the EA contains a number of imponderables which could possibly be eliminated if the nature of the B-reading of the EAs were better understood. But I think these imponderables lie in the problem rather than in the analysis itself, as the considerable variation in judgement regarding the C-relatedness of individual cases shows. The necessary and possibly sufficient requirement on the theory is therefore presumably that it should indicate the range within which a consistent interpretation for sentences like (404a) is possible.

The properties of the C-relatedness of EAs noted in point (xv) have thus been shown to be the effect of the selection of a C-dependent or adjusted scale, and the degree of variation inherent in the data results from the presumably only partial determinacy of the selection of the adjusted scale.

A corollary of this analysis is the deviancy of (422a) as distinct from (b) or (c), if we make the plausible assumption in (423) about measurement units:

(422)(a) ?Hans ist zehn Punkte gut
Hans is ten points good

(b) Hans ist zehn Punkte besser als alle anderen
Hans is ten points better than all the others

(c) Hans ist zwei Punkte zu gut
Hans is two points too good

(423) Measurement units are only defined for adjusted scales.

The problem with (422a) is thus not that there are no independent measurement units for gut/schlecht but that the positive of gut is precluded from scale adjustment. If a (semi-correct) interpretation is allowed for (422a), then this would mean that gut is projected onto an adjusted scale. In other words under the conditions under which (422a) is interpretable (424) is also permissible:

(424) ?Hans ist zehn Punkte gut, aber das heißt nicht, daß er gut ist
Hans is ten points good, but that does not mean that he is good

There is a parallel interpretation for cases like (425), in which the normally contrastive interpretation of schlechter is cancelled by the necessary scale adjustment:

(425) Hans ist zwei Punkte schlechter als Fritz, aber doch noch ganz gut
Hans is two points worse than Fritz, but still quite good

From these and many other cases with considerable variation in acceptability I conclude that tracing the non-contrastive use of EAs to the selection possibilities for adjusted scales is in principle correct.

To conclude, let us note the difference between the defect in (422a) and the cases discussed earlier of the type *2 metres short*: the latter violate NEC, while the former violates condition (423). The detour interpretations are correspondingly different: in (422a) contrastiveness is cancelled, but in *2 metres short* it is not.

10.3 Dimensional Adjectives as Evaluative Adjectives

The theory of EAs developed in 10.1 and the connection of scales for Pos-As and Neg-As discussed in 10.2 now allow us to set up a secondary relation between EA and DA, which explains the detour interpretation observed with respect to points (xviii) and (xix). To present the problem, let us consider the sentences from (102):

(426)(a) Der Tisch ist so niedrig wie er schmal ist (=(102b))
The table is as low as it is narrow

(b) $[[\text{QUANT VERT T}] \subset [\text{N}_C - [\alpha c_i\ [[\text{QUANT ACROSS T}] \subset [\text{N}_C - c_i]]]]]$

(427)(a) ?Der Tisch ist niedriger als er schmal ist (=(102a))
The table is lower than it is narrow

(b) $\exists c[[\text{QUANT VERT T}] \subset [[\alpha c_i\ [[\text{QUANT ACROSS T}] \subset [\text{N}_C - c_i]]] - c]]$

(428)(a) ?Der Tisch ist so hoch wie er schmal ist (=(103b))
The table is as tall as it is narrow

(b) $[[\text{QUANT VERT T}] \supset [0 + [\alpha c_i\ [[\text{QUANT ACROSS T}] \subset [\text{N}_C - c_i]]]]]$

Since VERT and ACROSS require unidimensional spatial scales, the two DAs in (426) can be projected onto the same scale. Also, (426) does not violate any condition and is therefore fully acceptable. However, if we look more closely, there is a problem regarding the interpretation, a problem which becomes tangible, not in SF but only in CS. Within the same reference class (say, TABLE), N_C is not identical for different dimensions. But this means that the c_is have to be subtracted from two different scale values at the same time, so that they cannot be interpreted via proper intervals.[107] This problem becomes manifest in SF in (428), where the c_is have to be concatenated simultaneously with 0 upwards and with N_C downwards. Matters are made more difficult by the incompatible '$\supset$'- and '$\subset$'-relations. The sentence, while it does not violate any v-condition, has no coherent interpretation. (427), finally, violates SMC2, since $[\text{N}_C - c_i]$ does not define any element of D_0. Because the complement adjective here is not a Pro_A, this violation cannot be eliminated by deleting 'v –'. The sentence is deviant.

Nevertheless, sentences (427) and (428) are in a certain sense interpretable. (427) means, at a pinch, that the table is further below the norm regarding height than regarding width, and (428) that it exceeds the norm regarding height by as much as it falls short of the norm regarding width. These readings cannot be obtained from standard SFs. I shall now derive their existence as detour interpretations.

We know that in the positive DAs without DPs have an $\exists$-quantified c which itself requires v to be instantiated by N_C. The resulting SF fulfils the conditions for the B-reading of an EA. For clarity I will introduce the following abbreviated definitions:

(429) $[\hat{x}\ [\text{LONG}\ x]] =_{def} [\hat{x}\ [\exists c\ [[\text{QUANT MAX}\ x] = [\text{N}_C + c]]]]$

(430) $[\hat{x}\ [\text{SHORT}\ x]] =_{def} [\hat{x}\ [\exists c\ [[\text{QUANT MAX}\ x] = [\text{N}_C - c]]]]$

The definiens gives the internal structure of LONG and SHORT (and analogously for all DAs) which have all the properties of a Pos-A/Neg-A pair with the same domain of predication. Under this stipulation lang and kurz are classifying predicates like gut and schlecht or klug and dumm. This follows trivially from the theory developed so far. What is not trivial is that the DAs in this reading can form the operand of the gradation operator (381). This yields a schematically derivable secondary G-reading of the following kind:

(431) $[\hat{c}\ [\hat{x}\ [[\text{QUANT DI LONG}\ x] = [v + c]]]]$

(432) $[\hat{c}\ [\hat{x}\ [[\text{QUANT DI SHORT}\ x] = [v + c]]]]$

On the basis of (411), (432) is also SF-equivalent to (433):

(433) $[\hat{c}\ [\hat{x}\ [[\text{QUANT DI LONG}] = [\text{K}\ [v + c]]]]]$

Thus lang and kurz again arrive on a unified scale. There are now a series of interesting consequences.

Firstly, the scale unified by the predication domain is organized around the buffer interval $\tilde{d}$. The adjectives are now contrastive because, being C-related, they specify values above 0_C and below $0'_C$.

Secondly, in this secondary reading +Pol-As and −Pol-As both behave like +Pol-As inasmuch as they do not have any negative interval concatenation. Furthermore, v now is not instantiated by N_C but by 0_C. In this reading the relevant violations of v-conditions do not apply.

Thirdly, the ordering relation induced by [DI [LONGx]] is isomorphic with that on the original dimension scale for inherent reasons, but the scales are not identical. This is what I referred to in 4.5 as secondary scale formation. It must be kept strictly distinct from the scale stacking induced by viel because it is based on the reorganization of the regular SF structure. In this secondary scale formation N_C is reinterpreted or shifted, so to speak, so that its end point functions as the indifference value of the scale type (415).

Fourthly, the values on this secondary scale, though they are derived from the original dimensional values, are not identical with the dimensional extents. In particular their metric need not coincide with that of the dimensional scales, since it is based on relative values.

These properties follow from (431) - (433) on the basis of independently motivated assumptions. For sentence (434), which is unacceptable in the primary reading, they determine the meaningful interpretation of the secondary reading (c):

(434)(a) ?Hans ist größer als Eva klein ist
Hans is taller than Eva is short

(b) $\exists c\ [[\text{QD H}] \supset [[\alpha c_i\ [[\text{QD E}] \subset [\text{N}_C - c_i]]] + c]]$

(c) $\exists c\ [[\text{Q DI TALL H}] \supset [[\alpha c_i\ [[\text{Q DI TALL E}] \supset \text{K}\ [0_C + c_i]]] + c]]$

The primary reading (b) is defective, since because of $[\text{N}_C - c_i]$ it contains a violation of SMC2. This does not apply to (c), since $[0_C + c_i]$ is an initial part of the scale from which K forms the value.

It now becomes clear that, in the derived reinterpretation, even sentences like (426) - (428) have a meaningful reading. The corresponding representation for (428) is:

(435) $[[\text{Q DI HIGH T}] \supset [0_C + [\alpha c_i\ [[\text{Q DI NARROW T}] \supset [0_C + c_i]]]]]$

The two degrees being compared are equally determined from 0_C. For this to be possible on *one* scale, there is the non-trivial condition that the ordering regarding [HIGH x] and [NARROW x] should be projected onto a common scale. This is a question of conceptual organization, and its flexibility is difficult to delimit. For cases like (428) the common scale is relatively easy to construct, while sentences like (436) lie on the border-line of incommensurability:

(436) ?*Tokyo is as overpopulated as Dallas is boring*

We have thus accounted for the distribution of possible complement adjectives noted in (xviii) and (xix) and the reduced acceptability in the case of secondary interpretation.

In conclusion let us look at a general aspect of reinterpretation on the basis of the definitions given in (429) and (430).

What the definitions are meant to indicate is not that the internal structure of the definiendum LONG is eliminated but that it functions as a whole package and can be subjected as such to further combinations. This 'freezing' of the internal structure is presumably not only a means that can be used for the purpose of secondary interpretation, but possibly the reflex of certain complexes in SF which characterize not only the actual generation but also the ontogenesis of mental structure formations. What this idea suggests regarding language acquisition is the following.

In the first phase of lexical assignment, in which these words function apparently in a purely classificatory way, the SFs for DAs like groß (*tall*), klein (*short*) etc., are treated as a whole block. Its internal structure only comes into play at a later stage of maturation. In the maturational process, the phases of which are examined by GOEDE (this volume) for viel (*much*), groß (*tall/large*), hoch (*high/tall*), lang (*long*) and breit (*wide*), the structural schema common to DAs is released on the one hand,while on the other hand, the specification of **DIM** in this schema is established. From the point of view presented here these two developments correspond to the triggering of two independent, interacting modules, that of gradation and that of the dimensional designation, and the two need not take place simultaneously.

On this basis two assumptions can be meaningfully reconciled which are sometimes represented as being incompatible. FODOR (1981) has argued emphatically that word meanings cannot be the result of inductive generalization but must be based essentially on internal dispositions which are only activated by experience, but are not derived from it. However, if the relevant argumentation, which I cannot set out here, is found to be convincing, this does not mean that one has to accept the thesis FODOR links with it that lexical items are semantically unstructured wholes (cf. note 99). In the light of the ideas just outlined it makes perfectly good sense – and is empirically and theoretically much sounder – to regard the SFs of lexical items as structured, even if they belong as such to the disposition for word acquisition. The ontogenetic process of maturation then consists in the activation of the schemata and the development of the interaction of the various structural modules.[108] It seems even more reasonable to me, incidentally, not to regard the structures abbreviated to LONG, SHORT etc. in toto as components of the innate disposition but rather the modules whose development makes their structuring possible. What is then to be regarded as innate are not the word meanings but the schemata of their constitution, in our case the subsystem which determines the structure of the DAs as a central lexical class and the subsystem which organizes the establishment of scales. The picture which thus emerges is not only more realistic but corresponds more directly to the assumptions which have emerged regarding the ontogenesis of syntactic structure formation (cf. CHOMSKY (1986) and related work). These conclusions are by no means necessarily bound up with the assumptions on the secondary interpretation of DAs, but they do show that the structural relations which play a part here have to be explored from various points of view.

10.4 Final Balance

The structure of the theory of gradation given in (110) can now be set out in more detail as follows:

(437)(a) *The theory of the* SF *of the lexical items involved contains the following assumptions:*

(i) *the basic structure of the* DAs *(including* viel/wenig *(much/little) which do not contain any instance of* **DIM***)*

(ii) *the null hypothesis on the* B-*reading of the* EAs*, and the ordering relation represented by* DI

(iii) *the derivation of* so *(and thus of the equative) from the regular adjectival* so

(iv) *the representation of* -er, -st, zu *(too) and* genug *(enough) as special lexical affixes.*

(b) *The conditions on the constants occurring in the* SF *assumed in (a) consist of two components:*

(i) *the contextually dependent specification of v by* CVS

(ii) *the conditions* SMC, NEC *and* 0EC, *which characterize certain instantiations of v as inadmissible.*

These two components of the theory require as a general framework firstly general assumptions on the structure of SF, secondly assumptions on its compositional derivation from LF, which include in particular the assignment of θ-roles in accordance with the LF structure and the projection of complement clauses, and thirdly assumptions on the interpretation of SF by appropriate modules of the conceptual structure, which include scale types (including scale adjustment), scale stacking and connection operations.

Within the lexical SF we can identify certain characteristic configurations such as [αc [W c]], [$v \pm$ c] and the SF of viel, which can be regarded as candidates for pre-established schemata of the kind mentioned at the end of 10.3. A crucial factor in the combinatorial derivation of the SF of complex gradation constructions is the binding or instantiation of the comparison variable v and of the difference variable c, which allows us to distinguish between v-type constructions (comparative, superlative, zu-constructions) and c-type constructions (equative, genug-constructions and measure phrase constructions), each type having its own characteristic features.

A crucial point in the theory is the role of the v-conditions, which determines the effect of combining certain SF constants independently of the type of syntactic construction through which they come about.

I have shown step-by-step how the seemingly disparate spectrum of properties listed in 3 and 4 under (i) - (xx), the limiting phenomenon (xxi) and a whole series of other phenomena can be derived from the theory summarized in (437). In addition it was shown that provisional assumptions concerning areas which are not actually part of gradation produce plausible analyses of the facts of gradation. This applies especially to the interlocking of viel with the conditions of mass nouns and plural formation, the properties which the equative and the comparative share with so and anders, and the partial systematicity of the EAs.

A final important point is the fact that we can also derive from the theory the various kinds of auxiliary and detour interpretations which distinguish correct expressions from deviant but interpretable ones and from incomprehensible structures, and thus differentiate the class of syntactically well-formed expressions from the point of view of their SF structure and of their interpretation in CS. Thus the uncertainty of judgement becomes one of the phenomena accounted for by the theory.

There are, finally, two comments to make on the series of problems mentioned at the end of 4.7 which have been analysed by VON STECHOW (1985) and whose treatment cannot be shown in detail here.

VON STECHOW's first problem is 'Russell's Ambiguity', as illustrated by sentences like (438):

(438) Hans glaubt, daß er größer ist als er ist
Hans thinks he is taller than he is

In one interpretation (the '*de dicto* reading') the sentence says that Hans believes something contradictory, and in the other (the '*de re* reading') it states Hans' wrong belief. We may first make the simple observation that the same ambiguity is seen in sentences like (439):

(439) Hans glaubt, daß er das Buch kennt, das er nicht kennt
Hans thinks he knows the book he does not know

In both cases the ambiguity is based on the embedding of a contradiction in an opaque context, which makes a *de dicto* and a *de re* reading possible for the second part of the construction. In our analysis (and incidentally in VON STECHOW's too) the case of (438) can easily be traced back to a more general one which also includes (439). Whatever the theory proposed for opaque contexts is like,[109] if it produces the required result for relative clause constructions, then it does so for the comparative too, because the complement clause of the comparative, like the relative clause, defines a property which under opaque conditions allows two readings. To put this the other way round: a theory which treats the ambiguity of (438) as a problem of the comparative and has no solution or a different solution for (439) is empirically wrong.

The following consequence is less trivial: (440) is ambiguous in the same way and for the same reasons as (438):

(440) Hans glaubt, daß er so groß ist wie er nicht ist
Hans thinks he is as tall as he is not

In the theory developed here this results from the fact that the equative with a negated complement is always fulfilled if the corresponding comparative with an affirmative complement is fulfilled. In VON STECHOW's analysis, however, (440) is – contrary to fact – unacceptable in the same way as (441):

(441) Hans glaubt, daß er größer ist als er nicht ist
Hans thinks he is taller than he is not

In the present theory (441) contains an antinomy characteristic of comparatives with negated complements, it is not interpretable in any reading, and is thus essentially different from (440).

A similar argument applies to the counterfactual conditionals – VON STECHOW's second problem – which are illustrated by (442):

(442) Wenn er weniger geraucht hätte (als er geraucht hat),
wäre er gesünder (als er ist)
If he had smoked less (than he smoked)
he would be healthier (than he is)

Here too we are dealing with the embedding of the comparative in an opaque context, but this time the context is not a verb for propositional attitudes like glauben (*believe*) but the conditional construction. Again there are parallel constructions which require the same treatment:

(443) Wenn er das Buch gelesen hätte (das er nicht gelesen hat),
würde er die Geschichte kennen (die er nicht kennt)
If he had read the book (that he did not read) he would know
the story (that he does not know)

Just like the relative clauses in (443) within the counterfactual conditional construction, the complement clauses in (442) must have the *de re* reading. This reduces the case in (442) to the more general case, just like the ambiguity in (439). Here too the asymmetry of negated complements in the comparative and the equative remains:

(444)(a) Wenn er so klug wäre wie er nicht ist, wäre er so weit gekommen wie er nicht gekommen ist
If he were as clever as he is not he would have got as far as he did not get

(b) *Wenn er klüger wäre als er nicht ist, wäre er weiter gekommen als er nicht gekommen ist
If he were cleverer than he is not he would have got further than he did not get

Sentence (a) is rather uncertain for reasons we know, but it is understandable, while (b) is uninterpretable.

I have mentioned these two problems in order to show how the theory interacts with other structural components.

11 Outlook

11.1 Possible Extensions of the Analysis

The basic structure of the semantic theory of gradation I have developed is indicated by the components under (437). But for obvious reasons it interacts with different principles, rules and elements in LF, SF and CS. I have discussed a large number of cases of interaction, and in some of them it is clear what the further implications are. A whole set of this kind are the processes of word formation involving DAs. Take nominalizations like Höhe (*height*), Breite (*width*), Kürze (*shortness*) etc. A first conjecture here would be that Länge (*length*) in sentences like (445) has the lexical entry (446), that is to say it is derived from lang (*long*) by re-distribution of the θ-roles and by corresponding syntactic re-categorization.

(445) Die Länge des Bootes ist größer als erwartet
The length of the boat is greater than expected

(446) [lang + e]; N, [__NP]; [$\hat{x}$ [$\hat{\underline{c}}$ [[QUANT MAX x] = [v + c]]]]

The external (referential) θ-role of the relational noun binds the difference variable c. Provided this variable is not $\exists$-quantified (which is problematic in the case of a referential interpretation), v is replaced by 0, and Länge actually does specify the extent of the object identified by the governed NP. If Kürze were analysed in an analogous fashion, the v-conditions would guarantee that v assumes the value N_C, which would provide a meaningful explanation of why sentences like (447) are unacceptable:

(447) *Die Kürze des Bootes beträgt 5 Meter
The shortness of the boat is 5 metres

Nevertheless this is only a provisional approach and it will presumably need to be changed. Expressions like (448a) have (b) rather than (c) as their paraphrases, and this requires a different structure than the one indicated in (446).

(448)(a) (Ausschlaggebend war) die Kürze des Referats
(What was decisive was) the shortness of the lecture

(b) *the fact that the lecture was short*
the lecture's property of being short

(c) *the degree to which the lecture was short*

Another area are expressions like erhöhen (*raise/heighten*), verbreitern (*widen*), kürzen (*shorten*) etc., which, as mentioned earlier, can only be dealt with in the framework of a theory of inchoatives and causatives.

The status of DAs in constructions like (449) is quite a different kind of problem:

(449) Hoch über der Stadt, weit vor dem Tor, tief unter der Erde
High above the city, far outside the gate, deep beneath the earth

Here it is not immediately clear whether the head of the construction is the preposition (as JACKENDOFF (1977) assumes) or the adjective. If it is the adjective, it is then unclear whether the PP is the complement or an adjunct of the adjective. All three solutions raise problems which I shall not follow up (but see the discussion in LANG (this volume) on the distance interpretation of the DAs).

A point of departure for a whole series of further investigations is provided by the degree phrase DP. I shall sketch some of the possibilities, without attempting to make this sketch complete or systematic.

At the end of 8.1 under (317) I separated cases like mehr dick als groß from regular gradation. The observation made there, that in such cases DAs are interpreted as EAs, can now be reconsidered in the light of what was said in 10.3. What is still unaccounted for is the special use of mehr (*more*), and for that matter weniger (*less*), in such constructions. They cannot be instances of mehr and weniger as the M head of an MP (cf. the entries under (310)), since they do not have the obligatory MP complement but a complement clause, the surface residue of which is an adjective. The only alternative available is to regard them as cases of the comparative of viel (*much*) and wenig (*little*). For this to make sense they must apparently be able to function as modifiers to an adjective in the following way:

(450) Hans ist [$_A$ mehr [$_A$ dick]] als wie$_i$ er ist [e$_i$ Pro$_A$ [groß]]
Hans is more fat than he is tall

However, this is not a regular modification: the unification of the external θ-roles of mehr and dick does not produce any meaningful result, and for this and other reasons I ruled out in (11) any modification of adjectives which would be analogous to that of substantives. I think this assumption is correct and that mehr ⋯ als er Pro$_A$ groß ist must in fact be analysed as an adverbial modifier of the copula in [$_{VP}$ ist dick]. The AP which has mehr as its head thus becomes a qualification of the instance of Hans ist dick. This becomes plausible when we consider that a reasonable paraphrase for (451a) is not (b) but (c):

(451)(a) Hans ist mehr dick als groß (=(317a))
Hans is more fat than (he is) big

(b) Hans ist in größerem Maße dick als groß
Hans is to a greater extent fat than big

(c) Es ist mehr so, daß Hans dick ist als daß er groß ist
Hans is fat rather than big

The conjecture is borne out in particular by (451c): in such constructions mehr can be replaced with eher (*rather*); regular comparatives in contrast cannot be paraphrased by *rather*. A more hard and fast formulation of this idea would presuppose a suitable theory of the copula.[110]

Genuine extensions of DP are the modifiers ungefähr (*approximately*), annähernd (*almost*), mindestens (*at least*) and höchstens (*at most*), which have already been mentioned, of which the latter two characteristically involve conditions on scope determination. Although these conditions systematically interact with the phenomena of gradation, they must be established independently. I cannot follow up this issue here.

Likewise I can only hint at the interesting interrelations between gradation and the so-called degree particles in German like noch and schon (which literally mean '*still*' and '*already*' but cannot be matched by one-to-one translations in English). The 'phase assignment' associated with noch and schon can be projected onto the scales involved in gradation:

(452)(a) Hans ist noch groß, Eva ist schon klein
Hans for his part is what you would call tall, but Eva is definitely short

(b) Hans ist noch klein, Fritz ist schon nicht mehr klein
Hans is still small, Fritz is no longer small/Hans is definitely short, but Fritz is by no means (what you would call) short

The phases in question may, but need not involve temporal sequences. What is important here is that they must be related to the corresponding sections of the scale.[111] The comparatives with stressed noch are a particularly revealing special case:

(453)(a) *Hans ist nicht groß, aber er ist nóch größer als Fritz
Hans is not tall, but he is even taller than Fritz

(b) *Fritz ist klein, und Hans ist nóch größer
Fritz is short, and Hans is even taller

(c) (Fritz ist groß, aber) Hans ist nóch größer
(Fritz is tall, but) Hans is even taller

What the examples show clearly is that, counter to the general observation that DAs are never contrastive in the comparative, stressed noch makes norm-relatedness obligatory. To derive this statement formally and in detail would

require an analysis of noch and of the effect of the contrastive stress. I shall therefore only indicate informally an idea for such an explanation.

The central semantic function of noch is the continuation of a series. In the case of noch + comparative this is the series of concatenated difference intervals (in the same direction), where the complement of the comparative provides the anchorage for one interval only. N_C (or in the case of EA, 0_C) has to serve as the starting point for a second difference interval. This implies that both the matrix adjective and the complement adjective specify a value above or below N_C, in other words are contrastive. It is by no means trivial to specify explicitly the details from which this explanation follows, but it is clear that the theory of the comparative makes the elements needed available.

A particularly intricate case of complex gradation are the constructions with je - desto (*the more ⋯ the more ⋯*). Let us compare (368), analysed in 9.2, with sentences like (455):

(454) A ist so viel größer als B wie C kleiner ist als D (=(368))
A *is so much taller than* B *as* C *is shorter than* D

(455)(a) Je dicker ein Buch ist, desto teurer ist es
The thicker a book is the more expensive it is

(b) Ein Buch ist um so teurer, je dicker es ist
A book is the more expensive the thicker it is

(455b) makes the structure of gradation with je - desto clear: the matrix adjective teurer is specified by the DP um so (viel) wie es dicker ist. This is in a way parallel to (454), where größer is specified by so viel - wie C kleiner ist als D (*so much - as* C *is shorter than* D). It differs, however, in two respects: firstly, the amounts of difference specified by the two comparatives are not – as in (454) – related to a value specified by the complement clause, and secondly, instead, the amount of difference of the first is made into a function of the second. In other words, um so (or desto) is the head of a DP whose SF makes the value for c in the matrix adjective into a function of c in the complement adjective. The formal means of elaborating on this sketch cannot be developed here.[112] Nevertheless it is clear where such an extension would have to start.

Finally, I should like to take up a problem which does not require any extra investment but is a strict extension of the components already introduced. Chomsky (1981, p. 81ff) discusses constructions of the following kind:

(456) *More books are read by more students than you think*

The phenomenon which is of interest here is the fact that the complement clause is bound to the two antecedents *more books* and *more students* by a 'construal process'.[113] This construal process is covered, with the semantically correct consequences, by the conditions for the projection of complement clauses discussed in 7.1. For sentence (456) we have the following situation:

(457) *More books are read by more students*
than$_i$ you think e_i *Pro$_A$ books are read by* $\emptyset$ *Pro$_A$ students*
than$_i$ you think $\emptyset$ *Pro$_A$ books are read by* e_j *Pro$_A$ students*

Think is a bridge verb and thus requires the application of (196) – extended by (200) – both comparatives thus being contained in the projection domain. This automatically results in the binding of the complement to both antecedents, as required for the construal process. Since only one *than* can stand in clause-initial position and thus ultimately be absorbed by the comparative in SF, the question arises how the DP positions marked by $\emptyset$ in (457) are to be specified. The effect in SF must be that of a contextually determined value for DP. This results from the fact that sentence (458), which is synonymous with (456), is to be interpreted as indicated by (459), though necessarily somewhat opaquely:

(458) *More books than you think are read by more students than you think*

(459) *More books than you think (that books of the number you think are read by students) are read by more students than you think (that the number of books you think are read by students)*

By 'the number you think' the contextual value of $\emptyset$ is indicated. I shall leave open the technical details necessary for fulfilling this condition.

It must be noted that by no means all complements with double antecedents can be coherently interpreted by such a projection. A simple example is (460), where the interpretation is unclear from the same reason that (461) cannot have a clear interpretation:

(460) Hans springt häufiger höher als Fritz
Hans more often jumps higher than Fritz

(461) Hans springt häufiger als Fritz (höher als Fritz)
Hans jumps more often than Fritz (higher than Fritz)

Here the projection (462) generated by (196) would not find any reasonable value for $\emptyset$:

(462) Hans springt häufiger höher
wie$_i$ Fritz springt e_i Pro$_A$ $\emptyset$ Pro$_A$
wie$_j$ Fritz springt $\emptyset$ Pro$_A$ e_j Pro$_A$

Hans more often jumps higher
than$_i$ Fritz jumps e_i *Pro$_A$* $\emptyset$ *Pro$_A$*
than$_j$ Fritz jumps $\emptyset$ *Pro$_A$* e_j *Pro$_A$*

It is interesting to note, finally, that the projection conditions also explain why the complement in (463) cannot be bound to both comparatives:

(463) Ein wendigerer Mann wäre ein geeigneterer Kandidat als Peter
A more agile man would be a more suitable candidate than Peter

This sentences is covered by (204), not by (196), since both APs are attributive and the complement is not a bridge construction. We thus get the projection base in (464), which only contains one comparative and therefore does not produce a double binding of the complement:

(464) Ein geeigneterer Kandidat
wie$_i$ [$_S$ Peter ein e_i Pro$_A$ Kandidat]
a more suitable candidate than [$_S$ Peter is a candidate]

The complement to wendigerer, according to this, is not syntactically specified. The fact that this – contrary to von Stechow's conjecture (cf. note 114) – has nothing to do with number or with mass nouns is shown by (465), where the same effects occur:

(465)(a) Saubereres Wasser würde besseres Bier ergeben als dieses
Cleaner water would produce better beer than this

(b) Mehr Bewerbungen würden mehr Probleme bringen als die schon bekannten
More applications would create more problems than we already have

It is of course possible to interpret (465b) in the sense of (466), but then one of the complements, viz. als die schon bekannten Bewerbungen (*than the applications we already have*), is due to the context of interpretation rather than the syntactically determined projection.

(466) Mehr Bewerbungen (als die schon bekannten Bewerbungen) würden mehr Probleme bringen als die schon bekannten (Probleme)
More applications (than the applications we already have) would create more problems than (the problems) we already have

In other words, it follows from the projection conditions when a complement is bound to more than one DP and when this is ruled out.

11.2 Open Questions

The points mentioned in 11.1 concern the interaction of gradation theory with other components of the grammar. In this section I want to take another look at two problems which have to do with the content of gradation theory itself.

The first concerns measure phrases which have been with us throughout the whole investigation and which we referred to in many different connections. Nevertheless a coherent theory of measure phrases as such is very much lacking (and this applies, as far as I can see, not only to the present investigation but generally). Let me begin by arranging both the problems covered and those left open. A certain ordering may be provided by the levels CS, SF and LF.

In CS there are three things to clarify regarding measure phrases: measurement units, numbers, and their combination.

I defined measurement units in (145) as the representatives of classes of intervals of equal length. For which scales measurement units are possible is a conceptual problem on which I have nothing fundamental to say, and I shall therefore simply observe that dimension and quantity scales as well as (some) ordering scales allow measurement units. Whether measurement units are fixed, and which ones, is a matter determined by accident, convention and need. What is crucial is their status. Intervals on a scale are conceptual entities, albeit not in the sense of primary individuals, and they thus belong to a potential reference domain. Measurement units are not individuals of this reference domain and are therefore not actual referents.

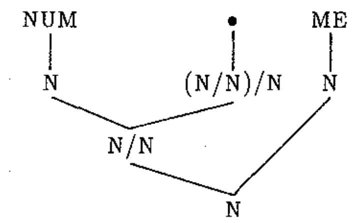
It is not an accidental accessory but an inherent condition that measurement units are linked with numbers. Measurement units are thus the interface between two conceptual modules: that of comparison and that of arithmetical operations. In a more systematic framework measurement units would possibly have to be defined as the product of the interaction of these two modules. Regarding the conceptual status of numbers I have not made any assumptions: the problem needs to be investigated independently. But it is clear that numbers in themselves are scale-forming, presumably with the condition that within them measurement units are not derived but are constitutive. Without pursuing this speculation any further we may say that numbers are available for gradation in CS.[115] Even if measurement units imply access to numbers, this does not say anything about how they combine. A general answer to this problem presupposes an explicit theory of the concatenation and other operations established in the arithmetical module, and such a theory lies outside the bounds of this investigation. I have therefore introduced the combination of numerical values $\underline{n}$ with measurement units ME only intuitively as an iterative concatenation of intervals of the class represented by ME and have represented this by '$\underline{n}$. ME'. For the theory of gradation this is sufficient (with one restriction) as long as only '$\underline{n}$. ME' is again an entity of the type of ME. For an explicit theory of measure phrases, however, this is not adequate, as we shall see.

The restriction just mentioned concerns the treatment of the factor phrases, whose multiplicative concatenation in SF had to be shown and related to the corresponding lexical item (cf. (225)). A properly constructed theory must of course make explicit the relation between multiplicative concatenation in measure and in factor phrases. The point thus raised has yet another aspect to it: to combine with numbers is an essential component of measurement units and is inherently linked to their status as representatives of intervals, but not as primary, that is localized intervals. This would suggest that the units concatenated by factors have the same status. Since this applies in principle to all values that are interpretations of c, more precisely of Y in the context [X § Y], we get a corresponding subdivision of D into D_0 and D/D_0, where only D_0 contains proper, localized intervals. This idea relates plausibly to the comments I have made on the v-conditions, in particular on SMC, and may well be of interest in further generalizing and deepening the theory of gradation. We shall shortly be pursuing this further from a somewhat different point of view.

Let us consider next the nature of measure phrases in SF. I have throughout been making the assumption, which is adequate as far as gradation is concerned,

that the SF of MP has the form [NUM ME] and is an expression of category N. This leaves open the categorization of both NUM and ME, and it suppresses the specification of their combination necessary to a theory of MPs. If one extrapolates assumptions that are intended to apply to factor phrases and also certain plausible ideas on NUM and ME, then the following conjecture suggests itself:

(467)



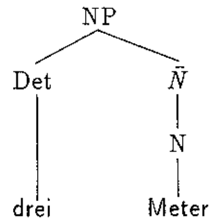
This is not an empirically founded assumption but a unification within the theory which, as we shall see presently, raises as many problems as it solves. According to the assumption in (467) the '•' is a functor characteristic of the SF of MPs. Since it is also crucial to factor phrases NEC could thus be specified more precisely with reference to '•'. But this does not change its theoretical content in any way. The problems raised by (467) are as follows: where does the functor '•' come from in the compositional derivation from LF? Since it cannot be ascribed as an inherent component either to the SF of numerals or to that of units of measurement, it obviously has no recognizable basis in LF.

Whatever the solution to this problem might be, we can record that the possibilities of occurrence of MPs in SF are systematically restricted. In DAs they only occur as specifications of c and never of v. This is guaranteed by the independently motivated projection condition (260) even for constructions like *shorter than three metres*, where the MP is a complement to the comparative and thus apparently provides the value for v. Actually, however, the value for v is determined only indirectly by the MP. Primarily it is an element of c_i of D_0 (cf. (262)).[116] It holds quite clearly and directly for factor phrases that they can only provide values for c. Thus the formal structure of SF reflects in a non-trivial way the distinction between D_0 and D/D_0 established above for CS. The correspondence is interesting firstly because it is not presupposed but is well founded empirically and derived compositionally and secondly because it is by no means always straightforward and transparent but is sometimes indirect.

What has just been said applies to DAs – including viel and wenig – and to EAs insofar as measurement units are introduced for them. However, measure phrases occur in a number of other combinations which are not subject to the present discussion.[117] They raise a whole series of unsettled questions regarding a unified theory of measure phrases, as I shall now show.

On the basis of the $\bar{X}$ theory, which I have been presupposing throughout, the head of the MP must determine the category of the whole phrase. Usually the measurement unit is regarded as the head and categorized as a noun, so that the MP is a maximal projection of N, in other words an NP. Let us assume that (468) is a minimal assumption which corresponds to these presuppositions:[118]

(468)



It is clear that measure phrases differ from other NPs in a number of features. The question is thus whether these special features are compatible with (468).

Regarding the possibilities of occurrence of MPs the following points (among others) are important: firstly, as degree specifications for DAs the MPs alternate with the following items:

(469)(a)	*wie* lang	*drei Meter* lang
	how long	*three metres long*
(b)	*wieviel* zu lang	*drei Meter* zu lang
	how much too long	*three metres too long*

For (a) I have called the relevant position DP and for (b) DP'. Independently of which of the two versions considered – (270a) or (270b) – is the more appropriate, the question arises how we are to account for the fact that NP can be an instance of DP (and DP'). If we consider in addition to (469b) cases like (470), then the question inevitably arises whether drei and not Meter is the head of the MP and therefore determines its categorization:

(470)(a)	*wieviele* Studenten	*drei* Studenten
	how many students	*three students*
(b)	*wieviele* Leute	*ziemlich viele* Leute
	how many people	*rather a lot of people*
(c)	*wieviel* zu lang	*ziemlich viel* zu lang
	how much too long	*rather a lot too long*

The alternative would be either to assign Meter to two different syntactic categories or to split up the category N by appropriate features, so that measurement units would differ from canonical nouns by special features.

Secondly, based on the parallels in (471), I have treated MPs in the case of mass nouns analogously to DP'. (c) shows that this parallel could be extended to measurement specifications in plural NPs:

(471)(a)	*wieviel* größer	*drei Meter* größer
	how much taller	*three metres taller*
(b)	*wieviel* Wasser	*drei Liter* Wasser
	how much water	*three litres of water*
(c)	*wie viele* Bewerber	*drei Dutzend* Bewerber
	how many applicants	*three dozen applicants*
		sechsunddreißig Bewerber
		thirty-six applicants

However, whereas in the case of adjectives the DPs are clearly complements and are θ-marked, there is an additional problem in the case of MPs with mass nouns.

The case and number markings, as (472) shows, are not realized by the mass noun but by the measurement noun:

(472)(a) Mit drei Litern Wein kommen wir aus
With three litres of wine we will manage

(b) Zwei Sack/Säcke Zement sind zu wenig
Two bags of cement are not enough

Thus the MP must be the head of the whole NP at least for the level on which the distribution of case and number features are defined. Whether the possibilities considered under (327)/(328) for LF can still be maintained in view of this situation needs to be examined. In any case the parallels between (472a) and (473a) would have to be taken into account:

(473)(a) Mit drei Dutzend Bewerbern kommen wir aus
With three dozen applicants we will manage

(b) Mit drei Dutzend der Bewerber kommen wir aus
With three dozen of the applicants we will manage

The distinctions between partitive NPs like (473b) and simple NPs are complicated and are subject to considerable differences among languages.

Thirdly, MPs occur as regular, independent NPs:

(474)(a) Drei Stunden wären zu viel
Three hours would be too long

(b) Gestern hat er drei Liter gekauft
Yesterday he bought three litres

Regarding the internal structure the relation between the two elements is open, even if the measure noun and not the numeral is the head of the MP: for a measure noun to be the head of a measure phrase, two conditions have to be fulfilled. Firstly, an indication of number of quantity must be present, and secondly definite reference is ruled out:

(475)(a) Der Weg ist drei/mehrere Meter zu lang
The path is three/several metres too long

(b) *Der Weg ist ungefähr/nicht eingeplante Meter zu lang
The path is approximately/unplanned metres too long

(c) *Der Weg ist die Meter zu lang
The path is the metres too long

Sentences like (476) are possible, but what they contain are not measurement specifications but references to quantities already introduced:

(476)(a) Das sind die zwei Liter Wein, die ich versprochen hatte
That is the two litres of wine I promised

(b) ?Kurt ist die zwei Meter groß, die für das Team verlangt werden
Kurt is the two metres tall required for the team

Whether the restrictions indicated here in the categorial structure of measure phrases are compatible with (468), whether and how the structure must be modified and which of the restrictions must be specifiable in LF, is not clear. What is clear is that a final characterization of the SF of measure phrases depends on the answer to these questions.

The second set of problems which are a crucial part of the theory of gradation and are still largely unanswered, concern the comparison class C, the definition of which I have been presupposing throughout. The various factors which come into play here were discussed in 4.2. The traditional view, which I have shown to be not generally valid, that for an attributive AP the governing noun defines the class C, would now have to be interpreted as follows: the SF of the noun specifies the value of C in N_C. In this connection there is an interesting proposal by HIGGINBOTHAM (1985). Presupposing general assumptions about the functions of θ-marking for adnominal and adverbial modification, which largely corresponds to assumptions I have been making, suggests a special form of θ-marking for precisely this case. According to this proposal an adjective like klein has an external θ-role and a so-called autonymous θ-role by which the governing noun is θ-marked. If we designate a θ-role $\hat{x}$ that is autonomous in this sense as $\underline{\underline{\hat{x}}}$, then we would get the following SF for lang:

(477) $[\hat{c}\ [\underline{\underline{\hat{C}}}\ [\underline{\underline{\hat{x}}}\ [\text{QUANT MAX } x] = [N_C + c]]]]$

Since similar relations would have to be assumed for the reference class which determines the evaluation parameter in adjectives like *good*, the B-reading for *good*, according to the assumption made earlier, would have to be supplemented as follows:

(478) $[\underline{\underline{\hat{Q}}}\ [\underline{\underline{\hat{x}}}\ [[\text{VALUE } x]\ Q]]]$

However, all the problems discussed in 4.2 now apply to the two autonymous θ-roles in (477) and (478). For one thing $\underline{\underline{\hat{C}}}$ and $\underline{\underline{\hat{Q}}}$ would have to θ-mark the respective relatum. This is the governing noun only in the case of attributive APs. Furthermore, $\underline{\underline{\hat{C}}}$, but not $\underline{\underline{\hat{Q}}}$, is subject to the influences exerted by restrictive and appositive modification and particular and generic reference. Added to this, the specification of C by the governing noun is only adequate if the noun determines an inherent class norm. Finally, there are various syntactic alternatives for specifying C and Q. Some of these possibilities are recapitulated under (479):

(479)(a) Dieser Wellensittich ist klein
This budgerigar is small

(b) Hansi ist ein kleiner Wellensittich
Hansi is a small budgerigar

(c) Hansi ist klein für einen Wellensittich
Hansi is small for a budgerigar

(d) Für die Bezirksliga ist Peter sehr gut als Schachspieler
For the Regional League Peter is very good as a chess player

In (d) **Bezirksliga** would be a specification of C (in the G-reading of **gut**) and **Schachspieler** a specification of Q. The autonymous θ-role can thus be assigned to the governing noun (or verb) only in a limited number of cases in the way envisaged by HIGGINBOTHAM, and in all other cases the corresponding values must be determined in some other way.[119]

Besides a solution to the problem discussed in 4.2, the specification of C (and Q) requires an answer to the deeper question: how are free parameters in SF to be specified by syntactic constituents? Although the theory of gradation presupposes an answer to this question, the problem is of a much more general nature and cannot be solved for C in isolation.

A coherent theory of measure phrases which sets up a clear relationship between their specific properties on different levels, and a general understanding of the functioning of context-dependent parameters, of which C is a prime example, are by no means the only requirements whose fulfilment I have quietly taken for granted. The same thing applies to a whole series of points of various degrees of importance which are less closely related to the problems of gradation. Consider for example the various properties of contrastive accent or focus, the intricate conditions of definite, indefinite and quantified reference specification or the systematic relations between various lexical processes. The fact that the theory of gradation works despite these many desiderata is because the requirements which these presupposed components must fulfil are sufficiently clear. Even if detailed examination of the components left open here were to show that they do not exactly meet the presumed boundary conditions, potential consequences of those observations could be kept under control. This does not mean that possible modifications of the proposed theory need be no more than trivial readjustments: it would in fact be interesting if a restructuring were found to be necessary which would permit more fundamental generalizations or deeper motivations. However, I do think that the structure of the theory is sufficiently well defined to allow us to formulate and to integrate such consequences.

11.3 Prospects

The aim described in section 1 for this investigation was to proceed on the basis of existing analyses of gradation and comparison to develop a theory which encompasses a broad spectrum of facts, not only in order to incorporate them descriptively but to explain their structural interrelationships. An important feature is that the theory, in covering phenomena not taken into account hitherto, is not only able to reveal distinctions within the area considered so far but also incorporates new and different areas. In sections 3 and 4 the relevant facts were presented, and these were added to step-by-step as the case arose. The crucial point of the approach pursued then is the structure of the theory as outlined in 4.7 and the interconnections between its components.

The framework of the theory is a modular view of the structure of cognitive activity according to which the aspect of syntactic structure defined by LF determines the conceptual interpretation of linguistic utterances. This interpretation is mediated by the SF, which relates the properties and relations specified in LF to the internal structure of lexical items and thus determines the conceptual interpretation to the extent to which the grammatical knowledge **G** organizes the integration of general, extralinguistic, and contextual knowledge.[120] The constants, categories and variables of SF are the theoretical primes by which this aspect of grammatical knowledge is accounted for. Against this background the role of the two components of the theory of gradation mentioned in (110) can now be specified more precisely.

(a) *Lexical items.* First of all lexical items, in accordance with the basic conditions just summarized, are the nodal points of the mapping of LF onto SF. In LF lexical items are, roughly speaking, basic elements with certain properties for structural organization, and their combination defines the framework for conceptual interpretation. In SF the lexical items are complex structures whose form transfers the relations defined in LF to certain components of these structures.

However, the key role of lexical items has two more aspects beyond this intrinsic point of the approach adopted here.

Firstly, the configurations of basic elements specified in the lexical entries LE, together with general principles of structure formation, define the class of possible SF representations. This applies, mainly due to the categorial structure of SF, to the organization within SF on the one hand and – essentially because of the principles of θ-marking – to the mapping of LF onto SF on the other. In other words most of the structure of the combinatory mechanism of language defined by **G** can be projected from the structure of the lexical items. In this respect the theory of SF follows the insights which have been decisive in the development of linguistic theory in other areas, in particular that of syntax, in the past ten or fifteen years.

Secondly, the configurations of primes occurring in the LEs are not arbitrary selections from the possible combinations in SF but are to a large extent conceptually motivated, systematically organized patterns and schemata. The discovery of configurations which mediate the interlocking of various conceptual subcomponents and link them to linguistic structure formation is a program which has to be carried out step-by-step. Assumptions on the general schema of the SF of DAs or on the organization of so and the comparative morpheme are building blocks for carrying out such a program in a clearly delimited area.

(b) *Conditions on constants of* SF. The fundamental units of SF, like those of any other linguistic level, are subject to certain structural conditions which define their general status in the theory. In addition they are subject to specific conditions which are to be motivated empirically and constitute an essential part of the explanatory content of the theory. The principles of binding, of θ-marking and of case assignment are revealing examples of such conditions in the theory of syntax.

For the basic elements of semantic structure postulates or axioms have been used for a long time to set up the relations between expressions in which the basic units occur. The relations in question are essentially those of possible equivalent conversion or of deduction. Postulates of this kind have played an important role in characterizing relevant properties of the expressions and constructions investigated, for example the contrary nature of +Pol-A and −Pol-A or the conversion relation between the comparative of a +Pol-A and a −Pol-A. A fundamentally different form of condition or principle concerning SF constants, which has not been considered so far, are the v-conditions, which play a crucial part in the derivation of widely differing properties of the expressions and constructions investigated. They characterize systematic properties of certain constants, just as meaning postulates do, but they differ from these in a fundamental way.

The v-conditions do not state any possibilities of conversion or deduction but stipulate principles of interpretation and thus structure the class of admissible representations in SF, and they do so independently of which lexical and syntactic configurations produce them. In other words the v-conditions do not characterize permissible operations which an SF structure can be subject to but define conditions for interpretable SF configurations. Comparison of a relatively general meaning postulate which relates antonymous EAs to the same scale (=(a)) and the scale-mapping condition SMC (=(b)) illustrates this again:

(480)(a) $[[\text{QUANT DI } \bar{P}\ x] = [\text{v} + \text{c}]] \equiv [[\text{QUANT DI P } x] = \text{K } [\text{v} + \text{c}]]$

(b) $[= \text{X}]$ implies $\text{Int(X)} \in \text{D}_0$

Application of (480a) to a graded Neg-A determines the properties of the corresponding expression only insofar as the relation to the corresponding Pos-A is shown. Fulfilment of (480b) on the other hand is an indispensable condition for the admissibility of the configuration $[\text{Y} = \text{X}]$ for any X and Y in SF.

In many ways I regard the role of the v-conditions as the most interesting aspect of the proposed theory and shall therefore add two more general thoughts on it.

Firstly, the v-conditions, though they are bound to certain constants (or configurations of constants), specify a rather general and certainly not trivial framework within which SF structures are to be interpreted. This is shown by the partly very complex and indirect effects of the interaction of the individual conditions and the representations subject to them. In this respect they represent principles which are not derivable from the permissible interpretations of linguistic expressions as such. They rather determine the framework for linguistic knowledge to be fitted into. In this way they explain how knowledge about interpretability even of very intricate or marginal constructions is possible and shed light on a special aspect of the problem of the learnability of natural languages.

Secondly, the formulation of the v-conditions raises the question whether they are a special feature of gradation theory or a general phenomenon of the structure of natural languages. This is a question which can only be answered of course on the basis of empirical investigations aiming at systematic theory construction. There is no doubt that the v-conditions do in fact refer to principles of the comparison operation and are thus specific to gradation theory. But it seems to me to be a plausible conjecture that there are other areas of structure formation which are subject to analogous principles. One area which suggests itself for useful exploration along these lines is that of local and temporal deixis, which is another domain where values for appropriate variables are established on the background of highly structured basic conditions. If these speculations turn out to be correct the next step would be to consider whether principles of the kind in question are specific to certain domains or whether they form a more general schematism. Considerations of this kind go beyond the foreseeable scope, but they do show how a theory of the semantics of natural languages which goes beyond recording the descriptions of idiosyncractic features can be pursued.

I should like to conclude by giving two examples of the many problems – some general and some very special – which could be pursued against the background of the theory I have presented.

One of the traditional views of dimensional adjectives is the asymmetry of markedness between +Pol-As and −Pol-As. The facts considered in this connection seem at first glance to produce a simple pattern deriving from nominative vs. contrastive use. It seems that the core of this bundle of roughly circumscribed phenomena is indeed the configuration $[v + c]$ vs. $[v - c]$ in the SF of the DAs. However, for reasons that can now be understood, the phenomena form a highly intricate picture (cf. also the Epilogue to this volume, by BIERWISCH and LANG). If this conclusion is correct, then the actual task of a theory of markedness in this domain is to incorporate the status of '+' and '−' as constants of SF into a more general theory of markedness.

The basic conditions developed in the proposed theory of gradation must be applicable to the various groups of lexical items falling within their domain. Besides the spatial DAs investigated more closely this concerns adjectives for other dimensions having the same structure in principle, but it also concerns DAs with non-canonical properties. The group that is the most complicated because of the special nature of their scale are the terms for heat or temperature values, but there is also the intricate group of time adjectives like *old/new/young* or *early/late*.

On the whole I regard the findings on the structure of the theory I have attempted to summarize here as the most important result of the investigation. But it goes without saying that these findings are only of interest to the extent that they are relevant and revealing regarding the explanation of pertinent facts. I have attempted to show this to be the case with regard to many individual phenomena among which – besides the standard problems – the derivation of interpretations of deviant or semicorrect expressions with their specific properties constitutes an important part.

Notes

1 It is hardly possible to list the relevant works, especially since important ideas are contained not only in works devoted to the subject directly but often also in those devoted to other topics. A general picture of work carried out in the sixties is given by BARTSCH AND VENNEMANN (1972). VON STECHOW (1985) gives a compilation from recent years. HELLAN (1981) provides a detailed discussion over the whole range of the topic.

2 In this respect the role of comparison is quite analogous to that of the passive, the features of which as a grammatical phenomenon can be traced back to the working of general syntactic principles in combination with the morphologically induced facts of the passive participle. Cf. the discussion in CHOMSKY (1981, pp. 117-127). Similarly, features of comparison that are well known but are often largely left out of account will be traced back to the interaction of general conditions of gradation with morphological and lexical facts concerning the relevant items.

3 In BIERWISCH (1988), I have given a relatively detailed version that corresponds to the present state in orientation, though not in detail. I shall not assume a knowledge of that version, and shall therefore not discuss the modifications which have emerged with the solution of a number of individual issues. I have discussed that version (and its predecessors) with many people who have suggested changes and given me some useful ideas to follow up. Besides those involved in the present project I should like to make special mention of Lars Hellan, Jim Higginbotham, Ray Jackendoff, Hans Kamp, Jerry Katz, Ferenc Kiefer, Pim Levelt, Pieter Seuren and Arnim von Stechow.

4 A more detailed discussion of the underlying assumptions on SF is given in BIERWISCH (in preparation). I shall refer in what follows to the framework given there, but from case to case I shall use it rather loosely and make simplifications and short-cuts where this serves the presentation.

5 These rules are all erroneous, not so much because they represent the positive, at least semantically, as complex, which is both counter-intuitive and inelegant, but because they are factually wrong and do not begin to account for the actual distribution of norm-relatedness. The only analysis which attempts a radically different approach is that of KLEIN (1980). However, despite its formal explicitness, this analysis too is unacceptable for many reasons, so I shall not discuss it here (incidentally, in a roundabout way it boils down to something like a variation of version I, p.84). I agree in essence with the objections to KLEIN put forward by VON STECHOW (1985).

6 As far as sentences like (30) are taken into account at all, they are put aside by ad hoc stipulations. BARTSCH AND VENNEMANN (1972, p. 70ff), for example, give a rule which interprets (30a) as (30b) and thus eliminates the special character of (30a). CRESSWELL (1976) excludes (30a) by the rule that values contained in measure phrases are only defined for the *tall* scale and not for the *short* scale. But this would make even (29c) impossible. More important than the fact that both analyses are wrong is the conclusion that the status of (30a) does not originate from a lexical coincidence of a certain class of adjectives but is of a far more fundamental nature in the following sense: all −Pol adjectives in the sense defined in 4.1 below necessarily have the property in question. What has to be explained is why this is so, i.e. how it follows from the structure of *klein*. This is why the phenomenon served as a kind of divining rod for formulating my own ideas.

7 VON STECHOW (1985), as well as describing his own version, which I shall discuss directly, discusses the most important of these variations with regard to the relevant consequences arising from the differences between them. Most of these consequences concern questions of scope, which I shall discuss later. A variation of version I particularly worth mentioning is given by WUNDERLICH (1973), which is the only one to cover explicitly the complicated distribution of norm-relatedness I shall be discussing. It does so through appropriate conjuncts in the resulting semantic representations. I shall not go into this variation for two reasons. Firstly, although it achieves a greater degree of descriptive adequacy than its rivals regarding the point mentioned, it does so only by way of specially stipulated conditions which set up the desired norm-relatedness from case to case and thus does not explain how it actually comes out. Secondly, the technical mechanism used is so intricate that it cannot be set out here.

8 To be able to apply this proposal to equatives without a factor phrase, like (32c), one would have to assume that in the absence of a factor phrase x_3 by convention is equal to 1. Then (32c) becomes SF-equivalent to (i):

(i) Hans ist einmal so groß wie Eva
Hans is once as tall as Eva

I regard this consequence as dubious, though it is not the only flaw in this analysis.

9 CRESSWELL (1976) envisages a version of this answer in defining degrees as pairs (u, >), or (u, <), where u is the scale value and > and < are the ordering relations on the scale. *Tall* and *short* then have degrees with respect to converse orderings. The constants TALL and SHORT would then have to be supplemented by a specification of the appropriate degrees. We shall see shortly that this does not achieve the goal.

10 Arnim VON STECHOW (unpublished) has proposed an attempt in this direction based on the following idea: $[x[\text{SHORT } y]]$ is defined as $[x[\text{TALL } -y]]$, where $-y$ is a negative scale value, so that '$-$' takes over the function of U. I shall not demonstrate here that the proposal in this form does not work. However, it did in a way determine the direction in which I shall develop my theory of antonymous adjectives of degree, though with several additional components.

11 WUNDERLICH (1973), DOHERTY (1969) and KIEFER (1978) are exceptions. But since they cover the facts only descriptively I shall not discuss them further here.

12 I have left the superlative out of the discussion because it does not at the moment provide any additional aspects. It is almost always treated as the comparative with a universally quantified comparison element ('comparans').

13 Cf. ZIMMERMANN (this volume), who assumes maximal projections of Adv, and Q.

14 The division of GAs into DAs and EAs corresponds approximately to the classification by KEENAN (1983) of relative (i.e. restrictive non-absolute) adjectives into transparent and non-transparent ones. I shall not adopt the program that underlies KEENAN's classification for reasons which I shall give in section 4.2.

15 I should like at least to mention the particularly intricate case of adjectives for the scale of heat: *warm, cold, hot* (and possibly *tepid*). These are DAs which apparently contradict the statement just made. The problem here lies in the way the scale is normed in a particular way, which requires special analysis. I shall leave aside this problem, which does not affect point (xi).

16 If adjectives are adnominal on account of their category, predicative (and adverbial?) adjectives too must at least be accompanied by a latent noun. Then a sentence like (i) must be analysed as (ii) or (iii):

(i) Der Tisch ist hoch
The table is tall

(ii) Der Tisch ist ein hoher Tisch
The table is a tall table

(iii) Der Tisch ist ein hohes Ding
The table is a tall thing

However, (ii) and (iii) as analyses of (i) are not only unfounded syntactically but require a large number of ad hoc additions semantically. It is e.g. questionable whether (ii) is equivalent to (i), and for generic sentences like *an elephant is big* there is no question of (ii) anyway. Predicative adjectives such as in *he ran naked through the room* cannot be accounted for by this theory at all.

17 KEENAN (1983) distinguishes between transparent and non-transparent GAs in a sense which suggests the following interpretation: non-transparent GAs have a free parameter Q and possibly C, but transparent GAs only have C. If this is the case, then KEENAN's distinction does not – as indicated in note 14 – correspond to that between DAs and EAs, since there are DAs with a free Q, e.g. breit (*wide*), groß (*big*), to give just a few examples that LANG (this volume) explains, and there are EAs without a free Q, like faul (*lazy*), müde (*tired*), ängstlich (*timid*), which hardly show any reference-dependent variation. I regard this point as worth putting on record and the question of correspondence to KEENAN's classification as less important, since his basic assumption that adjectives are primarily adnominal seems to me inappropriate.

18 For the sake of completeness let us note that the small group of non-restrictive adjectives like scheinbar (*ostensible*), ehemalig (*former*), angeblich (*alleged*), künftig (*future*), are not covered by the modification theory presented here, and, I think, rightly so. These adjectives are not extensional modifiers, nor are they intensional in the sense of the theory rejected. Rather, they require separate treatment to explain their peculiar properties: they cannot be used predicatively; if they are used as adverbs, they are not VP adverbials; and they are not gradable, though they are not absolute adjectives like verheiratet (*married*), unteilbar (*indivisible*) or tot (*dead*). I suspect that this bunch of properties is not a chance agglomerate.

19 What this information looks like formally in SF and how the fixing of Q can be specified more precisely must be settled within the theory of SF. Early and undoubtedly inadequate first approaches in this direction are certain types of semantic markers in KATZ (1972) and the semantic representation of nouns for physical objects which determine the interpretation of DAs in BIERWISCH (1967).

20 This splitting, or doubling, of norm-relatedness has also been overlooked by those authors who, like WUNDERLICH (1973) or KIEFER (1978), have taken any notice of the problem at all.

21 Here two auxiliary operations are applied: (a) kurz is interpreted as an absolute adjective, (b) this is then graded secondarily like an EA. The schemata underlying these operations will be formulated and explained later. They make it possible to apply auxiliary operations when these are required by special contexts.

22 Generally, but not necessarily, (87a) is regarded as a transformational reduction of (87b), though again there are differing views concerning the deletion operations involved. For a detailed exposition, motivation, and evaluation of various ways in which the question has been tackled see, inter alia, BRESNAN (1973, 1975), JACKENDOFF (1977) and ZIMMERMANN (this volume). The alternative view of the relation between (87a) and (87b) is that in (a) the missing lexical items are not deleted but are empty, and are simply filled semantically by interpretation rules. Cf. JACKENDOFF (1977) and PINKHAM (1982).

23 In the interpretative version: a lexical realization of the constituent in question is ruled out.

24 The term 'p-contrastive' (for *prosodically contrastive*) is used to avoid confusion with *contrastive* in the sense of NR and CR. For the grammar of p-contrast and the relation to focus formation see SELKIRK (1984, chapter 5).

25 WILLIAMS (1978) makes a first attempt to define the term 'structurally analogous', though without including hypotactic configurations. I take it for granted here that the required terms can be defined. I shall discuss the necessary conditions in more detail in 7.1.

26 VON STECHOW's analysis does allow of a second reading, in which (107c) is more or less SF-equivalent to (i):

(i) *For nobody else: Hans is more stupid than he is*

The status of this interpretation is dubious and in any case very marginal. If this reading is precluded for (107c), VON STECHOW's proposal remains problematic. I shall come back to these problems in 7.5. Cf. also note 92.

27 In order not to violate the deletion principle (90), the sentence requires p-contrast for nicht ist, which explains the difficulty in interpretation.

28 It is not surprising that they apply to English, as I have shown in BIERWISCH (1988). But even languages unrelated to German, such as Hungarian or Japanese, contain analogues to all the phenomena discussed in section 4. Cf. note 68.

29 It might be interesting finally to take stock of versions I-III. Of the groups of facts discussed (i), (ii) and (vi)-(viii) are covered, though with reservations, (iii)-(v) pose difficulties and (ix)-(xx) cannot be covered. This would seem to justify the claim that these theories are descriptively inadequate.

I should mention here that VON STECHOW (1985) presents a revealing analysis of eight other facts, which chiefly have to do with problems of scope. I cannot discuss these problems here, but I shall be integrating directly some of the solutions proposed by VON STECHOW into the theory to be presented, because in all relevant respects the necessary conditions for doing so are built into it anyway.

30 Actually the series of natural numbers is a paradigmatic special case of a scale D. On the other hand numbers have a property which degrees do not have: they form the foundations of arithmetic and thus of a specific conceptual module. It is an interesting task, though one which I cannot follow up here, to find out the consequences of the interaction of these two components of C. Here I shall simply assume that due to this interaction degrees can be expected. I will return to this problem in 11.2.

31 They arise from the nature of the dimension T which is relevant to comparison, and not from the structure of the comparison and of the scale D involved. The point being noted here is one of the peculiarities that have to be clarified separately for the pertinent lexical items (cf. note 15). It turns out, incidentally, that the deficit in the heat or pitch scale is filled in accordance with (114) whenever corresponding conceptualizations are introduced. Conceptually, the dimensions are treated as if their scale had a zero point.

32 A discussion of this question with reference to comparative clauses is contained in CLARK (1976, pp. 79-110). For special consequences see also BLUTNER (this volume). BLOCK (1981) gives a comprehensive survey of the problems of 'double coding'.

33 A particularly interesting case is the projection regarding the aspect identified by groß, where the value range is the height scale (for Hans ist groß), the area scale (for ein großes Quadrat) and the volume scale (for ein großer Ball). LANG (this volume) argues convincingly that groß identifies primarily a proportional schema and the projection represents a kind of measurement scale. This provides a plausible framework for the facts described by GOEDE (this volume). In any case projection regarding groß too is always a unidimensional degree.

34 For the time being it is unimportant whether P is stipulated as a two-place function P (T, V) over aspects and entities or as a one-place function P (T(V)) over the assignment of T to V.

35 PINKAL (1983) discusses this phenomenon in a much broader framework and shows that there are fundamentally context-dependent conditions on the precision of the interpretation of SF. So they do not only concern the properties of the positive and comparative being considered here. Even measure phrases are affected: *2 metres high* has different tolerances for raspberry bush than it does for a highjump bar. In the following I shall presuppose such a general condition for the format of CS representations and shall assume that the selection of the amount of difference meets this condition. The condition of (129) and all other cases is thus: d_i where $\mu(d_i)$ differs relevantly from $\mu(d_o)$.

36 Indications of measurement that are realized linguistically are nouns with special syntactic properties, as the following comparison shows:

(i) *The landing stage is (* the) two boats long*

(ii) *The landing stage is as long as (the) two boats*

With the article (ii) is unambiguous, while (i) is ungrammatical. Measure phrases are NPs which do not allow the definite article. In certain cases they can (and in German sometimes must) be in the singular when used with numerals. I shall take the syntactic properties for granted and shall come back to some unsolved problems in 11.2.

37 I shall return in 6.2 to the problem touched upon here. At this point I shall merely point out that the root of the 'limit phenomenon' summarized there under (xxi) lies in the asymmetry of the implication on which the axiomatic stipulation of '$\supset$' in (121c) is based. The premise of the implication only gives a sufficient condition for the conclusion to apply, but leaves the necessary condition open. For our problem this means that for '$x \supset y$' to be valid it is sufficient if all intervals in y are also intervals in x, but it does not say whether x contains intervals which y does not

contain. The fact that sentences like (144) have a preferential interpretation that Hans is no less and no more than 1.50m tall can then be explained by the fact that the implication is preferably but not necessarily interpreted as indicating the necessary *and* sufficient condition for the validity of the conclusion. To put this somewhat differently: '$x \supset y$' is at any rate fulfilled if y is contained in x; of the various possibilities which fulfil this condition, the possibility that x does not exceed y has a certain priority. The order of preference among various possibilities, of which the one discussed here is one special case, is a general phenomenon of which I cannot give a fundamental analysis here.

38 This structure of the comparison relation is to be found in a certain sense in version III, namely in the conjunct $[x_1 = x_2 + x_3]$, which occurs in (41) and which provided the initial impetus to the present theory. The crucial difference is that in version III this component is only introduced into the semantic representation as a result of syntactic composition, while in the theory developed here it is contained in the SF of the adjectives themselves. We shall see that this step leads to a simple explanation of the characteristic properties of the DAs and their function in complex expressions.

39 There is another problem in connection with the question how big the interval that produces the interpretation of x_i and x_j must be for sentences (150) and (151) to be true, i.e. by how much the board has to deviate from the average in order to be long or short. The question is one of the threshold value of $\mu(d_i)$ as determined by the situation, i.e. of the context-dependent condition 'relevantly different from 0'. Cf. note 35 and the discussion in 5.3.

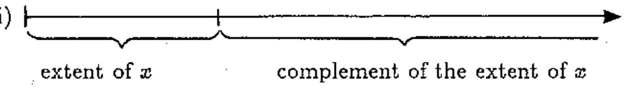
40 This is a stipulation which suggests itself, but it is not the only possible one. One of several conceivable alternatives consists in introducing DIM not as a function but as a relation of the category (S/N)/N, so that [[DIM x] y] would mean that the invididual x has an extent y of the dimension specified by DIM. [DIM x] would then be an expression of the category S/N and its interpretation would consist in the property of having a particular DIM-extent. This has the corresponding consequence for the categorization and interpretation of the functor QUANT. I shall not pursue this purely theory-internal alternative any further.

41 Cf. the results put forward by BLUTNER (this volume) and the detailed investigations by SCHRIEFERS (1985). They show that the different complexity of processing does not correlate with the contrastive and nominative use of DAs, in other words with the recurrence of N_C. Cf. also BIERWISCH and LANG, Epilogue (this volume).

42 The point in question here has often been observed but, as far as I can see, has only been systematically analysed by ATLAS (1984) and by SEUREN (1985), who develops further the analysis in SEUREN (1973), which belongs to version II. The fact of interest in the present connection is that SEUREN sets up the relation between the compared scale segments that is crucial to gradation, by using a predicate 'x is much to y', which has the following interpretation:

(i) x is much to $y =_{def} \forall z\, [z \in y \rightarrow z \in x]$

Clearly this in principle makes the same statement for 'x is much to y' as was made for $[x \supset y]$ in (121c), on which my treatment of asymmetry is based. I must here refrain from showing how SEUREN integrates the component defined in (i) compositionally within version II; I notice, however, that the difference between +Pol-A and −Pol-A is covered by the fact that the former identifies an extent and the latter the complement of an extent, as shown in (ii):

(ii) 

'Is much to' is thus equally applicable to +Pol-A and −Pol-A, but at the price of "shortness" being interpreted as an indefinite (or infinite) scale segment. Apart from the fact that this is intuitively implausible, it does not allow a solution to most of the phenomena discussed in section 4. The analysis by ATLAS (1984) is based on a predicate 'x exhibits y', which likewise has the same properties as $[x \supset y]$. ATLAS gives no syntactic basis for the compositional generation of the representation he postulates and only treats the comparative and equative of +Pol-As. I shall therefore not try to prove explicitly that all the conclusions and properties emerging from ATLAS' analysis can be reconstructed point for point in the present theory.

43 Here it is not a question of the degree of vagueness of the interpretation mentioned in note 39, which is in any case not 'directed', while the asymmetry of the continuation (corrections or clarifications) in (159) and (160) clearly show the directedness of the phenomenon discussed here. The fact that each possibility of extension corresponds to the directed scale-relatedness is independent of the degree of precision of the interpretation.

44 This corresponds to the fact that they do not have an article which specifies reference properties (cf. note 36). As complements to DA measure phrases are θ-marked in accordance with (7), i.e. they are coindexed with $\hat{x}_3$ (or substituted for x_3 in accordance with (13)). However, since they are not referential, their index is not transferred to a referential θ-role in accordance with (10). These assumptions seem to me to be reasonable and empirically well founded, and they have the right consequence for the role of MPs. I shall return to the problem of MPs in 11.2.

45 A gesture linked with so_k can (but need not) be made as a kind of deictic localization of a scale value. It is interesting to note that for (176a) it can only be directed upwards and for (b) downwards. (If we try to imagine reversing these gestures we very soon become aware of how inappropriate this reversal is.) The gesture realizes the scale relatedness carried out externally and the corresponding direction of the operation. In 7.2 I will show that the abbreviation used here for the SF of so_k must be replaced by a general analysis of so which conflates the deictic so and the so of the equative.

46 Closely related to the question operator wie is the wie in indirect questions and in comparative clauses, whose similarity to comparative and equative constructions is crucial. I shall represent this wie semantically as a lambda operator $\hat{c}$ and shall here leave the question open whether [WH c] and $\hat{c}$ are only alternative ways of symbolizing the same operator which functions either as an interrogative or a relative pronoun according to the properties of COMP.

47 We shall see later that precisely this condition not only applies to measure phrases but underlies both the deviancy and the detour interpretation in constructions like Das Boot ist doppelt so kurz wie der Steg (*The boat is twice as short as the landing stage*). Cf. section 7.2.

48 The argumentation for cases like (178a) which are also norm-related on the basis of 0EC, is somewhat more complicated but in principle similar.

49 One thing which supports this speculation is the fact that 0EC can apparently be suspended if relevance is guaranteed in some other way. This is the case when the assignment of dimension itself is informative, for instance in sentences like

(i) *The table is wide, not long*

with a contrastive accent on the adjectives, which differ only as to dimension. It is not easy to verify whether or not there is norm-relatedness in (i). If a purely nominative interpretation of the DA is possible here, it would be explained by the interpretation of 0EC considered. More or less the same thing applies to sentences like (ii), which many speakers interpret as a listing and not as an evaluation of dimensions (Ewald LANG: personal communication):

(ii) *The brick is tall, wide and long*

50 The question concerns more generally the autonomy of SF with respect to CS, a problem which cannot be discussed at length here but which is related crucially to the role of SF conditions of the type discussed here and must therefore be followed up separately. Some details and conclusions are considered by BIERWISCH and LANG in the Epilogue to this volume.

51 In cases like hoch (*high*) / niedrig (*low*) / flach (*shallow*) / tief (*deep*) / steil (*steep*) or alt (*old*) / neu (*new*) / jung (*young*) much more complicated relations can occur than the (rare) lexical gaps, and this is discussed in detail by LANG (this volume). The general structure of DAs provides a schema which can be filled empirically in various ways without the schema itself being abandoned.

52 The explanations given in 5.3 on the nature of N_C come into play again here: what the conjunction of (183a) and (b) says is that there is no interval c that is relevant to interpretation by which the board surpasses, or falls short of, N_C. According to the particular degree of precision determined by the context, N_C then appears as an interval with a more or less 'smudged' endpoint. The conjunction is thus true for a larger or smaller scale segment around N_C. This does not cancel out the fact that N_C is an SF constant that is interpreted by an element D_0 in CS.

53 This is marked most clearly, but not necessarily, by a contrastive accent on nicht (*not*). A more complete treatment of negation would have to take into account the fact that nicht is a focus-forming operator which, in addition to a scope, requires a focus, i.e. a domain of negation indicated as a rule by contrastive accent. For sentence negation scope and focus coincide. For an extensive discussion see JACOBS (1982).

54 ZIMMERMANN (this volume) argues plausibly that in German the two elements can be traced back to the same underlying combination als wie, in which wie represents the operator in question and als is a semantically empty complementizer. The comparative and the equative then only differ in that they determine different deletions in the sequence als wie. The analysis of complement clauses developed in this section can, incidentally, be regarded as an elaboration of the program drafted by ZIMMERMANN (this volume, section 6).

55 The basic idea of the positional correspondence in (196) is an adaptation of the 'across the board' condition proposed by WILLIAMS (1978), in particular with regard to coordinate constructions. There is no doubt that (196) must be incorporated into a more general theory of syntactic projection or ellipsis which contains coordination and degree complements as systematic special cases. A simple extension of otherwise elegant theories of coordination, such as that of GAZDAR (1981), to cover degree complements is impossible, however, because these differ from coordinate constructions in some crucial respects. For one thing, the complement, i.e. (b) in (196), is part of the GP in (a), a subordination which is ruled out for conjuncts. And for another thing, as a consequence of this, the matrix sentence and the complement sentence do not fulfil the condition for coordinating constructions of being constituents of the same rank which form a new constituent of the same category.

56 Another precondition for (196) to work is an analysis of comparatives as in (i), so that the counterpart of $[_{AP}\ e_i\ [_A \cdots]]$ is correctly determined.

(i) $\cdots [_{AP}\ [_{DP}$ -er als $[_{\bar{S}}$ wie$_i \cdots]]\ [_A$ hoch$]] \cdots$

Here -er is the comparative morpheme. The condition (i) will be modified in 7.3, but this can be ignored for the moment. Incidentally, I shall also leave aside the fact that the degree complement clauses are optionally or obligatorily extraposed from DP. Cf. ZIMMERMANN (this volume). In place of the complement clause, DP then only contains a corresponding trace. The problem being discussed here is not affected.

57 The extension in (200) can easily be modified so as to cover iterated bridge constructions like *than he thought somebody could suspect*. For a detailed discussion see CHOMSKY (1977) who uses such constructions to argue plausibly that the extraction of the degree operator wie (as_2) is an instance of WH-movement.

58 The fact that definite NPs are ruled out here is illustrated by cases like

(i) *Mit dem so schweren Hammer wie diesen
With the hammer as heavy as this one

(ii) *Der breitere Tisch als dieses alte Ding
The wider table than this old thing

(iii) *Der grüne Tisch wie dieser
The green table like this one

Case (iii) shows that this restriction is valid beyond the field of gradation. It is not clear why only indefinite NPs are possible here. Notice that the semantically closely related cases (iv) - (vii) are possible.

(iv) Mit dem Hammer, der so schwer ist wie dieser
With the hammer that is as heavy as this one

(v) Der Tisch, der breiter ist als dieses alte Ding
The table that is wider than this old thing

(vi) Der Tisch, der so grün ist wie dieser
The table that is as green as this one

(vii) Der grüne Tisch, der so ist wie dieser
The green table that is like this one

59 There is one exception to this: SSCs of the form größer als zwei Meter (*taller than two metres*) are subject to particular restrictions, which will be introduced in 7.3.

60 An instructive example of such an approach is provided by KLEIN (1980), who gives special interpretation rules for S and NP complements, the latter providing the alignment of NP with S.

61 When ebenso (*just as*) / (*just so*) occurs instead of so is a question that I shall leave aside here. Presumably ebenso must be analysed as syntactically complex, so that eben alternates with other adjuncts to so, such as factor phrases. I shall restrict the analysis here to the simple so.

62 Technically, θ-marking applies generally to a chain consisting of a constituent and the traces bound by it. The argument in SF is then the head of the chain, unless it is an operator binding the trace, which is then a variable. This is the case for example for wie, which binds the trace e_i in the DP of the complement sentence. Possibly the trace left after extraposition explains why DP complements can never be topicalized, as distinct from other als/wie NP constituents of the same format: the trace produces impermissible 'cross-over' phenomena.

63 The conversion (222c) incidentally shows something which my analysis of the equative indirectly has in common with version II discussed in 3.2. Compare the representation (36c) of sentence (i) repeated in (ii) with the SF-equivalent conversion (iii) of (iv):

(i) Hans ist so groß wie Eva
Hans is as tall as Eva

(ii) $\forall x$ [[EVA [TALL x]] $\rightarrow$ [HANS [TALL x]]]

(iii) $\forall c$ [[[QD EVA] $\supset$ [0 + c]] $\rightarrow$ [[QD HANS] $\supset$ [0 + c]]]

(iv) [[QD HANS] $\supset$ [0 + [αc [[QD EVA] $\supset$ [0 + c]]]]]

In another respect the analysis given here is related to that of version I. This resemblance is due to the common properties of '$\supset$' and '$\geq$'. Putting it very briefly, (iv) is only fulfilled in CS if (v) is also fulfilled.

(v) [QD HANS] $\supset$ [QD EVA]

The analysis of the equative in version III is based on the idea of multiplication and therefore has no bearing on the present theory.

64 This strategy would require another modification, namely interpreting the difference between N_C and [QD B] as a unit of measurement, so that (228) would mean that the length of the table is three times the difference between board and norm of length – an absolutely inadequate solution. Another solution would be to count from N_C, thus violating 0EC. Then (228) would mean that the length of the table was lower than N_C by three times more than the length of the board, an interpretation that could be made up under very special conditions (N_C would then have to be a definitely identified value). There is another solution in cases like *a third as long*, which is analogous to *3 metres short*. Cf. note 70 for arguments for this auxiliary interpretation, which at the same time makes it clear why this solution will not do for factors greater than 1.

65 That this is so is shown by the following consideration: the SF of (i) must imply the proposition (ii). The reversal of the containment relation involved here cannot take place within DP but only by involving the matrix adjective.

(i) Hans ist höchstens so groß wie Fritz
Hans is at most as tall as Fritz

(ii) $\forall c$ [[QD HANS] $\supset$ [0 + c] $\rightarrow$ [QD FRITZ] $\supset$ [0 + c]]

66 A similar limit expression is what underlies the analysis by VON STECHOW (1985). It is based on the definiteness operator *the* and a limiting operator *Max*, so that *the* (*Max* (W)) identifies the largest interval that has the property W. The difference between *the* (*Max* (W)) and [αc [Wc]] is that the former expression only refers to the limit and the latter to the path in the sense explained above. I shall indicate the grounds for this distinction immediately.

67 However, [αP [W'P]] refers to each element of a given property set and thus allows the generalization described here, which VON STECHOW's limit operator does not allow: *the* (*Max* (W)) only refers to the limit and would therefore not yield the set required in the case of comparison so (cf. note 66).

68 The existence of a morphologically realized comparative is certainly a marked option which does not occur often, as shown by STASSEN (1984). It is interesting, though, that even in languages without a comparative the analogous constructions have largely the same distribution of contrastive and nominative interpretation of the adjectives or dimensional nouns involved. To give a characteristic example, we have the following distributions of norm-relatedness in Japanese:

(i) Kono uti wa takai / hikui +NR
This house high /low
[This building is tall / low]

(ii) Kono uti wa ano ki yori takai / hikui –NR
This house that tree from high / low
[This building is taller / lower than that tree]

(iii) Kono uti wa ano ki to onazi kurai takai –NR
This house that tree equal as high
[This building is as tall as that tree]

(iv) Kono uti wa ano ki to onazi kurai hikui +NR
This house that tree equal as low
[This building is as low as that tree]

In all cases wa is a postposition which marks the subject, in (iii) and (iv) to is a postposition which approximately means 'in comparison'. The positive (i) and the expressions corresponding to the comparative (ii) and to the equative (iii) and (iv) have exactly the same distribution pattern of NR as German or English. Other constructions not only confirm this distribution but also show the same pattern of dubious and deviant cases. While there are considerable differences in morphosyntactic realization among various languages, the SF structures are thus subject to essentially analogous conditions. Of course the details require systematic analysis.

69 Incidentally, under these – but only these – conditions [αc [Wc]] becomes the limiting operator *the*(*Max* (W)) proposed by VON STECHOW. Cf. note 66.

70 The consequence of this idea is instructive regarding factor phrases such as in (i). The analogous splitting of the interpretation gives (ii) as the second conjunct and (iii) or (iv) as the first conjunct, according to whether the Pro_A bridge is applied only in the matrix adjective or in the complement as well:

(i) Das Brett ist dreimal so kurz wie der Tisch
The board is three times as short as the table

(ii) $[[\text{QD B}] \subset [\text{N}_C - [[3 \bullet] [\alpha\text{c} [[\text{QD T}] \subset [\text{N}_C - \text{c}]]]]]]$
(iii) $[[\text{QD B}] = [[3 \bullet] [\alpha\text{c} [[\text{QD T}] \subset [\text{N}_C - \text{c}]]]]]$
(iv) $[[\text{QD B}] = [[3 \bullet] [\alpha\text{c} [[\text{QD T}] = \text{c}]]]]$

What is said above for (228) also applies to (ii): the SF only becomes interpretable by means of a further violation and then produces a reading that is actually unacceptable. The SF (iii) for its part is incompatible with (ii), since (ii) requires that the board should not be longer than the table, while (iii) requires it to be three times as long. Thus there only remains the solution described earlier of violating NEC and interpreting N_C as a fixed value c_i. But the greater acceptability with factor phrases smaller than 1 mentioned in note 64 can now be explained: if in (iv) 3 is replaced by $\frac{1}{3}$, then (iv) is compatible with (ii). The interpretation is then strictly analogous to that in (245b): it says that the board and the table are short (according to (ii)) and that the length of the board is a third of that of the table. We see that the assumption about Pro_A has very intricate but at the same time instructive consequences.

71 This does not mean that (260) is implausible, since the condition corresponds entirely to the DP character of measure phrases. But it is not independently motivated. I do not see at the moment how the complements in question can be accounted for without stipulations. BRESNAN (1973) in fact makes an analogous assumption for the cases discussed, which she expresses by a special identity predicate, though in a different theoretical framework.

72 The sentences projected by (196) would receive a correct SF which does not violate any v-condition. I shall give the representation for (i) without comment:

(i) *Das Brett ist so lang/kurz wie drei Meter
The board is as long/short as three metres
(ii) $[[\text{QD B}] \supset [0 + [\alpha\text{c}_i\ [[\text{QD}\ [3\ \text{M}]] \supset [0 + \text{c}_i]]]]]$
(iii) $[[\text{QD B}] \subset [\text{N}_C - [\alpha\text{c}_i\ [[\text{QD}\ [3\ \text{M}]] \subset [\text{N}_C - \text{c}_i]]]]]$

(ii) is fulfilled if and only if Das Brett ist 3 m lang is fulfilled and (iii) if and only if the illegal interpretation of Das Brett ist 3 m kurz is fulfilled. This is plausible and it is indeed a detour interpretation accessible for (i), but it would not explain the deviancy of (i).

73 This also applies if the PF of the comparative is suppletive and thus irregular, which is not seldom the case with DAs, as WURZEL (1987) demonstrates. Even then the SF is compositional and predictable. gut/besser in this respect behave no differently than suppletive tense forms like am/was.

74 For phonological reasons the structure (i), for instance, is required, while the conditions in SF require the hierarchy indicated in (ii):

(i) [un [schön + er]]
(ii) [[un [schön]] er]

PESETSKY (1985) proposes a way to deal with this apparent paradox. It is also clear that the comparative suffix must be ordered before the case and number affixes but, like these, does not affect the lexical category. The effect of the comparative on the θ-grid, which will be taken up immediately below, does not seem to be compatible with the conditions proposed by WILLIAMS (1981) for derivational processes. In general, then, it is dubious whether -er is to be classified as a derivational or as an actual inflectional element, and whether such a classification is in fact necessary.

75 The illegal binding can be avoided by modifying the SF of the DA as follows:

(i) $\underbrace{[[\hat{v}\ [\hat{c}\ [\hat{\underline{x}}\ [[\text{QD}\ x] = [v\ \S\ c]]]]]}_{\text{U}}\ v']$

In (i) the variable v is bound by $\hat{v}$, so that the expression indicated by U is a three-place predicate of category ((S/N) /N)/N. Its first argument is specified by the added argument v'. The SF as a whole is itself an expression of category (S/N)/N. We can assume that $\hat{v}$ is not a θ-role of the DA but binds the variable v' within the lexicon. The variable v' is then, as hitherto, specified by CVS. Since the affixing of -er also takes place within the lexicon, it can be applied before the conversion just mentioned. In the SF of -er the abstractor $\hat{v}$ is then deleted and U is specified as a variable of category ((S/N)/N)/N so that -er does not take the whole SF of the DA as its argument but only the part marked by U. Thus we again arrive at the representation (266c), but this time with legal abstractor binding. This possibility of correction is a slightly modified version of a proposal I owe to Lars HELLAN, which amounts to shifting the abstractor $\hat{v}$ from the affix -er into DA, where it is rendered harmless if not needed.

76 The distinction between DEGREE and DEGREE' and the corresponding projections DP and DP' has several similarities with that drawn by JACKENDOFF (1977) between Deg and Q and by ZIMMERMANN (this volume) between Adv and Q. I shall not go into details of similarities and dissimilarities since all ideas concerning the basis of the relevant syntactic categories need further clarification.

77 Here too $\hat{v}$ creates an illegal binding, which can be avoided in the way described in note 75: that is, $\hat{v}$ in (273) is dropped when the SF of the DA is modified in the way discussed.

78 Notice that even with a contextually restricted scale the antinomies in the comparative discussed do not disappear. On the contrary, they become even clearer: the difference interval c cannot then be an element of D, either in the case of +Pol-A or −Pol-A.

79 The lexicon form for the (pro)nominal ander is roughly:

(i) [ander]; A; $[\hat{\underline{x}}\ [[\alpha x_i\ [\text{P}\ x_i]] \neq x]]$

where P is a parameter of category S/N which specifies the property of a contextually determined reference set. Incidentally, (i) is also the core of the reciprocal einander (*each other*).

80 The conversion of the comparative in (299c) shows, incidentally, an indirect relationship between the analysis given here and version II in 3.2: in (36b) the comparative is represented by an affirmative and a negative conjunct which in a sense correspond to the two conjuncts in (299c). I should point out that it is only in this very indirect sense that the thesis put forward by SEUREN (1973, 1985), that the complement of the comparative contains a negation, can be upheld. If this thesis is viewed as a claim about the syntactic structure – and this is in fact SEUREN's view – it leads to nothing but incorrect consequences, for example that comparatives with a negated complement are analytical. Since SEUREN makes the assumption in order to explain the occurrence of negative polarity properties in complement clauses, he must also assume that equatives also have an inherently negative complement, which he can only achieve by semantic conversions (hence negations can be legitimized almost anywhere). Moreover, as shown by VON STECHOW (1985),

the occurrence of negative-polarity items in the complement clause can be traced back to the far more general property that the comparative and the equative, regarding the complement clause, are 'downward-entailing'. I shall not pursue this point any further. The property in question can be derived from the interpretation [αc [W c]] without any extra assumptions.

81 For $\exists$c to be subordinated to the operator αx and for viel to be able to provide an SF of the category N, (9) must be appropriately qualified. The step is a natural generalization which classifies abstractors together with all term-forming operators.

82 With the extended modification theory from (224) the adverbial sehr in (307) could also be the modifier of a DP and could take iterations like sehr sehr lang (*very very long*) into account. The resulting SF predicts a correct interpretation, but I leave it to the reader to spell this out. It is clear that, for pragmatic reasons, when explicit representations are produced iteration breaks off at a certain threshold. (The same applies analogously to viel in viel viel länger (*much much longer*) etc.)

83 On closer inspection the relatedness of (310) to the comparative is recognizable: the structure of the SF in (310) has the form [$\hat{v}$ [v + c]] and [$\hat{v}$ [v − c]]. The crucial characteristic of the comparative, however, is that v is instantiated by a complement, and this is precisely what (310) does. We see then that the analysis in (310) is less ad hoc than it at first appears. It also gives food for thought on lexical restructuring processes in language change.

84 This could indicate that adverbial sehr is not without dimension specification and contains something like a condition QUANT [INTENS x]. (307) would then have to be modified accordingly and sehr would not only be suppletive to viel but would also be more special.

85 However, I suspect that the v-conditions can be generalized to cover '$\complement$'. Whether this has interesting consequences must be a matter of further investigation.

86 A more precise formulation of this condition must be based on a property of properties so far hardly researched, namely the part-whole-heredity (see the remarks in BIERWISCH (1980)). Adjectives which are part-whole-hereditary are *green, wooden, rusty*, etc. but not *large, round, single-coloured*. A property is part-whole-hereditary if it follows from 'all parts of x are P' that x is also P. Spatial dimension adjectives designate non-hereditary properties. For inherent reasons mass nouns can only be modified by part-whole-hereditary adjectives: **large foliage* vs. *large leaves*. The problem discussed in the following can therefore be narrowed down to non-hereditary properties.

87 Pluralia tantum like Leute (*people*) show that lexical treatment of the plural is unavoidable, with the consequences mentioned.

88 If we go into detail, quite intricate situations arise: *much large cattle*, for example, requires an illegal inner domain of modification, which seems to be borrowed from the possible reading of *cattle* as a non-mass noun. I cannot go into the problems involved, but I think the analysis outlined helps to home in on them.

89 It is no coincidence that the collective reading is only possible in the case of predicates which allow an interpretation involving part-whole-heredity in the sense of note 86. One may compare, for instance, the possible readings for *The girls were cheerful* and *The girls were short*.

90 VON STECHOW (1985) assumes basically the same solution to the problem by a version of quantifier-lowering on the surface structure. Apart from general considerations against quantifier-lowering the solution has the same effect in LF. But, like Q-raising, it is subject to the misgivings expressed below.

91 For precisely this reason VON STECHOW (1985) also takes account of quantifying-in into the complement sentence only for $\forall$-quantified NPs.

92 If the negation is raised together with the quantifier, we get an SF for (354a) whose conditions can be paraphased by (i):

(i) *There is no girl x such that Hans is taller than x*

(i) is contingent and applies if Hans is at most as tall as the shortest girl. It seems, incidentally, that this reading exists as a quite marginal possibility for (354a). The analogous reading for (354b), however, is ruled out. This could be regarded as an indirect surface effect, since in (b), but not in (c), a domain exists in the surface for sentence negation.

93 The criterion is conditional both for zu and genug. It expresses the fact that the condition that follows from P is fulfilled for genug but not for zu. It is therefore unnecessary to stipulate a counterfactual conditional clause, as VON STECHOW (1985) proposes in his analysis of *too*. K is a criterion just like N_C and the recourse to possible worlds is superfluous.

94 Many EAs are in actual fact multi-place predicates which also govern syntactically internal arguments. Examples are angenehm (für NP) (*pleasant* (to NP), vorteilhaft (für NP) (*advantageous* (to NP)), stolz (auf NP) (*proud* (of NP)), nützlich (für NP) (*useful* (to NP)). However, none of these arguments is a carrier of the θ-role $\hat{c}$ for degree phrases. They can therefore be left out of account here. The treatment of the EAs as one-place predicates is thus to be seen in the light of this abstraction.

95 Here and in the following I shall speak of the individuals in C, although the idea can be transferred to subsets of C in the sense considered in the analysis of the mass nouns.

96 I shall leave the question open here whether the condition that P allows degrees of intensity must be specified by certain formal features of the structure of P in SF. For examplary EAs like *good* and *lazy* the condition is presumably bound to specific components of their SF (cf. 10.2). However, the considerable context-sensitivity in many cases suggests that the condition can also be specified or modified relative to the interpretation in CS. The question depends, for example, on the decision about the status of sentences like *France is more hexagonal than Belgium*. It is also conceivable that what is formally specifiable is not the condition that P allows intensity degrees but, on the contrary, the condition that certain Ps canonically do *not* allow intensity degrees. The answer to this question is not crucial in the present context.

97 KLEIN (1980), who bases the gradation of all adjectives including DAs on a similar idea, assumes that the ordering relation is only a partial ordering, because *x is clever* for example produces different orderings for the x's involved according to whether the criterion for *clever* is, say, mathematical or social skill. I regard this proposal as irrelevant. In such cases it is a matter of different specifications for the relevant parameter Q in *clever*, but the evaluation by DI applies to instances of CS for which the parameter is specified. This is not a formal sleight of hand;

it corresponds to the empirical fact that without a specification of the evaluation parameter gradation remains indefinite. The case cited is entirely analogous to Hans ist groß, where the comparison class is not specified, which does not mean that height does not define a proper ordering.

98 I shall henceforth ignore adjectives with internal arguments like *pleasant* etc. (cf. note 94). Including them would be a purely technical problem. Also, to avoid the illegal abstractor binding of v in the comparative, the precaution discussed in note 75 would have to be taken.

99 Meaning postulates of this form must be assumed, at least for the elementary SF constants, in order to be able to define SF-equivalence. On the other hand it cannot reasonably be supposed that the B-reading of the EAs is generally a basic element in SF (I shall not discuss here the view put forward by FODOR (1981, p. 257 ff and in other works) that lexical items generally have no internal structure. This would affect not only the EAs but also the DAs, and it is clear that an explanatory theory would thus be ruled out altogether.) It follows that postulates of the form illustrated in (392) must at least in part be derivable (this applies trivially to antonymous DAs).

100 The following ideas were stimulated by discussions with Ilse ZIMMERMANN, who does not share responsibility for the result.

101 In addition, of course, there are the differences which result from the different syntactic status of un and nicht: nicht (and kein (= 'nicht ein' (*no, not a* ...)) interact with other scope-forming items, while un is a lexical affix and only has word-internal scope. Sentence negation can be continued by indications of correction, while un-cannot: Der Stuhl ist nicht bequem, sondern unbequem (*The chair is not comfortable but uncomfortable*): *Der Stuhl ist unbequem, sondern ... (*The chair is uncomfortable, but* ...).

102 These representations are provisional, and do not, for example, cover the distinction between gut/schlecht (*good/bad*) and gut/böse (*good/evil*). But they are not entirely unfounded: they are an adaptation of a proposal made by KATZ (1972, p. 162 ff).

103 The situation that arises here for *gut/ungut/böse/schlecht* thus has certain parallels to that for tief (*deep*)/untief (*shallow*)/niedrig (*low*)/ flach (*shallow/flat*), which are analysed in detail by LANG (this volume). In both cases, besides the change in value for the variable of the predication domain, a change in the conditions of the predication domain itself is involved. The situation is further complicated by lexico-morphological idiosyncrasies which overlie the systematic structure. For ungut there is no possible comparative because of the suppletive form besser (*better*), to which there is no possible *unbesser, since the structure in LF is [[un gut]er]. The emerging possibilities to systematically derive certain boundary conditions for lexical peculiarities form a topic in their own right.

104 The problem to be solved here was pointed out to me by Jerry KATZ (personal communication).

105 Clearly the same effect is produced if the equivalence is specified not as in (411a) but as follows:

(i) $[[\text{QUANT DI } \bar{P}x] = [v + \text{c}]] \equiv [[\text{K } [\text{QUANT DI P } x]] = [v + \text{c}]]$

Assuming the G-reading, UN could then be defined with the help of K.

106 Perhaps the question with DAs is whether N_C is precisely one specific interval. If this were to be avoided, N_C could be regarded as a class of intervals and all occurrences of N_C in the representations so far could be replaced by the expression: $[\alpha c_k[c_k \in N_C]]$. Then N_C no longer defines a point on a scale but a section, an interval of indifference. Incidentally, the questions discussed in 5.3 concerning the fuzziness of N_C remain unchanged, they now simply apply to the problem of delimiting the class N_C. I shall therefore continue to assume that the fuzziness is to be accounted for by the context-dependent selection of the difference interval c. For the EAs, though, an indifference interval between 0_C and $0'_C$ is necessary for the reasons mentioned.

107 If cases like (426) are to be shown to be interpretable directly, Int(c), i.e. the interpretation of amounts of difference, must be changed. Int(c) may then not be regarded as an interval but must be seen as a representative of a class $[d_i{:}\mu\,(d_i){=}k]$ for an amount k. Amounts of difference thus take on the character of measurement units. Although this does not seem implausible, it does not render correctly the interpretation of (426). What the sentence says is not that the distance of the table from the height norm is identical to that from the width norm, but that the distances are of the same order for each norm. The difference is subtle, but not artificial. The discussion that follows will make the matter clearer, and will show that (426), like the other two sentences, is interpreted with the help of secondary scales. The fact that (426) seems less deviant than (427) can be explained by the fact that it does not violate any v-conditions.

108 I have discussed the conceptual and empirical basis for the distinction between the mental representation of a structure and the operational availability of its compositional make-up in BIERWISCH (1981). The fact that certain structural components are not available for all operations is not equivalent to their not being represented mentally. Regarding our topic, it does not necessarily follow from the purely classificatory interpretation of lang that LONG is in fact an unstructured item. It only implies that the components of its structure are not involved in combinatorial processes.

109 I regard the theory developed in JACKENDOFF (1984 and earlier work), which is based on the concept of mental representation as a generalization of the *de dicto* situation, as more interesting than the scope theory which follows the tradition of canonical standard-logic. An idea similar to JACKENDOFF's is contained in the operator ACTUALLY, proposed by VON STECHOW to mark the *de re* reading. But this is not essential here, since it suffices to trace the comparative back to the relative clause case.

110 These observations do not apply to the small number of adjectives for which ZIMMERMANN (this volume) assumes a feature −MK, by which they are precluded from morphological (i.e. lexical) comparative formation. ZIMMERMANN lists böse (*evil*), gram (*ill-disposed*), feind (*hostile*), wert (*useful/worthy*), zugetan (*devoted*). In the strictly lexical treatment of the comparative which I have been assuming, there only remains the possibility of stipulating the idiosyncratic realization of -er by mehr (*more*) controlled by −MK. In view of the marginal nature of the (?pseudo-)adjectives concerned this does not seem implausible. It is clear that the problem, which I must leave aside here, is distinct from the regular, lexically non-restricted use of mehr/weniger (*more/less*) in the modificatory sense.

111 LÖBNER (1984) makes an interesting proposal which puts noch (*still*) and schon (*already*) into the general context of quantifier expressions and incorporates their

interaction with phenomena of gradation. I think some of his assumptions must be modified in the light of the theory of gradation developed here, but I cannot discuss the details.

112 George LAKOFF (personal communication) has drawn my attention to a particular puzzle:

(i) *The longer she makes larger detours, the more easily she meets more people*

It would appear that in sentences like (i) even the amounts of difference which are only bound indirectly by je - desto (*the more ... the more ...*) are incorporated into a composition of functions. It is difficult to tell to what extent this is a strict interpretation. Clearing up the intuitive judgements here requires a great deal of intuition gymnastics.

113 The context in which CHOMSKY discusses these cases with double antecedents concerns the fact that the 'construal rule' is not restricted by subjacency as extraposition is. I shall not go into this contrast here, since it is only the construal cases that are relevant to gradation.

114 VON STECHOW (1985), who discusses "double-head complements", seems to have overlooked cases like (460). I therefore regard as incorrect the assumption that all grammatically permissible constructions of this kind have a definitive interpretation, even if it is sometimes difficult to explain. It is similarly incorrect that the difficulties arising have syntactic rather than semantic causes. (460) and (461) are clear counter-examples: the difficulty lies solely in finding a value for $\emptyset$. Finally, it is also erroneous to assume that sentences like those under (463) do not allow a double-head interpretation because a conflict thus arises regarding the complement to be projected, an assumption from which VON STECHOW also erroneously concludes that only mass nouns and plurals can occur as carriers of double-head complements.

115 The interaction between the modules of numbers and of comparison is significant not only from the systemic but also from the ontogenetic point of view. In accordance with the considerations put forward at the end of 10.3 the development of the two modules can certainly take place independently and 'out of phase', and hence the comparison module can certainly work independently of the existence of number (and thus of measurement units).

116 For this generalization to be generally applicable the SF of *more/less* as the head of an MP (as in *more than three metres* – cf. (310)) must in fact be regarded as separated from the comparative, which I have done for empirical reasons. The connection shown in note 83 thus has an elucidating rather than a systematic value.

117 Except for the MP in the case of mass nouns, for whose occurrence I have outlined two versions (cf. (327) and (328)) which are both based on the SF of viel (*much*) and thus fall within the domain of the DAs. However, we shall see shortly that both versions must be re-examined from the syntactic point of view.

118 A relatively detailed discussion of facts and problems to be cleared up on this presupposition is contained in JACKENDOFF (1977) and in SELKIRK (1977). I cannot go into the various ramifications of their arguments. Neither of these works makes any explicit assumptions regarding the internal structure of measure phrases, though the structure given in (468) is an adequate extrapolation, and thus they provide no answer to the questions raised in the following.

119 Added to this there is the question, which is by no means simply a technical one, of how $\hat{C}$ comes in as a θ-role, since the value of v, to which C is bound, is not a lexical property of DAs or of the G-reading of EAs.

120 It was in this sense that I described SF in 2.1 as a level of representation intermediate between LF and CS. Because of the lack of any fundamental approach to a unified, systematic theory of conceptual structure formation this stipulation is very dependent on pretheoretical terminological stipulations. While the relation between LF and SF can be characterized explicitly, the relation between SF and CS depends on assumptions on the fundamental character of CS which are simply not available. In this situation it is difficult to develop sound argument on the distinctness and the specific nature of SF vis-à-vis CS. If, like JACKENDOFF (1984), for example, we do not wish to regard SF as a level of representation distinct from CS, we can thus regard SF as a distinct class of representations within CS, provided that CS is in general compatible with the conditions applying to SF. Seen in this way the interpretation Int(X) embeds the unit X of SF into the framework of representation defined by the conceptual system **C**. Until some fundamental assumptions on **C** and CS are clarified, talk of autonomous levels is metaphorical, especially since the structure to be assumed for the domain organized by **C** as a level is totally unclear. (See BIERWISCH and LANG (this volume) for further discussion.)

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