This chapter motivates and develops a semantic analysis of gradable adjectives as measure functions: functions from objects to degrees. I argue that propositions in which the main predicate is headed by a gradable adjective $\varphi$ have three primary semantic constituents: a reference value, which denotes the degree to which the subject is $\varphi$, a standard value, which corresponds to another degree, and a degree relation, which is introduced by a degree morpheme and which defines a relation between the reference value and the standard value. Building on a syntactic analysis in which gradable adjectives project extended functional structure headed by a degree morpheme (Abney 1987, Corver 1990, 1997, Grimshaw 1991), I show that this analysis supports a straightforward compositional semantics for comparatives and absolute degree constructions in English, and that it explains the restricted scopal properties of comparatives that were problematic for the traditional scalar analysis of gradable adjectives, in which gradable adjectives are relational expressions and comparatives quantify over degrees.

2.1 Measure Functions and Degree Constructions

2.1.1 Puzzles

Chapter 1 concluded with a puzzle. A number of facts, including cross-polar anomaly, incommensurability, and comparison of deviation, provided strong support for the semantic analysis of gradable adjectives as expressions that define a mapping between objects in their domain and degrees on a scale. An important component of this analysis was the claim that the basic meaning of a gradable adjective is that of a relational expression: a gradable adjective introduces two arguments, an object and a degree, and defines a mapping between them. A general characteristic of argument expressions is that they provide a domain for quantification. It follows that if degrees are actual arguments of a gradable adjective, they should provide a domain for quantification. The general success of the analysis of comparatives as expressions that quantify over degrees—this analysis played an important role in the explanations of incommensurability, cross-polar anomaly, and comparison of deviation—appears to verify this prediction.

The assumption that degree constructions are quantificational expressions raises other expectations, however. If these constructions quantify over degrees, then we expect them to participate in scope ambiguities in contexts in which other quantificational expressions (e.g., quantified NPs) show similar ambiguities. The facts discussed in section 1.4 of chapter 1 indicated that this is not the case: there is no evidence that the quantificational force introduced by a comparative participates in scope ambiguities in which the scope of the comparative is wide. The same is true of the quantificational force introduced by a comparative when it is embedded in a comparative clause. These observations lead to the following conclusions. First, if comparatives never show scope ambiguities, then the hypothesis that they are quantificational must be called into question. Although one could modify the traditional analysis so that the quantification introduced by a degree construction must take narrow scope by explicitly encoding this constraint in the interpretation of the comparative morpheme (as in e.g., von Stechow 1984a, Rullmann 1995), an alternative explanation in which the scopal facts are derived should be preferred. Second, if a property of arguments is that they provide a domain for quantification, then the semantic behavior of the comparative clause suggests that it is an argument-denoting expression. In the traditional account, however, the comparative clause is part of the quantificational construction introduced by a comparative expression in which the scope of the comparative is wide. In effect, the comparative introduces an expression that defines a relation over degrees, which introduces a relation between the reference value and the standard value.

Overlying the scope issues was a separate problem which arose specifically in the case of analyses which treat the comparative in terms of existential quantification: the interpretation of comparatives with less. As observed in chapter 1, if the interpretation of the absolute construction is stated in terms of an "at least as" relation, as in (i), it is impossible to construct accurate truth conditions for comparatives with less.

The logical representation of (ii), shown in (iii), is satisfied even if Molly's height exceeds Max's height, since it would be true in such a situation that for some $d$ ordered below the degree of Max's tallness, Molly is at least as tall as Max.

The general success of the analysis of comparatives as expressions that quantify over degrees—this analysis played an important role in the explanations of incommensurability, cross-polar anomaly, and comparison of deviation—appears to verify this prediction.
A more general problem for a relational analysis of gradable adjectives can be described as the "problem of compositionality". A strong theme in work on gradation, dating at least to Sapir (1944) (see also Fillmore 1965, Campbell and Wales 1969, Bartsch and Vennemann 1972, Cresswell 1976, Bierwisch 1989), is that comparison (i.e., a partial ordering relation) is a psychological primitive, and that the basic interpretation of gradable adjectives should be stated in terms of such a relation. Indeed, this hypothesis is the basis for the scalar analysis sketched in the last chapter, in which the core meaning of a gradable adjective is defined in terms of a partial ordering relation. This is most clearly illustrated by considering the truth conditions of a typical absolute construction such as (1), which are stated in terms of a partial ordering between two degrees.

(1) Benny is tall.

Benny is tall is true just in case the degree to which Benny is tall is at least as great as some contextually determined standard of tallness (possibly relativized to the comparison class to which Benny belongs). This is formalized in (2), where \( \delta_{\text{tall}} \) denotes a function from objects to degrees on the scale associated with the adjective "tall", and \( s \) denotes the appropriate standard value.

(2) \[ \| \text{tall}(Benny,s) \| = 1 \text{ iff } \delta_{\text{tall}}(Benny) \geq s \]

The problem of compositionality, articulated by McConnell-Ginet (1973) and Klein (1980, 1982), is that the assumption that the comparison relation is somehow "basic" is not supported by the morphosyntactic facts of natural languages. If the comparison relation were a psychological or semantic primitive, then the expectation should be that the comparative form of the adjective should be less marked than the absolute form. This expectation is not supported by the facts; it appears to be true that in languages that have both a comparative and absolute form, the comparative is morphologically (and syntactically) more complex than the absolute (McConnell-Ginet 1973:96). Given the fact that comparative constructions are always morphologically or syntactically complex, plus the observation that gradable adjectives appear in a variety of semantically distinct degree constructions, not all of which obviously involve a notion of comparison (see footnote 2), considerations of compositionality dictate that the basic interpretation of gradable adjectives should be specified independently of a notion of comparison, and that the interpretations of complex degree constructions should be derived as a function of the meanings of gradable adjectives and the meanings of degree morphology. This point is articulated by Klein (1980:4), who says:

We also require a semantic theory for English to analyse the interpretation of complex expressions in terms of the interpretations of their components. An answer to the question of the interpretation of such constructions

(980-4) which asks: "What are the effects and the meanings of complex morphology?" This point is articulated by Klein (1972, 1973) and is supported by the facts. A common objection to a theory of compositionality that explores the effects of complex morphology is that it would be inapplicable to cases where the meaning of an expression is specified by a function of an expression's components, such as (1), which is a function of the meanings of "tall" and "at least as great as". However, this objection is based on a misunderstanding of the role of compositionality in the interpretation of complex expressions. In a theory of compositionality, the meaning of a complex expression is specified by a function of the meanings of its components, such as (2), which is a function of the meanings of "tall" and "at least as great as".
The expression of the form \([AP \text{ a-}X]\) is clearly complex. How do its components contribute to the meaning of the whole?

I take it that a minimal requirement of any semantic analysis of comparatives and gradable adjectives is to provide a satisfactory answer to Klein's question. With these considerations in mind, we can construct a list of requirements that an analysis of the semantics of gradable adjectives and degree constructions should aim to satisfy. First, it should provide a principled explanation for why the quantificational force introduced by a degree construction does not participate in scope ambiguities. Second, for comparative constructions at least, it should explain why a subpart of the degree construction—the comparative clause—does participate in scope ambiguities. Third, it should support an explanation of the crucial empirical facts discussed in chapter 1: incommensurability, cross-polar anomaly, and comparison of deviation. Finally, in order to adequately satisfy requirements of compositionality, it should characterize the meaning of gradable adjectives independently of a notion of comparison, and the interpretations of complex degree constructions should be explained in terms of the interaction of the meaning of the adjective and the meanings of degree morphemes.

The goal of this chapter is to develop an alternative to the traditional scalar analyses that satisfies these requirements. Specifically, I will reject the traditional claim that gradable adjectives have a degree argument, arguing instead that gradable adjectives denote measure functions: functions from individuals to degrees (cf. Bartsch and Vennemann 1972, Wunderlich 1970), and I will claim that degree morphemes do not introduce quantification over degrees, but rather combine with a gradable adjective to form a complex property whose meaning is roughly the same as the meaning of a gradable adjective on the traditional view (Wunderlich 1970), and I will claim that degree morphemes do not introduce quantification over degrees. Further, I will reject the traditional claim that comparison introduces a grade-free adjectival function that results in the opposite in the domain of comparison. Instead, I will argue that the scale in which it is associated and the relational (e.g., comparative) characteristics introduced by a degree construction do not participate in scope ambiguities, and I will introduce the concept of a measure function that is defined over a scale and a measure value. Finally, I will show how these considerations, combined with the introduction of measure functions, lead to a robust compositional semantics of degree constructions, focusing on the analysis of absolute and comparative degree constructions in English.
Comparative and equative constructions such as (5)-(7) can also be analyzed in terms of a relation between the standard and a subject-oriented degree, but the determination of the standard value is more complex.

(5) The Hale-Bopp comet was brighter than Hyakutake was.
(6) The Mars Pathfinder mission was less expensive than the Viking missions.
(7) The earth is as large as Venus.

In an analysis in which degree constructions quantify over the degree argument of a gradable adjective, comparatives and equatives function as indefinite descriptions of a standard value: the value of the standard is a function of the denotation of the comparative clause and the meaning of the degree morpheme that heads the comparative.

This is illustrated by the semantic analyses of these sentences in (8)-(10), using the formalism adopted in chapter 1.

(8) \[ \exists d [ d > \text{\small max}(\lambda d'.\text{bright}(\text{Hyakutake},d'))][\text{\small bright}(\text{Hale-Bopp},d)] \]

(9) \[ \exists d [ d < \text{\small max}(\lambda d'.\text{expensive}(\text{the Viking missions},d'))][\text{\small expensive}(\text{the MP mission},d)] \]

(10) \[ \exists d [ d \geq \text{\small max}(\lambda d'.\text{large}(\text{Venus},d'))][\text{\small large}(\text{the earth},d)] \]

For example, the comparative in (8) constrains the standard value to be some degree that exceeds the (maximal) degree to which Hyakutake was bright; the entire sentence is true just in case the degree to which Hale-Bopp was bright is at least as great as the standard.

Note that although the different relations introduced by the comparative degree morphemes play a crucial role in determining the value of the standard, they do not affect the relation between the subject and the standard: in each of (8)-(10), as in the absolute constructions in (3) and (4), the relation between the degree to which the subject is \( \phi \) and the standard degree is a partial ordering relation.

Although (8)-(10) provide accurate characterizations of the truth conditions of (5)-(7), the interpretations of these sentences could have been characterized more directly in terms of a relation between two degrees, rather than quantification over degrees. Specifically, (5)-(7) could have been analyzed in terms of a relation between the degree to which the subject is \( \phi \) and a standard degree, which is then compared to the degree to which the subject is \( \phi \). In this view, the truth conditions of (5)-(7) could be stated as in (11)-(13).

(11) The Hale-Bopp comet was brighter than Hyakutake was just in case the degree to which Hale-Bopp was bright exceeds the degree to which Hyakutake was bright.
(12) The Mars Pathfinder mission was less expensive than the Viking missions just in case the degree to which the Mars Pathfinder mission was expensive is exceeded by the degree to which the Viking missions were expensive.
(13) The earth is as large as Venus just in case the degree to which the earth is large is at least as great as the degree to which Venus is large.

The analyses in (8)-(10) and (11)-(13) differ in two important ways. The first is the relation between the standard values in comparative and absolute constructions. In (8)-(10), the comparative clause constrains the standard value to be some degree that exceeds the (maximal) degree to which Hyakutake was bright; the entire sentence is true just in case the degree to which Hale-Bopp was bright is at least as great as the standard.

The analyses in (11)-(13) differ in this respect: in (11)-(13), the relation between the subject and the standard is a partial ordering relation, rather than a quantification over degrees. In (11)-(13), the comparative clause provides a constraint on the standard value, rather than quantifying over degrees. In (11)-(13), the sentence is true just in case the degree to which Hale-Bopp was bright exceeds the degree to which Hyakutake was bright; the entire sentence is true just in case the degree to which Hale-Bopp was bright exceeds the degree to which Hyakutake was bright.

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constructions. The second difference involves the relation between the degree to which the subject is $\phi$ and the standard value. In (8)-(10), this relation remains the same regardless of the particular degree morpheme involved. In contrast, in (11)-(13) this relation is determined by the particular degree morpheme used.

These differences represent the core of the alternative analysis of gradable adjectives and degree constructions that I will develop here. Specifically, I will argue that the interpretation of sentences constructed out of a gradable adjective $\phi$ should be characterized in terms of three semantic constituents, which are specified in (14).

(14) i. A reference value, which indicates the degree to which the subject is $\phi$;

ii. a standard value, which corresponds to some other degree; and

iii. a degree relation, which is asserted to hold between the reference value and the standard value.

The analysis consists of three fundamental claims. First, gradable adjectives denote measure functions—functions from individuals to degrees—and the reference value in sentences like (3)-(7) is derived by applying the adjective to the subject. Second, the context-dependent standard in an absolute construction, a measure phrase in an absolute construction, and the comparative clause (the complement of than or as) perform the same semantic function: they introduce the standard value. Third, degree morphemes denote relations between the reference value and the standard value, i.e., they introduce the degree relation. In the following sections, I will consider these claims in more detail.

2.1.3 Measure Functions

Consider again the traditional analysis of absolute constructions like (3) and (4). What is important to recognize is that the underlying relational characteristics of these constructions in an analysis in which gradable adjectives denote relations between individuals is that the meaning of a gradable adjective must include a function from objects to degrees, an assumption that is implicit in the truth conditions provided for the absolute in chapter 1 (see also (2) above). For example, the meaning of dense must be something like (15), where $\delta_{\text{dense}}$ is a function from objects to the scale associated with dense.

(15) $\text{dense} = \lambda_{x} f_{M}(x, \text{length})$

(16) $\text{long} = \lambda_{x} f_{M}(x, \text{length})$

(17) $\text{wide} = \lambda_{x} f_{M}(x, \text{width})$

Bartsch and Vennemann's approach is designed to reflect the psychological fact that

\[ p \leq (x)^{\text{dense}} f_{M}(x) \]

measure functions, which project their arguments onto scales of length and width, respectively.

The hypothesis that gradable adjectives denote measures of length and width, and the degree relation, is that the adjective $\phi$ is a function from objects to the scale associated with $\phi$.

On this view, the meaning of the adjective includes three components: a degree argument, a partial ordering relation, and a function from individuals to degrees, i.e., a measure function (for a detailed analysis of this hypothesis, see Bartsch and Vennemann 1972). In this view, the meaning of the adjective includes these components: a degree argument.

In terms of these semantic constituents, which are specified in (14), the interpretation of the adjective $\phi$ is as follows: it corresponds to some other degree and it is a standard value, which indicates the degree to which the subject is $\phi$.
"measuring" is a unitary process" (1973:69; cf. Bierwisch 1989). While it may indeed be true that the psychological aspects of measurement should be characterized in terms of a single, general cognitive apparatus, this does not necessarily provide a compelling semantic argument for representing the meanings of all gradable adjectives in terms of a single function. Such an approach can only be justified by linguistic evidence; what turns out to be the case, however, is that the linguistic evidence argues against this view. To see why, it is necessary to take a closer look at scales and degrees.

As in chapter 1, I will assume that a scale is defined as a totally ordered set of points, and that scales are differentiated by their dimensional values (cf. Cresswell 1976). Like Cresswell and Bartsch and Vennemann, I assume that dimensions are semantic primitives: intuitively, a dimension is a quality or attribute that permits grading, or, put another way, a property with respect to which two objects can be compared (see also Sapir 1944 and Bierwisch 1989). As observed in chapter 1, the importance of the dimensional parameter is that it provides a means of distinguishing between two scales: a scale $S_1$ and a scale $S_2$ are distinct if and only if they are associated with different dimensions. This distinction provides the basis for a straightforward explanation of incommensurability (see the discussion in chapter 1, section 1.3.3.1): for any two degrees $d_1$ and $d_2$, $d_1$ and $d_2$ are commensurable just in case they are degrees on the same scale. For example, assuming that the adjectives tragic and long define functions from objects to scales with different dimensional parameters, and that the comparative morpheme more denotes an ordering relation between two degrees, the anomaly of (18) is expected.

(18) # The Idiot is more tragic than it is long.

The reference value (the degree to which The Idiot is tragic) and the standard value (the degree to which The Idiot is long) are degrees on different scales, therefore the relation asserted to hold between the two degrees is undefined.

We can now return to the discussion of Bartsch and Vennemann's proposal. If the interpretation of all gradable adjectives is stated in terms of a single, general measure function and a scale specification, then it follows that no two lexically distinct adjectives share the same scale. For example, since the range of the measure function in the meaning of the adjective long is different from that of the measure function in the meaning of the adjective wide, as illustrated in (16) and (17) above (the former is a scale of length and the latter is a scale of width), it must be the case that the two adjectives project their arguments onto distinct scales. The problem for this analysis is that well-formed examples of comparative subdeletion such as (19) indicate that degrees of length and degrees of width are comparable.

(19) Billy-Bob's tie is as wide as it is long.

Since the reference and standard values in (19) are degrees on different scales, the comparison relation should be undefined, and (19) should have the same status as (18).

The problem could be avoided by assuming that long and wide share the same scale—for example, a scale along a dimension of "linear extent". If this were the case, then (19) would be perfectly interpretable.

7 The problem is that Bartsch and Vennemann's claim that the meanings of all adjectives are defined in terms of a single scale is not accurate. The problem with the comparative morpheme more is that it does not provide a means of distinguishing between two scales: degrees on different scales are not comparable. An alternative solution to the problem posed by examples like (19) would involve assuming that the distinct scales of length and width are somehow similar enough to permit a mapping between them which licenses comparison. This approach weakens the strong constraint on commensurability defined above, however, and raises a number of questions, most important of which is: when are such mappings defined and when are they undefined?
measure function is incompatible with this assumption. A crucial distinction between e.g. long and wide is that they may impose different orderings on their domains, even in contexts in which their domains are equivalent. If both adjectives were associated with the same scale and the same measure function, as in Bartsch and Vennemann’s analysis, this fact could not be captured. That is, if the interpretations of long and wide were as shown in (20) and (21), then in a context in which their domains are the same, the analysis would incorrectly predict that the adjectives would impose exactly the same orderings on their domains, since their meanings are characterized in terms of the same measure function.

(20) long = \lambda x.f_{\text{linear extent}}(x)
(21) wide = \lambda x.f_{\text{linear extent}}(x)

Given these considerations, I conclude that the interpretations of gradable adjectives should not be characterized in terms of a single, general measure function. Instead, I will assume that every gradable adjective denotes a distinct measure function whose domain is the set of objects that satisfy the selectional restrictions of the adjective and whose range is a scale. This view allows for the possibility that distinct lexical items such as long and wide have identical dimensional parameters, and so map the objects in their domains to the same scale. But since long and wide denote different functions from objects to the same scale, they may impose distinct orderings on their domains. At the same time, this analysis maintains an account of the functional unity the class of gradable adjectives, which Bartsch and Vennemann derive from the assumption that the meanings of all gradable adjectives are stated in terms of a single measure function. In the analysis proposed here, this unity follows from the fact that gradable adjectives are all of the same semantic type: they are expressions of type `<τ,d>`, functions from expressions of type τ to degrees.

The interpretations of long and wide on this view can be stated as (22) and (23), where λ x.long(x) and λ x.wide(x) are distinct functions from objects to degrees on a scale of “linear extent”.

(22) long = λ x.long(x)
(23) wide = λ x.wide(x)

The intuition underlying the hypothesis that long and wide denote different functions from objects to the same scale is that although they measure objects according to the same dimension, they do so according to different (“perpendicular”) aspects. An important difference between long and wide is that the dimensional parameter of long, unlike that of wide, may take on different values (i.e., long is associated with more than one dimension—more than one scale—on this view). If long and wide were associated with the same dimension, they would be associated with the same scale in which their domains are equivalent. If both adjectives were associated with the same scale in which their domains are equivalent, then in a context in which their domains are the same, the analysis would incorrectly predict that the adjectives would impose exactly the same orderings on their domains, since their meanings are characterized in terms of the same measure function.

The intuition underlying the hypothesis that long and wide denote different functions from objects to the same scale is that although they measure objects according to the same dimension, the objects to which they apply may be different. That is, if the interpretations of long and wide were as shown in (20) and (21), then in a context in which their domains are the same, the analysis would incorrectly predict that the adjectives would impose exactly the same orderings on their domains, since their meanings are characterized in terms of the same measure function. A crucial distinction between e.g. long and wide is that they may impose different orderings on their domains, even in contexts in which their domains are equivalent. Therefore, I conclude that the interpretations of gradable adjectives should not be characterized in terms of a single, general measure function.
which of the possible values of the dimensional parameter of the adjective is intended, which in turn determines the scale onto which it projects its argument.

2.1.4 Degree Constructions

The fundamental difference between the analysis of gradable adjectives as measure functions and the traditional scalar analysis is that in the latter, the meaning of a gradable adjective includes a function from objects to degrees, but this is only one component of the meaning of the adjective: it also includes a degree argument (the standard value) and a comparison relation (a partial ordering relation). In the alternative approach I have advocated, the comparison relation and the degree argument are eliminated, leaving only the measure function as the core meaning of the adjective. The intuition underlying this analysis is that the semantic function of a gradable adjective is to project its argument onto a scale. A result of the analysis is that it provides a starting point for an implementation of the tripartite analysis of propositions constructed out of gradable adjectives that I introduced in section 2.1.1. Specifically, I suggested that the interpretation of absolute and degree constructions should be characterized in terms of three semantic constituents: a reference value, a standard value, and a degree relation. On this view, the meaning of a sentence like (27) can be paraphrased as (28), which is stated in terms of a partial ordering between two degrees.

(27) The neutron star in the Crab Nebula is dense.

(28) The degree to which the neutron star in the Crab Nebula is dense is at least as great as some standard of denseness (relativized to a comparison class for neutron stars).

The reference value in (28) is the degree to which the neutron star in the Crab Nebula is dense; the standard value is some standard of denseness relativized to a comparison class for neutron stars.

Abstracted from the tripartite analysis of propositions constructed out of gradable adjectives, the fundamental difference between the absolute form and the degree form is that the absolute form represents the basic meaning of the adjective, and the interpretations of complex degree constructions are stated in terms of the absolute form. Once the assumption that adjectives are relational has been discarded, however, the primacy of the absolute disappears. Instead, the line of reasoning described above is reversed. The analysis of gradable adjectives as measure functions is the same, both for the fundamental semantic function of a proposition and for the comparison relation in a proposition containing an adjectival construction.

In the discussion up to now, I have maintained a distinction between absolute and comparative constructions. However, I will try to reconsider the relationship between absolute and comparative constructions and introduce a new perspective on the fundamental difference between absolute and comparative constructions. In this section, I will introduce a new perspective on the analysis of gradable adjectives and the fundamental difference between absolute and comparative constructions. In section 2.1, I introduced the comparison relation and the degree function, which are fundamental to the analysis of gradable adjectives. In this section, I will introduce a new perspective on the fundamental difference between absolute and comparative constructions, which is that the semantic function of a gradable adjective is to project its argument onto a scale. A result of the analysis is that it provides a starting point for an implementation of the tripartite analysis of propositions constructed out of gradable adjectives, which I have suggested in section 2.1.1.

The reference value in (28) is the degree to which the neutron star in the Crab Nebula is dense; the standard value is some standard of denseness (relativized to a comparison class for neutron stars).

The difference between the absolute form and the degree form is that the absolute form represents the basic meaning of the adjective, and the interpretations of complex degree constructions are stated in terms of the meaning of the absolute. Once the assumption that adjectives are relational has been discarded, however, the primacy of the absolute disappears. Instead, the line of reasoning described above is reversed. The analysis of gradable adjectives as measure functions is the same, both for the fundamental semantic function of a proposition and for the comparison relation in a proposition containing an adjectival construction.

In the discussion up to now, I have maintained a distinction between absolute and comparative constructions. This distinction is an artifact of the relational analysis, however, since a claim of such an analysis is that the propositional form represents the basic meaning of the proposition. In the alternative approach I have advocated, the comparison relation and the degree argument are eliminated, leaving only the measure function as the core meaning of the adjective. The intuition underlying this analysis is that the semantic function of a gradable adjective is to project its argument onto a scale. A result of the analysis is that it provides a starting point for an implementation of the tripartite analysis of propositions constructed out of gradable adjectives, which I have suggested in section 2.1.1.
Uranus is as cold as Neptune. The meanings of these sentences can be characterized in exactly the same way as (27), as illustrated by (33)-(35).

(33) The degree to which Pluto is cold exceeds the degree to which Neptune is cold.
(34) The degree to which Jupiter is cold is exceeded by the degree to which Neptune is cold.
(35) The degree to which Uranus is cold is at least as great as the degree to which Neptune is cold.

As in the case of (27), the determination of the reference value in these examples is clear: it is derived by applying the adjective to the subject of a gradable adjective; the reference values whose degree relations have been illustrated correspond to the meaning of a gradable adjective.

The intuition underlying this analysis is that a gradable construction denotes a function that takes a grade as its argument and returns a real number.

More exactly, the intuition is that a gradable construction corresponds to a function that takes a grade as its argument and returns a real number. This function is determined by the particular degree morpheme involved.

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(36) $\text{Deg} (\text{Ref}, \text{Stnd}) = 1$ if $\langle \text{Ref}, \text{Stnd} \rangle \in \text{Deg}$

According to (36), a proposition constructed out of a gradable adjective is true just in case the reference value and the standard value stand in the relation introduced by the degree morpheme. Although this analysis provides an accurate characterization of the truth conditions of propositions involving gradable adjectives, it does not yet explain an important feature of gradable constructions: their predictability.

In order to achieve this result, I will propose that a degree morpheme combines with a measure function (a gradable adjective) and a degree (the standard value) to generate a property of individuals. The basic interpretation of a degree morpheme is given in (37), where $G$ is a gradable adjective, $d$ is the standard value, and $R$ is the relation introduced by particular degree morphemes (e.g., a partial ordering for the absolute morpheme, a total ordering for more, etc.).

The intuition underlying this analysis is that a degree construction denotes a function that picks out the subset of the domain of a gradable adjective whose projection onto the scale associated with the adjective stand in some relation–the relation specified by the particular degree morpheme involved.
In the traditional analysis, the interpretation of a gradable adjective $\phi$ is defined in terms of a partial ordering relation, as in (38) (where $\delta\phi$ is a function from objects to the scale associated with $\phi$).

(38) $\phi = \lambda d \lambda x [\delta\phi(x) \geq d]$.

It follows from this analysis that the property derived by saturating the degree argument of a gradable adjective is always of the form “is at least as $\phi$ as the standard value”. Quantification over the standard value provides a way of distinguishing between different degree constructions, but the relation between the reference and standard values remains the same: it is a partial ordering relation.

In contrast, the analysis I have advocated here removes the relational component from the meaning of the adjective, leaving only the measure function. As a result, the relation associated with a particular degree construction is determined by the meaning of the degree morpheme that heads the construction, allowing a range of different degree properties to be constructed through the combination of a gradable adjective meaning and whatever degree morphemes the language contains. Consider, for example, (30) and (31), discussed above and repeated below.

(30) Pluto is colder than Neptune.
(31) Jupiter is less cold than Neptune.

The degree morphemes in these examples introduce distinct relations; as a result, the degree constructions in the two sentences are differentiated by the relations they impose on the reference and standard values. Assuming that “more” introduces the relation “>” and “less” introduces the relation “<”, the “more comparative” in (30) can be assigned the interpretation in (39), and the “less comparative” in (31) can be interpreted as in (40).

(39) $\lambda x [\text{cold}(x) > \text{cold}(\text{Neptune})]$
(40) $\lambda x [\text{cold}(x) < \text{cold}(\text{Neptune})]$

(39) denotes the property of being cold to a degree that exceeds the coldness of Neptune; (40) denotes the property of being cold to a degree that is exceeded by the coldness of Neptune. The properties expressed by (39) and (40) are identical with respect to standard values; they differ only in their relational characteristics.

To summarize, the semantic analysis of degree constructions proposed here consists of two claims. First, the truth conditions of a proposition containing a gradable adjective should be characterized in terms of three primary semantic constituents: a reference value $r$, a standard value $s$, and a degree relation $R$. Second, a degree construction composed of a gradable adjective $\phi$ and a degree morpheme of the form “more” or “less” denotes a property of an individual: the property of being $\phi$ to a degree which stands in the $R$ relation to the standard value. In (39), the degree relation is “>” and the standard value is the coldness of Neptune; in (40), it is “<” and the standard value is the coldness of Neptune. The properties expressed by degree constructions in terms of more and less can be assigned interpretations like (39) and (40) respectively.

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The black hole at the center of the galaxy is so massive that even light can’t escape the pull of its gravity.

If these degree constructions fit into the paradigm outlined here, then it should be possible to state the truth conditions of, for example, (41)-(43) in terms of a relation between a reference value (the degree to which Mercury is hot, the degree to which Hale-Bopp was bright, the degree to which the black hole at the center of the galaxy is massive) and some other value. Then, it should be possible to explain the scopal characteristics of degree constructions without adding. That is, it should be possible to explain the scopal characteristics in terms of causal relations between degrees and states of affairs.

In section 2.1.4, I have stated that the semantic analysis of gradable adjectives and degree constructions is straightforward if a notion of comparison is presupposed. The reason for this is that the truth conditions of degree constructions are determined by the properties of the degree values and the properties of the states of affairs that the degrees describe. Thus, if a notion of comparison is required, then the truth conditions of degree constructions can be stated in terms of a comparison relation.

The difference between degree constructions like (41)-(43) and the absolute and comparative constructions discussed above is that the meanings of the former are characterized in terms of causal relations between degrees and states of affairs, rather than ordering relations between pairs of degrees. As a result, the question that must be answered is the following: what are the properties of a causal relation between a degree and a state of affairs, and how is such a relation constituted? The answer to this question has important empirical consequences, as statements like (41)-(43) have clear inferences that must be explained. For example, although the argument in (47) is valid, the one in (48) is not.

(47) Kim is too old to qualify for the children’s fare.
Sandy is older than Kim.

∴ Sandy is too old to qualify for the children’s fare.

(48) The bottle of milk in my refrigerator is too old to drink.
The bottle of wine in my closet is older than the bottle of milk in my refrigerator.

∴ The bottle of wine in my closet is too old to drink.

Although I will leave an investigation of these issues for future work, it should be noted that the explanation of degree constructions like (41)-(43) does not require a notion of comparison.

2.1.5 Evaluation

In section 2.1.1, I listed several desiderata that a semantic analysis of gradable adjectives and degree constructions should aim to satisfy. First, it should explain the scopal characteristics of gradable adjectives and comparative constructions. Second, it should support an explanation of incommensurability, cross-polar anomaly, and comparison of deviation. Third, in order to satisfy concerns about compositionality, it should be possible to state the truth conditions of gradable adjectives independently of a notion of comparison.

Although it is possible to explain the truth conditions of the examples in (49), it is not possible to do so in a way that is consistent with the principles outlined above. The problem is that the truth conditions of degree constructions are determined by the properties of the degree values and the properties of the states of affairs that the degrees describe. Thus, if a notion of comparison is required, then the truth conditions of degree constructions cannot be stated in terms of a comparison relation.

(49) The black hole at the center of the galaxy is so massive that even light can’t escape.
incommensurability in the analysis proposed here was outlined in section 2.1.2 and will be discussed further in section 2.4.1, and the explanation of cross-polar anomaly and the degree to which Pluto is cold and Neptune is not that cold.

A central claim of the analysis of degree constructions outlined in the previous section is that the degree morpheme has no quantificational force; in this respect, it differs from all of the accounts discussed in chapter 1: the scalar analyses of comparatives as existential quantification structures and generalized quantifiers, as well as the vague predicate analysis, which involved existential quantification over degree functions. The empirical consequence of this difference is that it explains why comparatives do not participate in scope ambiguities. If degree morphemes do not head a construction that quantifies over the degree argument of a gradable adjective, then there is no expectation that comparatives (as a type of degree construction) should participate in quantificational scope ambiguities. More importantly, if degree morphemes are components of the predicative expression in a proposition constructed out of a gradable adjective, then their scopal properties should be the same as those of the predicate. Since predicates, in effect, always have narrow scope (i.e., they have no independent scopal characteristics), comparatives and other degree constructions should also always have narrow scope.

To see this, consider the case of negation. In section 1.4.1 of chapter 3, I observed that a sentence like (49) is not ambiguous: it can only be interpreted as a denial that Neptune is colder than Pluto, not as a claim that there is a degree which exceeds the degree to which Pluto is cold, and Neptune is not that cold.

The problem for quantificational analyses of comparatives was that without additional stipulations, such a reading cannot be ruled out: if comparatives are quantificational, then (50) and (51) should both be derivable from (49). Although the facts discussed in chapter 1 indicated that the comparative construction did not participate in scope ambiguities, this was not true of the comparative clause: comparatives in other contexts (e.g., in the scope of universal quantifiers, intensional contexts, etc.) can be explained in the same way.

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In contrast, the analysis of comparatives as degree properties generates a single logical representation for (49): Assuming that negation has clausal scope, (49) has the interpretation in (52): it asserts that it is not the case that Neptune has the property of being colder than Pluto.

The failure of comparatives to show scope ambiguities in other contexts (e.g., in the scope of universal quantifiers, intensional contexts, etc.) can be explained in the same way.
interpretations were presented as evidence that the comparative clause does show scope ambiguities in intensional contexts.

(53) Karl thought Neptune was colder than it was.
(54) If Venus were less hostile than it is, we would be able to land a probe on its surface.

Unlike the relational analysis, in which the standard value is denoted by the entire comparative construction (which includes the comparative clause as a subconstituent), the analysis that I have outlined in this section claims that the standard value is denoted by the comparative clause. In other words, in the analysis proposed here, it is the comparative clause that denotes the “degree argument” in a degree construction. If the comparative clause denotes an actual argument, then the fact that it participates in scope relations is not surprising. The exact way in which it interacts with other expressions to trigger scope ambiguities should be explained in terms of its internal semantics (e.g., whether it is a type of definite description, as I have assumed here, or a universal quantification structure); this is not a question that I will address here, but see Kennedy 1997c for arguments that the comparative clause is a type of definite description (see also Russell 1905, Hasegawa 1972, Postal 1974, Horn 1981, von Stechow 1984a, Larson 1988a, Lerner and Pinkal 1992, 1995, and others for relevant discussion).

2.1.6 Historical Context

Before moving on to a more detailed look at the compositional analysis of specific degree constructions, the approach to the semantics of gradable adjectives and degree constructions that I have proposed here should be situated in the context of previous work. In general terms, the analysis of gradable adjectives as measure functions bears some similarity to the analysis of gradable adjectives in the vague predicate analysis: in both accounts, gradable adjectives denote functions, and the interpretation of complex degree constructions involves the composition of degree morphology with the adjective to generate a complex property that is applied to the subject. The crucial difference between the measure function analysis and the vague predicate analysis is that the former includes the core assumptions of a scalar approach: scales and degrees are part of the ontology, and gradable adjectives define mappings from objects to degrees. More generally, the measure function analysis derives the ordering on the domain of a gradable adjective from a semantic property of the adjective itself, as does the traditional scalar analysis; it does not assume an inherent ordering on the domain, as the vague predicate analysis does.

In this respect, the measure function analysis is also similar to a “fuzzy logic” approach. The basic claim of a fuzzy logic approach is that (at least some) expressions that are analyzed in classic model theory as functions from expressions of type \( \tau \) to \{0,1\} (e.g., adjectives and other one-place predicates) should instead be construed as functions from objects of type \( \tau \) to the interval \([0,1]\)—the set of real numbers between 0 and 1, inclusive. Intuitively, functions of this type map objects to numerical values that represent the degree to which the object manifests some gradable property, for example, "tallness." When objects that are definitely not tall are substituted for \( x \) in the formula \( \text{tall}(x) \), the result is 0; for objects that are definitely tall the result is 1; and for all other objects, the result is some real number between 0 and 1. Comparisons in this approach are based on the order relation of the real numbers, and the ordering characteristics of measure functions may be derived from the order relation of the real numbers.

Klein (1980) criticizes this analysis for failing to make a distinction among objects that definitely possess a gradable property like tallness, pointing out that in a context in which two objects \( a \) and \( b \) are both definitely tall, but \( a \) is taller than \( b \), the value of \( \text{tall}(a) \) and \( \text{tall}(b) \) in a fuzzy logic analysis would be the same: 1. As a result, the proposition denoted by the comparative clause does show scope ambiguities in intensional contexts.

The construction of the comparative morphemes with the adjective to generate a complex property does not imply that the interpretation of the adjective itself is context-dependent. Rather, the interpretation of the adjective is context-independent, and it is applied to the subject. The crucial difference between the measure function approach and the adjective approach is that the adjective approach allows for a context-dependent interpretation, whereas the measure function approach allows for a context-independent interpretation of the adjective.
Given the hypothesis that the meaning of a proposition constructed out of a gradable adjective should be characterized in terms of a reference value, a standard value, and a degree relation has its roots in Russell's (1905) analysis of the comparative construction as a relation between two definite descriptions (see fn. 4), and it is similar to the generalized quantifier analyses of comparatives discussed in chapter 1 (e.g., Moltmann 1992a; see also Postal 1974, Cresswell 1976, and Williams 1977). For example, the interpretation of a sentence like (55) in a generalized quantifier analysis is (56) (see the discussion in chapter 1, section 1.4.5 for details).

The truth of (56) is dependent on whether the arguments of the comparative operator (which are derived by abstracting over the degree variable introduced by the adjective) satisfy the relation introduced by the comparative morpheme. (56) is true just in case the set of degrees to which Pluto is cold properly includes the set of degrees to which Neptune is cold.

The analysis developed in the previous section is similar in that the comparative morpheme defines a relation between two expressions—the standard value (the degree to which Pluto is cold) and the reference value (the degree to which Neptune is cold)—but it differs crucially in the semantic analysis of the comparative morpheme. Instead of combining with two property-denoting expressions, as in (56), the comparative morpheme combines directly with a gradable adjective and a standard-denoting expression to generate the property in (57), which, when applied to the subject, derives the proposition in (58).

The logical representation in (58) differs from (56) in two crucial respects. First, since gradable adjectives are analyzed as measure functions, it implements the hypothesis that the reference and standard values are primary constituents of the proposition denoted by (55) more directly than the generalized quantifier analysis, which achieves this result only by abstracting over the degree variable introduced by the adjective. Second, and most important, the degree morpheme has no quantificational force. As a result, it does not make incorrect predictions about the scopal properties of comparatives and other degree constructions.
2.2 The Extended Projection of A

The analysis of degree constructions developed in the previous section claimed that a degree morpheme combines directly with a gradable adjective and a standard-denoting expression to create a property of individuals, which is then applied to the subject. In subsequent sections, I will go through the compositional semantic analysis of the syntactic structures in which degree morphemes appear in some detail, focusing on absolute and comparative constructions. Before I do this, however, I will lay out my general assumptions about the syntax of degree constructions.

Following Abney 1987, I assume that adjectives, like nouns and verbs, project extended functional structure (see also Corver 1990, 1997, Grimshaw 1991). Specifically, I assume that the extended projection of A is headed by a degree morpheme, i.e., a member of \{∂, er/more, less, as, so, too, enough, how, this, that\} (where ∂ is the phonologically null morpheme associated with the absolute construction). I will further assume that the comparative clause—the constituent headed by than or as in comparatives and equatives, the non-finite clause in a too/enough construction, and the finite clause associated with so—has been selected by Deg° but adjoined to Deg'.

(59) illustrates the basic structure of the extended projection of A, where XP is the constituent that introduces the comparative clause.

Since degree morphemes are heads, they can impose restrictions on the types of arguments they allow. Thus more and less can be lexically specified to require XP to be a PP headed by than; as to require XP to be a PP headed by as; and so on for the other degree morphemes.

The extended projection of A, where D\text{eg}° is the constituent that introduces the comparative clause:

\[
\text{Spec} \rightarrow \text{V} \rightarrow \text{A} \rightarrow \text{Comps} \rightarrow \text{Deg}° \rightarrow \text{Deg}' \rightarrow \text{XP}
\]

In many respects, (59) reflects a natural approach to the syntax of degree constructions, given the success of similar approaches to nominal and clausal structure (see Grimshaw 1991 for an overview). Other than the work cited above, however, this analysis has not received a great deal of attention. There are at least two reasons for this. The first is the strength of the traditional analysis of the syntax of AP, articulated in Bresnan's (1973) seminal work on the syntax of comparatives. The core of Bresnan's analysis is the notion of a functional head of an adjective phrase that is headed by an adverbial that is an uninterpretable functional head. This head has been described as a complementizer or a combinator.

The contrast between (i) and (ii) illustrates the well-known fact that extraction of a complement out of an adjunct phrase is possible, while extraction of an adjunct out of an adjunct is impossible. The following facts show that this is indeed the case: (v) and (vii) show that arguments can be extracted out of the non-finite clauses introduced by too and enough, while (vi) and (viii) show that extraction of adjuncts is impossible.

(i) Who i was Audrey angry enough [to criticize e i]
(ii)*When i was Audrey angry enough [to criticize her boss e i]
(iii) Which car i was Tim too scared [to drive e i]
(iv) *How quickly i was Tim too scared [to drive the Fiat e i]
(v) Who i was Audrey angry enough [to criticize e i]
(vi)*How obnoxiously i was Audrey angry enough [to criticize her boss e i]
(vii) Which car i was Tim too scared [to drive e i]
(viii)*How quickly i was Tim too scared [to drive the Fiat e i]

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Constructions (which on her analysis consist of degree morphemes and their associated clauses) and measure phrases are base generated as constituents in the specifier of AP (see also Bowers 1970, Selkirk 1970, Jackendoff 1977, Hellan 1981, McCawley 1988, Hazout 1995). The basic structure of degree constructions within this type of analysis is shown in (60) (absolute constructions with measure phrases have essentially the same structure, differing only in the substitution of a measure phrase for DegP).14

\[ \text{AP} \]

\[ \text{DegP} \]

\[ A' \]

\[ g \]

\[ \text{Deg} \]

\[ \text{XP} \]

\[ A \]

A particularly appealing aspect of (60) is that it supports a straightforward compositional semantics of degree constructions in the context of a relational analysis of the interpretation of gradable adjectives: the constituent which occupies the specifier of AP denotes the degree argument of the head of AP. Recall from the discussion in section 2.1 that the meaning of a gradable adjective \( \phi \) in the relational account is (61), where \( \delta_{\phi} \) is a function from objects to degrees on the scale associated with \( \phi \).

\[ \phi = \lambda d \lambda x [\delta_{\phi}(x) \geq d] \]

The interpretation of a structure like (62) is straightforward: the measure phrase provides the degree argument of the adjective, and the sentence has the interpretation in (63), with the truth conditions in (64).

\[ \text{IP} \text{ Benny is [AP [DP 4 feet] tall]]} \]

\[ \delta_{\text{tall}}(\text{Benny}) \geq 4 \text{ feet} \]

\[ || \delta_{\text{tall}}(\text{Benny}) \geq 4 \text{ feet} || = 1 \text{ iff the degree to which Benny is tall is at least as great as the degree denoted by 4 feet.} \]

More complex degree constructions such as the comparative in (65) are interpreted in a similar way. Comparatives (and other degree constructions) quantify over the degree variable introduced by the adjective; assuming that quantificational expressions are subject to an operation of Quantifier Raising (May 1977, 1985), the degree phrase in (65) adjoins to a clausal node at LF, as shown in (66).

\[ \text{IP} \text{ [DegP more than Saturn's atmosphere is [AP [ei violent]]] [IP Jupiter's atmosphere is [AP [ei violent]]]} \]

The interpretation of a structure like (66) can then be formalized either in terms of existential quantification over degrees, as in the degree description analysis discussed in chapter 1, section 1.4, or in terms of the generalized quantifier analysis discussed in chapter 2.

\[ |p \in [\phi] = \phi \]

Following Bresnan 1973 (see also Hellan 1981, Heim 1985, McCawley 1988, Moltmann 1992a, Hazout 1995, Rullmann 1995, and others), I assume that the degree construction is a constituent at LF (i.e., that the than-constituent is extraposed in the PF component or is reconstructed prior to QR). I also assume that the “missing” material in the comparative clause is recovered through an ellipsis-resolution mechanism whereby missing material is reconstructed under identity with the AP in the matrix clause. In other words, I assume that the resolution of comparative “deletion” in an example like (65) is parallel to the resolution of antecedent-contained deletion (ACD) in an example like (i), which has the Logical Form in (ii) after QR and recovery of the elided material (see May 1985, Larson and May 1988, and Kennedy 1997a for discussion).

\[ (i) \text{ Kollberg recognized everyone that Beck did.} \]

\[ (ii) \text{[everyone that [Op [i Beck did]]]} \text{ [Kollberg recognized e]} \]

\[ \text{Note in particular that, just as in ACD, recovery of the matrix AP introduces a A-bar trace. If the comparative clause is an operator-variable construction, as argued in Chomsky 1977, then this trace provides a variable for the operator in the comparative clause to bind, just as recovery of the elided VP in ACD provides a variable for the relative operator to bind. I will return to a more detailed discussion of the syntax of comparative deletion in section 2.4.2 below.} \]

\[ (65) \text{ Jupiter's atmosphere is more violent than Saturn's atmosphere is.} \]

\[ (66) \text{[IP [DegP more than Saturn's atmosphere is [AP [ei violent]]] [IP Jupiter's atmosphere is [AP [ei violent]]]} \]

The interpretation of a structure like (66) can then be formalized either in terms of existential quantification over degrees, as in the degree description analysis discussed in chapter 1, section 1.4, or in terms of the generalized quantifier analysis discussed in chapter 2.
1, section 1.4.6. In the former analysis, the interpretation of (66) is (67), in which the degree construction provides the restriction for an existential quantifier; in the latter analysis, the interpretation of (66) is (68), in which the comparative morpheme is analyzed as a relation between the comparative clause and the main clause.

\[(67) \exists d \left[ d > \text{max}(\lambda d'. \text{violent}(\text{Saturn's atmosphere}, d')) \right] \left[ \text{violent}(\text{Jupiter's atmosphere}, d) \right] \]

\[(68) \text{more} \left[ \lambda d'. \text{violent}(\text{Saturn's atmosphere}, d') \right] \left[ \lambda d. \text{violent}(\text{Jupiter's atmosphere}, d) \right] \]

The logical representations in (67) and (68) are exactly the same as those used in chapter 1, and can be evaluated as discussed there.

This discussion brings into focus the second explanation for the lack of attention to the extended projection analysis of degree constructions. Although numerous researchers have discussed the semantic analysis of comparatives and other degree constructions within the context of a syntactic analysis along the lines of (60) (see e.g. Hellan 1981, Heim 1985, McCawley 1988, Hazout 1995), there has been virtually no discussion of how extended projection structures such as (59) should be interpreted.

16 An immediate problem is that the syntax of extended projection appears to be inconsistent with a relational analysis of gradable adjectives, given standard assumptions about the syntactic representation of argument structure. Within the syntactic tradition of the Principles and Parameters approach, which is the framework I am assuming here, the basic assumption about the relation between a head and its arguments is that arguments of a lexical head are generated either as complements or specifiers. In (59), however, neither of these relations obtains. Instead, the relation between the lexical head (the adjective) and its argument appears to be reversed: the maximal projection of the adjective is the complement of Deg0—the expression which, in a relational analysis, should head one of its arguments.

In (70), in which the adjective has a single argument, the denotation of AP is just the denotation of its head, a measure function.

\[(70) \text{DegP} \rightarrow \text{Deg'} \rightarrow \text{XP} \]

\[\phi \rightarrow \text{Deg'} \rightarrow \text{XP} \]

The logical representations in (57) and (67) are exactly the same as those used in chapter 1.
function from standard values to individuals—an expression of the same semantic type as a gradable adjective in the relational account (see the discussion of this point in section 2.1.4).

This complex expression combines with the standard-denoting expression, generating a function from individuals to truth values, with the result that DegP denotes a property of individuals, specifically, the property of having a degree of ϕ-ness that stands in the relation introduced by the degree morpheme to the standard value. The steps in the composition of (70) are shown in (71).

(71) Deg(AP):

    λG λd λx [R(G(x))](d)(ϕ) ⇒ λd λx [R(ϕ(x))(d)]

Deg'(XP):

    λd λx [R(ϕ(x))(d)](σ) ⇒ λx [R(ϕ(x))(σ)]

DegP:

    λx [R(ϕ(x))(σ)]

In the following sections, I will take a closer look at the structure and interpretation of absolute and comparative degree constructions in predicative position. I should point out that my goal here is not to undertake a complete syntactic analysis of the full range of degree constructions in English (see Corver 1990, 1997, and Abney 1987 for more detailed discussion of these issues); instead, I will focus on showing how the syntax of extended projection supports a straightforward compositional semantics for comparative and absolute degree constructions. The goal here is not to undertake a complete syntactic analysis of the full range of absolute and comparative degree constructions in predicative position. I should point out that in the following sections, I will take a closer look at the structure and interpretation of absolute and comparative degree constructions. The steps in the composition of (70) are shown in (71).

In (70) and (71), the standard expression is introduced by the degree morpheme to the standard value. The steps in the composition of this complex expression combine with the standard-denoting expression, generating a function from standard values to individuals—an expression of the same semantic type as a gradable adjective in the relational account (see the discussion of this point in section 2.1.4).
Let us consider first the interpretation of absolute constructions with overt measure phrases, such as (75). Like other degree morphemes, the absolute morpheme should denote an expression of the form in (69), repeated below.

\[(69) \text{Deg} = \lambda G \lambda d \lambda x [R(G(x))(d)]\]

What needs to be determined is the value of \(R\): the relation introduced by the absolute morpheme. Following a tradition of work on gradable adjectives (see Bartsch & Vennemann 1972, Bierwisch 1989, Gawron 1995 and the discussion in chapter 1, section 1.3.1), I will assume that the ordering associated with the absolute is a partial ordering relation.18 The meaning of the absolute morpheme can then be formalized as in (76) (where \(\text{abs}\) is the interpretation of the null morpheme in the logical representation language), and the truth-conditions for absolute constructions can be stated as in (77).

\[(76) [\text{Deg} \partial] = \lambda G \lambda d \lambda x [\text{abs}(G(x))(d)]\]

\[(77) \text{abs}(d1)(d2) \equiv 1 \text{ iff } d1 \geq d2\]

Given these assumptions, the compositional analysis of (75) is as shown in (78) (I assume that measure phrases denote degrees; see Cresswell 1976, Klein 1980, 1991, von Stechow 1984a,b, and Gawron 1995 for discussion).

18 Nothing hinges on the analysis of the absolute in terms of a partial ordering relation instead of one of equality. If, for example, Carston's (1988) claim that adjectives are ambiguous between an "at least as" and an "exactly" interpretation is correct, the analysis of the absolute presented here can be reworked accordingly. See chapter 1, section 1.4.2 and Horn 1992 for discussion of this issue.
the difference is that we must introduce a variable to saturate the standard argument, which I have indicated as \( ds \) in (80).

\( (80) \]
\\\[ \lambda x [\text{abs}(\text{thin}(x))(ds)](Mars' \text{atmosphere}) \]

\( (81) \]
\\\[ \lambda y G [\text{abs}(\text{thin}(y))(\text{thin}(x)))(ds)](g) \]

Since \( ds \) is a free variable, its value must be determined by a function from contexts to degrees. The general form of this function must be such that it assigns a value to a degree based on an appropriate comparison class; in the interpretation of (80), shown in (81), this function should assign to \( ds \) a value of thinness that corresponds to a standard for planetary atmospheres.

\[ (i) \text{No planet is small.} \]

This reading makes the claim that there are no planets that are small in a general sense, but at the same time, it allows for the existence of small planets (i.e., planets that are small with respect to a comparison class made up of planets and other celestial bodies). One way of accounting for readings of this sort, suggested by Ludlow, is to allow the comparison class to be expanded to include larger portions of the domain of the adjective (and possibly the entire domain).

\[ (83) \text{That elephant is large, and that flea is too.} \]

\[ (84) \text{Beck is tall, and his 6 year old daughter is too.} \]

The function should assign to \( a \) a value of thinness that corresponds to a standard for planetary comparison classes, based on an appropriate comparison class in the interpretation of (80), shown in (81). This function should be defined by a function from contexts to

\[ (85) \text{abs} (\text{thin}(x))(ds) \]

The difference is that we must introduce a variable to saturate the standard argument, which...
(85) Lana is intelligent.

(86) Lana is intelligent for a chimp.

(87) Mercury is small for a planet.

(88) Mookie is short for a basketball player.

Taking these examples as a starting point, let us assume that the indefinites in (86)-(88) introduce properties of individuals that are used as the basis for constructing a comparison class; for concreteness, I will refer to such properties as “comparison properties”.

The hypothesis that a property-denoting expression is used to determine a comparison class is a component of analyses in which the attributive form of a gradable adjective is taken to be basic (see Parsons 1972, Montague 1974, Cresswell 1976, Lerner and Pinkal 1992; cf. Kamp 1975, Klein 1982). In such analyses, what I have called the “comparison property” is supplied by a common noun meaning, e.g. planet in (89).

(89) Mercury is a small planet.

The hypothesis that the indefinites in examples like (86)-(88) are property-denoting expressions receives some support from an unusual parallelism between indefinites in absolute for-PPs and predicative indefinites: the former show the same agreement patterns as the latter, as illustrated by (i)-(ii).

(i) Mercury and Pluto are small for planets/*a planet.

(ii) Mercury and Pluto are planets/*a planet.

Building on these observations, I will propose that the absolute degree morpheme is ambiguous between the interpretation given above in (76) and repeated below, in which the standard value is introduced by a degree, and the interpretation in (90) where the indefinites are picked up on the basis of the comparison class.

(76) \[ \text{Deg}_1 = \lambda G \lambda d \lambda x \left[ \text{abs}(G(x))(d) \right] \]

(90) \[ \text{Deg}_2 = \lambda G \lambda P \lambda x \left[ \text{abs}(G(x))(\text{stnd}(G(P))) \right] \]

(90) differs from (76) in two crucial ways. First, the second argument of the degree morpheme is a comparison property, rather than a degree, and second, the meaning of the degree morpheme includes a “standard-identification” function, which I have represented as “stnd” in (90). This function takes a gradable adjective and a comparison property as arguments and returns the degree on the scale associated with the adjective that represents the appropriate standard value for that property. Although I will not attempt to work out the details of this computation here, I will simply state that the standard is taken to be the mean of the distribution of objects in the extension of the adjective, and that the mean is determined by a “standard-identification” function that takes the comparison property as an argument and returns the appropriate standard value.

Once the degree morpheme in (90) composes with a gradable adjective \( \phi \), the resulting complex expression denotes the relation between properties and individuals shown in (i).

(i) \( \lambda P \lambda x \left[ \text{abs}(\phi(x))(\text{stnd}(\phi(P))) \right] \)
The interpretation of examples like (86)-(88) is straightforward: the value of $P$ is supplied by the indefinite in the for-clause. Note that since the interpretation of the absolute morpheme in (90) "presaturates" the degree argument, the analysis predicts that measure phrases and comparison properties should be in complementary distribution. (91)-(92), which show that sentences with both a measure phrase and a "for-indefinite" phrase are ill-formed, verify this prediction.

(91)^* Benny is 4 feet tall for a 10 year old boy.
(92)^* The class was 3 hours long for a discussion section.

As it stands, however, this analysis does not yet provide a solution to Klein’s objection, because in examples (72) and (85), it is still necessary to supply a value for the comparison property. Crucially, we cannot assume that the comparison property is supplied indexically (as in e.g. Lerner and Pinkal 1992), because such an analysis would also make incorrect predictions in the case of VP ellipsis (see Klein 1980:15 for discussion).

The observations made above about the meanings of examples like (72) and (85) suggest a solution to this problem. These examples indicate that when the comparison class is implicit, its value is in some way dependent on the denotation of the subject. More precisely, the comparison class is identified based on some property possessed by the subject that is determined to be relevant in the context of utterance. In (85), the property of being a chimp; in (72), the property of being a planetary atmosphere. This observation provides the starting point for a semantic analysis of absolute constructions with implicit standards that maintains a certain amount of context-dependency, but also explains the ellipsis facts discussed by Klein. Specifically, I will assume that when a comparison property is not explicitly introduced, as in simple absolute constructions like (72) and (85), its value is determined in one of two ways. Either $P$ receives some default value, in which case $G$ is a "global standard" for $G$ (see footnote 19; for psychological evidence that gradable adjectives are associated with global standards, see Rips and Turnbull 1980), or the value of $P$ is determined by a context-dependent function $p$ that takes an individual as argument and returns a comparison property based on the value of its argument. To account for the observation that the comparison class is determined by property of the subject, I will further assume that the argument of $p$ is constrained to be identical to the external argument.

Given these assumptions, the interpretation of the degree phrase in (72), repeated below, is the degree property in (93).

(72) Mars' atmosphere is thin.
(93) $\lambda x [\text{abs}(\text{thin}(x)) (\text{stnd}(\text{thin}(p(x))))]$

(93) denotes the property of being thin to a degree that is at least as great as a standard of thinness determined on the basis of a contextually salient property of the target of predication. Composition of the property in (93) with the subject derives (94).

(94) \text{abs}(\text{thin}(\text{Mars’ atmosphere})) (\text{stnd}(\text{thin}(p(\text{Mars’ atmosphere}))))

Assuming that the value of $p(\text{Mars’ atmosphere})$ (the comparison property) is something like "is a planetary atmosphere", the standard value in (94) is the degree on the scale associated with thin that identifies a norm of thinness for planetary atmospheres. The crucial difference between (94) and the logical representation in (81) is that the computation of (94) includes resolving an explicit semantic dependency between the standard value and the subject, as specified in (93).

This dependency explains the ellipsis facts observed by Klein. Although the analysis does not provide a solution to Klein’s objection, it does explain the ellipsis of the degree phrase in (72), repeated below.

(96) The class was 3 hours long for a discussion section.

Because such an analysis would also make incorrect predictions in the case of VP ellipsis, the comparison property is supplied implicitly. The crucial assumption that the comparison property is supplied indexically (as in e.g. Lerner and Pinkal 1992) is therefore unnecessary to support a full description of absolute constructions in the context of utterance. This dependency explains the ellipsis facts observed by Klein. Although the analysis does not provide a solution to Klein’s objection, it does explain the ellipsis of the degree phrase in (72), repeated below.

(96) The class was 3 hours long for a discussion section.
developed here maintains the position that the determination of the standard value is context-dependent, it locates the indexicality in the function \( p \), which determines which of the set of properties associated with its argument should be used as the basis for determining the standard value. Crucially, since the argument of \( p \) is constrained to be identical to the subject of the predication, the domain from which it is chosen must vary in the two conjuncts of an ellipsis construction, even though the actual choice of comparison property is context-dependent. This can be illustrated by reconsidering (84), repeated below.

(84) Beck is tall, and his 6 year old daughter is too.

The logical representation of the verb phrase in the first conjunct in (84) is (95); assuming that VP ellipsis is licensed by identity of logical representations (as in Sag 1976 and Williams 1977), (95) also provides the interpretation of the elided VP.

(95) \( \lambda x[\text{abs}(\text{tall}(x))(\text{std}(\text{thin}(p(x))))] \)

Since (95) is predicated of two distinct objects in the conjuncts in (84), the actual values of the standards in the two conjuncts will vary as a function of the denotations of the subjects. In the first conjunct, the standard value is determined with respect to an appropriate comparison property for the individual denoted by Beck, an adult male; in the second conjunct, the standard value is determined with respect to a comparison property for the individual denoted by Beck’s 6 year old daughter.

In essence, the analysis claims that absolute constructions in which the comparison property is determined by \( p \) are reflexive constructions, analogous to verbs with implicit reflexive arguments, such as bathe. Like (84), the implicit argument of bathe can (and in fact must) have a “sloppy” reading under ellipsis (i.e., its value must vary): (96) has only an interpretation in which Beck’s 6 year old daughter bathed herself, not one in which Beck’s 6 year old daughter bathed Beck.

(96) Beck bathed, and his 6 year old daughter did too.

This analysis predicts that “strict” interpretations of elliptical conjuncts like (84)–interpretations in which the comparison property in the elided constituent is the same as the comparison property in the antecedent–should be impossible. This seems to be true: as noted above, (84) cannot mean that Beck’s daughter is tall for a grown man (assuming Beck is an adult male), although it can be interpreted as a statement that they are both tall with respect to some global standard. In the latter case, however, there is no dependency between the subject and the comparison property, so a sloppy reading is possible by default.

Additional evidence for this analysis is in the high level cases from sentences with quantificational subjects. Consider an example like (97).

(97) Everyone in my family is tall.

(97) can mean that every member of my family is tall with respect to whatever comparison property is appropriate for that individual, i.e., that each child is tall for a child, each man is tall for a man, and each woman is tall for a woman.

This interpretation of (97) corresponds to the logical representation in (98).

(98) \( \forall x[\text{member-of-my-family}(x)][\text{abs}(\text{tall}(x))(\text{std}(\text{tall}(p(x))))] \)

(97) can also mean that every member of my family is tall with respect to some global standard. The logical representation of the verb phrase in the first conjunct in (97) is (99); assuming the sentence is interpreted in the context of ellipsis, elliptical construction (99) is a “sloppy” reading of the sentence. Determining the standard value of the comparison property is context-dependent, since the argument of \( p \) is constrained to be the subject of the predication. The domain from which the comparison property is chosen is the standard value of the subjects. In the first conjunct, this value is determined with respect to whatever comparison property is appropriate for the individual denoted by every member of my family. In the second conjunct, the standard value is determined with respect to whatever comparison property is appropriate for the individual denoted by the subject of the predication. This analysis predicts that “strict” interpretations of elliptical conjuncts like (97)–interpretations in which the comparison property in the elided constituent is the same as the comparison property in the antecedent–should be impossible. This seems to be true: as noted above, (97) cannot mean that every member of my family is tall for a child, each man is tall for a man, and each woman is tall for a woman, although it can be interpreted as a statement that they are all tall with respect to some global standard. In the latter case, however, there is no dependency between the subject and the comparison property, so a sloppy reading is possible by default.

Additional evidence that this analysis is on the right track comes from sentences with quantificational subjects. Consider an example like (97).

(97) Everyone in my family is tall.

(97) can mean that every member of my family is tall with respect to whatever comparison property is appropriate for that individual, i.e., that each child is tall for a child, each man is tall for a man, and each woman is tall for a woman.

This interpretation of (97) corresponds to the logical representation in (98).

(98) \( \forall x[\text{member-of-my-family}(x)][\text{abs}(\text{tall}(x))(\text{std}(\text{tall}(p(x))))] \)

(97) can also mean that every member of my family is tall with respect to some global standard. The logical representation of the verb phrase in the first conjunct in (97) is (99); assuming the sentence is interpreted in the context of ellipsis, elliptical construction (99) is a “sloppy” reading of the sentence. Determining the standard value of the comparison property is context-dependent, since the argument of \( p \) is constrained to be the subject of the predication. The domain from which the comparison property is chosen is the standard value of the subjects. In the first conjunct, this value is determined with respect to whatever comparison property is appropriate for the individual denoted by every member of my family. In the second conjunct, the standard value is determined with respect to whatever comparison property is appropriate for the individual denoted by the subject of the predication. This analysis predicts that “strict” interpretations of elliptical conjuncts like (97)–interpretations in which the comparison property in the elided constituent is the same as the comparison property in the antecedent–should be impossible. This seems to be true: as noted above, (97) cannot mean that every member of my family is tall for a child, each man is tall for a man, and each woman is tall for a woman, although it can be interpreted as a statement that they are all tall with respect to some global standard.
Since the comparison property must be calculated for each individual that satisfies the restriction of the quantifier, the standard value changes according to the comparison property determined by that individual. If, on the other hand, the standard value were an indexically specified degree, its interpretation should remain constant. This is illustrated by an example like (99), in which the pronoun her is interpreted indexically.

(99) Everyone in my family is proud of her.

(99) can only mean that everyone in my family is proud of the same person; it cannot mean that everyone in my family is proud of some female individual.

The analysis of implicit comparison classes outlined here is very similar in its basic respects to the one developed in Ludlow 1989, but different in implementation. Ludlow argues that the standard argument in a sentence like (72) is introduced by an operator which moves from its base position in AP to adjoin to the subject, which is then used as the basis for determining the comparison class. Specifically, the comparison class is determined based on the lexical material included in N-bar. On this view, the non-identity of the standards in elliptical contexts follow from the fact that the “standard operator” in the two conjuncts adjoins to different expressions—the subjects of the two clauses—as shown in (100).

(100) [Op[that elephant] is large e and [Op[that flea] is large too]]

There are at least two problems with this type of analysis. The first is strictly syntactic: the analysis requires the standard operator to adjoin to an argument, but this type of adjunction has been claimed to be impossible (see Chomsky 1986). The second problem comes from examples in which the subject is quantificational, such as (97) above. If the standard operator adjoins to the quantificational subject and the lexical material in N-bar determines the comparison class, then the standard value in an example like (97) should be some average based on the combined heights of the members of my family. If this is the case, however, the result would always be true that someone in my family is taller than all the others. It would therefore be true that everyone in my family is taller than all the others, which (97) clearly does not mean.

2.4 Comparatives

2.4.1 Initial Observations and Questions

2.4.1.1 Domain of Investigation

The complexity and variety of the class of comparative constructions in English provides a rich domain of syntactic and semantic puzzles, most of which go beyond the scope of this dissertation. As a result, my focus in this section will be on the class of predicative comparatives such as (101)-(103).

(101) The Mars rock called "Barnacle Bill" is as wide as it is tall.

(102) Jupiter is larger than Jones thought it was.

(103) Mars is less distant than Saturn.

I will not discuss attributive comparison constructions such as (104)-(105) (see e.g. Pinkham 1982, Heim 1985, Lerner and Pinkal 1992, 1995, and Gawron 1995 for relevant discussion), nor will I discuss comparative nominals, such as (106)-(107) (see e.g. Cresswell 1976, Keenan 1987).
Mars has a thinner atmosphere than Venus.
I bought a less powerful telescope than Jaye did.
More stars are visible from the southern hemisphere than the northern hemisphere.
There are fewer black holes in the galaxy than there are stars.

Although there is reason to believe that the analysis that I will develop here is extendable to an analysis of these other constructions (see in particular Kennedy and Merchant 1997 for an analysis of attributive comparatives that builds on the proposals in this thesis), it should be observed that some constructions in which the comparative clause is missing more material than just DegP (see exponent these three cases, which should be read that from (108) onward) exemplify these three types, which, I should note that with comparative ellipsis is often used to refer to structures in which the comparative clause is missing more material than just DegP.

Within the class of predicative comparatives, I will distinguish three subtypes based on the superficial characteristics of the complement of than or as–what I have referred to thus far as the “comparative clause”. (101)-(103) exemplify these three types, which, following established tradition, I will refer to with the descriptive labels:

- Comparative subdeletion,
- Comparative deletion,
- Phrasal comparatives,

Comparative subdeletion structures such as (101) are comparatives in which the comparative clause is a constituent that could stand alone as an independent clause (see Grimshaw 1987), but must not contain an overt measure word or phrase, as illustrated by (107)-(109).

Comparative deletion structures are comparatives in which the surface complement of than or as is a “partial clause”: a clausal constituent (as indicated by the presence of verbal inflection) that appears to be “missing” some constituent at least as large as DegP. Comparative deletion is illustrated by (102) above, as well as (111)-(113).

Finally, phrasal comparatives are structures in which the surface complement of than or as is a single non-clausal constituent, as in (103) and (114)-(117).

It should be noted that “comparative ellipsis” is often used to refer to structures in which the comparative clause is missing more material than just DegP (see Gawron 1995 and Hazout 1995 for recent discussion); this label includes both phrasal comparatives and examples of comparative deletion such as (112). The question of whether an ellipsis operation is involved in the derivation of comparatives, and if so, which of the several possible operations is involved in the derivation of comparatives, is a topic of interest that I will elaborate in future work. My goal in this section is to show how the basic approach to the semantic analysis of predicative comparatives that I will propose in this section can be extended to encompass a broader class of predicative comparatives and declarative comparatives, and by extension, a foundation upon which to build a general account of the full range of comparative constructions in English. Throughout this section and elsewhere in this thesis, I will use the term “comparative subdeletion” to refer to structures in which the comparative clause is missing more material than just DegP.
The section will address. In order to avoid presupposing the outcome of the discussion, I have chosen the labels "subdeletion", "comparative deletion", and "phrasal comparatives" based on tradition and their usefulness as descriptive characterizations of the surface forms.

2.4.1.2 Comparative Relations and Degree Descriptions

According to the analysis of gradable adjectives and degree constructions developed in section 2.1, it should be possible to characterize the interpretations of comparative constructions in terms of the general schema for degree morphology in (118).

\[
\text{Deg} = \lambda G \lambda d \lambda x \left[ R \left( G(x) \right)(d) \right]
\]

Two questions need to be answered: what is the value of \( R \) for each of the comparative morphemes \( \text{er/more} \), \( \text{less} \), and \( \text{as} \), and how are the standard values derived in each of the three classes of comparatives that I am focusing on here? The answer to the first question is straightforward: \( \text{er/more} \) denotes a total order between two degrees, \( \text{less} \) denotes its inverse, and \( \text{as} \) denotes a partial ordering between degrees. Building on the analysis of the absolute degree morpheme in section 2.3, this claim can be implemented by adopting the interpretations of the comparative morphemes in (119)-(121) and the truth conditions in (122)-(124).

\[
\text{more/er} = \lambda G \lambda d \lambda x \left[ \text{more} \left( G(x) \right)(d) \right]
\]

\[
\text{less} = \lambda G \lambda d \lambda x \left[ \text{less} \left( G(x) \right)(d) \right]
\]

\[
\text{as} = \lambda G \lambda d \lambda x \left[ \text{as} \left( G(x) \right)(d) \right]
\]

This analysis directly implements the proposals from section 2.1: comparative morphemes denote relations between a reference value, derived by applying the gradable adjective that heads the degree construction to the target of predication, and a standard value.

This returns us to the second and more difficult question: how is the standard value derived in each of the subclasses of predicative comparatives? For subdeletion structures, the answer is straightforward: the comparative clause denotes a description of a degree (see Heim 1985, Izvorski 1995). The basic analysis runs as follows. If the complement of \( \text{than} \) in an example like (108) is a clausal constituent headed by a gradable adjective, then it must contain a degree variable–the standard variable introduced by the absolute morpheme. This variable can be abstracted over to derive an expression denoting a set of degrees, as shown in (125).

\[
\lambda d \left[ \text{abs} \left( \text{long} \left( \text{the Sojurner rover} \right) \right)(d) \right]
\]

The logical representation in (125) can be transparently derived from the syntactic representation of (101) if we assume, following e.g. Izvorski 1995 that the comparative clause in a subdeletion structure is a \( \text{wh} \)-construction, in which a null operator moves from a position in \( \text{DegP} \) to \( \text{SpecCP} \) (see also Chomsky 1977; but see Grimshaw 1987, and Corver 1991, 1993 for arguments that subdeletion does not involve \( \text{wh} \)-movement). On this view, the Logical Form of (108) is (126).
Although I will argue in section 2.4.2 that comparative deletion constructions do involve actual wh-movement in the syntax, I will remain agnostic as to whether the operator-variable relation in (126) is the result of actual movement, or whether it is derived in some other way. What is important is that the semantics provides some means of abstracting over the degree variable introduced by the absolute morpheme in (126), in order to derive the logical representation in (125). 25

The expression in (125) denotes the set of degrees \( d \) such that the Sojourn rover is at least as long as \( d \). Assuming the interpretation of the absolute morpheme adopted in the preceding section, the expression in (125) denotes the set of degrees on a scale ranging from the degree corresponding to the length of the Sojourn rover to the lower end of the scale. In order to derive a definite description of a degree, I will follow von Stechow 1984a in assuming that the expression in (125) is the argument of a covert maximality operator, which has the interpretation in (127) (where \( D \) is a (totally ordered) set of degrees; see also Rullmann 1995, and see the discussion of this point in chapter 1, section 1.3.2).

\[
\text{max}(D) = \begin{cases}
\forall d' \in D : d \geq d' \\
\end{cases}
\]

Note that the assumption that the comparative clause denotes a maximal degree is necessary even if we reject the semantic analysis of the absolute morpheme in terms of a partial ordering relation, adopting an interpretation in terms of equality instead. Von Stechow 1984a observes that if the comparative clause denotes a simple definite description, then in an example like (128), it should fail to denote, since there is no unique degree \( d \) such that Sasha can jump \( d \)-far.

\[
Ede \text{ can jump farther than Sasha can.}
\]

To account for facts like (128), von Stechow defines the maximality operator in (127), which provides the correct interpretation of the comparative clause: the maximal degree \( d \) such that Sasha can jump \( d \)-far. 26

26 It should also be noted that von Stechow's analysis of the interpretation of the comparative clause supports an explanation of a number of its important semantic properties, such as the licensing of negative polarity items and anti-additivity. See von Stechow 1984a:70 and Klein 1991:687-8 for discussion.
incommensurability outlined in section 2.1.3. Consider, for example, an anomalous sentence like (132).

\[(132) \#\text{The space telescope is more expensive than its optics are accurate.}\]

The interpretation of (132) is (133), which is true just in case the degree to which the space telescope is expensive stands in the \(\succ\) relation to the maximal degree to which its optics are accurate:

\[(133) \text{more} (\text{expensive} (\text{the space telescope})) (\max \lambda d [\text{accurate} (\text{the space telescope's optics})] (d))\]

The problem is that the reference value and the standard value are degrees on different scales: \textit{expensive} and \textit{accurate} project their arguments onto scales with different dimensional parameters, therefore their ranges are disjoint. Since the related degrees in (133) are not objects on the same scale (i.e., are not elements of the same ordered set), the relation introduced by the comparative morpheme is undefined, and the sentence is anomalous.

2.4.1.3 Comparatives and Ellipsis

The preceding discussion indicates that the comparative clause in subdeletion structures can be transparently interpreted as a description of a degree; what remains to be determined is whether the same can be said of comparative deletion constructions and phrasal comparatives. The core question that must be answered is the following: are comparative deletion constructions and phrasal comparatives structurally identical to subdeletion structures at a level of Logical Form, or are the former structurally distinct from the latter? In other words, do the derivations of the two classes of “reduced” comparatives involve some kind of ellipsis resolution, so that the compositional interpretations of the Logical Forms of deletion and ellipsis constructions are a form of logical form, or are the former structurally distinct from the latter?

In sections 2.4.2 and 2.4.3, I will argue that the latter is in fact the case. Comparative subdeletion structures, for example, receive a “direct” interpretation, whereby the standard value is derived by applying the interpretation of the corresponding degree expression (cf. Heim 1985).

A result of these claims is that it will be necessary to post three distinct interpretations of the comparative morpheme. The primary claims can be summarized as follows. First, “canonical” comparative deletion constructions—examples in which only a \textit{DegP} is apparently elided from the surface form—do not involve any kind of ellipsis; instead, the “missing” degree phrase is actually the trace of a null operator, which is categorically a \textit{DegP} (cf. Klein 1980, Larson 1988). This syntactic difference has a corresponding effect on the interpretation of the comparative clause: the comparative clause in a comparative deletion construction does not denote a description of a comparative construction, but rather a function from gradable adjective meanings to degrees. Second, phrasal comparatives in which the surface complement of \textit{than} or \textit{as} is a DP do not have true comparative “clauses” at all stages of the derivation (see Hankamer 1973). These constructions receive a “direct” interpretation, whereby the standard value is derived by applying the interpretation of the gradable adjective that heads the comparative to the standard expression (cf. Heim 1985).

The preceding discussion indicates that the comparative clause in subdeletion structures can be transparently interpreted as a description of a degree; what remains to be determined is whether the same can be said of comparative deletion constructions and phrasal comparatives. The core question that must be answered is the following: are comparative deletion constructions and phrasal comparatives structurally identical to subdeletion structures at a level of Logical Form, or are the former structurally distinct from the latter?

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In sections 2.4.2 and 2.4.3, I will argue that the latter is in fact the case. Comparative subdeletion structures, for example, receive a “direct” interpretation, whereby the standard value is derived by applying the interpretation of the corresponding degree expression (cf. Heim 1985).
The three interpretations are specified for the morpheme 
more in (134)a-c, where 
Q in (134)b is a function from gradable adjectives to degrees, and 
y in (134)c is an individual; exactly the same pattern holds for 
less and as.

(134) a. more1 = \( \lambda G \lambda d \lambda x [\text{more}(G(x))(d)] \) (subdeletion)
b. more2 = \( \lambda G \lambda Q \lambda x [\text{more}(G(x))(Q(G))] \) (comparative deletion)
c. more3 = \( \lambda G \lambda y \lambda x [\text{more}(G(x))(G(y))] \) (phrasal comparatives)

Although the assumption that the comparative morphemes are ambiguous seems undesirable, it should be noted that the ambiguity does not reflect a truth-conditional difference between the three comparative constructions, only a compositional one. The truth conditions for each of the three subclasses of comparative constructions are specified above in (122)-(124): they denote relations between a reference value and a standard value; what differs in the three constructions is the way in which the degree that represents the standard value is determined. More importantly, a comparison of comparative deletion and phrasal comparatives with true ellipsis structures provides empirical support for the analysis of comparative morphology outlined in (134). As I will show in the following sections, comparative deletion and phrasal comparatives differ from true ellipsis constructions in an important way: the interpretation of the “missing” material in the comparative clause is much more restricted than it should be if comparative deletion and phrasal comparatives involve ellipsis, but, it is enforced by the semantic analysis of comparative morphology in (134).

2.4.2  Comparative Deletion

2.4.2.1  Identity and Comparative Deletion

Two syntactic properties in particular characterize comparative deletion structures. First, as noted above, the comparative clause appears to have undergone some kind of ellipsis operation, which targets a constituent at least as large as DegP. Second, as observed by Chomsky (1977), the comparative clause displays characteristics typically associated with wh-constructions (see also Bresnan 1975, Grimshaw 1987, and Izvorski 1995). These properties are closely intertwined, because certain wh-questions target the feet because of the presence of a wh-extraction island.

Descriptively, whenever the “missing” material in the comparative clause is contained in an extraction island, the sentence is ungrammatical (see Pinkham 1982 and Kennedy and Merchant 1997 for additional relevant discussion). (135)-(142) provide an overview of some of the crucial facts:

**Wh-islands**

(135) Mercury is closer to the sun than I thought it was.
(136) *Mercury is closer to the sun than I wondered whether it was.
(137) *Mercury is closer to the sun than I knew who said it was.

**Complex NPs**

(138) Hale-Bopp was brighter than Carl claimed it would be.
(139) *Hale-Bopp was brighter than Carl's claim that it would be.
(140) *Hale-Bopp was brighter than a paper that said it would be.

**Adjunct islands**

(141) The solar flares were more energetic than the aurora borealis was.
(142) *The solar flares were more energetic than we were amazed when the aurora borealis was.

Alas, the assumption that the comparative morphology are ambiguous seems
Chomsky concludes from facts like these that the syntactic derivation of the comparative clause involves movement of a phonologically null operator (henceforth the "comparative operator") from some position within the comparative clause. This proposal receives additional support from some dialects of English, which permit an overt wh-word in the comparative clause, as shown by (143)-(144).

(143) The flooding was less than what we had thought it would be. [NPR, 1.29.97]
(144) Jupiter is larger than what Saturn is.

On the surface, the syntactic status of the comparative clause as a wh-construction appears to fit in naturally with the hypothesis that the interpretation of comparative deletion is completely parallel to that of comparative subdeletion, and that the comparative clause is a type of description. This approach assumes that the comparative operator binds a degree variable in the comparative clause, generating an expression which denotes a set of degrees (see e.g. von Stechow 1984a, Moltmann 1992b, Izvorski 1995). In an example like (145), the comparative operator binds a degree variable in the comparative clause, and the whole constituent is interpreted as the lambda expression in (146), which denotes the set of degrees \( d \) such that Neptune is at least as great as \( d \).

(145) Jupiter is more massive than Neptune is.
(146) \( \lambda d [\text{massive}(\text{Neptune})(d)] \)

This analysis raises an important and extremely problematic question for the syntactic assumptions that I adopted in section 2.2. If comparative deletion is like other elliptical phenomena in English, then the recovery of elided material at LF should be subject to certain constraints on identity. In particular, the elided material must have a logical representation that is identical to some other constituent in the discourse (Sag 1976, Williams 1977, May 1985, Kitagawa 1991, Fiengo & May 1994, Chung, Ladusaw, and McCloskey 1995; for simplicity, I will assume that ellipsis is licensed by identity of Logical Form). This assumption is crucial to the analysis of comparative deletion in section 2.4.1.2. The problem for this approach is that the syntactic assumptions adopted in section 2.2 would actually force us to assume that the recovered material in an example like (147), as well as other instances of comparative deletion, must not be identical to its antecedent. In the case of a comparative deletion structure like (147), the recovered material in the comparative clause is a Degree Phrase headed by the absolute morpheme, which denotes the set of degrees that are at least as great as the degree denoted by the antecedent.

(147) Jupiter is [DegP more massive than [CP Op x Neptune is [DegP e x \( \partial \) massive]]]

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missing DegP (DegP2) is contained within the DegP that supplies its interpretation (DegP1).

Assuming that ACD is resolved by adjoining the constituent that contains the deleted expression to a clausal node outside the antecedent (see May 1985, Larson and May 1987, Fiengo and May 1994, and Kennedy 1997a), the comparative clause in (148) must raise to IP, generating the structure in (149).

IP [CP Op Neptune is [DegP2 more massive than e]] [IP Jupiter is [DegP1 more massive than e]]

Even if we allow for the possibility that the PP headed by than can be ignored and a degree variable reconstructed in its place (cf. Chung, Ladusaw, and McCloskey 1995), the core problem is that the DegP that supplies the antecedent for the elided phrase (DegP1) is headed by the comparative morpheme more. In order to construct a LF that maps onto the correct interpretation of the comparative clause, however, the recovered material must be headed by the null absolute morpheme. To see why, consider what the interpretation of the comparative clause would be if the recovered DegP were headed by the comparative morpheme, as in (150).

IP [CP Op Neptune is [DegP2 more massive]] [IP Jupiter is [DegP1 more massive than e]]

This assumption is compatible with both an analysis of the comparative clause as a definite description and an analysis of the comparative clause as a universal quantification structure, as both types of expressions support ACD:

(i) Julio wanted to visit the planet Maureen did.
(ii) Julio wanted to visit every planet Maureen did.

If (150) were the actual LF of (145), then the comparative clause would have the interpretation in (151): it would denote the maximal degree d such that Neptune is more massive than d.

max (lambdax [more (massive (Neptune) x))] d)

This analysis cannot be correct, however, as it gives the wrong truth conditions for the comparative. If (151) were the interpretation of the comparative clause, then in a context in which Jupiter and Neptune were equal in mass, the interpretation of (145), stated in (152), would satisfy the truth conditions for the comparative, because in (152), which Jupiter and Neptune were equal in mass, the interpretation of the comparative clause denoted a degree that exceeded the maximal degree such that Neptune is more massive than d. This is clearly the wrong result.

If Jupiter and Neptune were equally massive, then the degree to which Jupiter is massive would exceed the maximal degree d such that Neptune is more massive than d. This is clearly the wrong result. A more general problem, if scales are dense linearly ordered sets of points, as I have assumed, is that the comparative clause in (152) would fail to denote, since there would be no maximal degree d such that Neptune is more massive than d.

One solution to this problem would be to assume that the identity constraints involved in licensing ellipsis do not distinguish between different degree morphemes. On this view, more and the null absolute morpheme would count as identical. There is clear evidence against this hypothesis, however. If it were the case that more and the null absolute morpheme counted as identical, then an example like (154) should permit an interpretation along the lines of (155).

The space telescope was more useful this year, and the gamma ray satellite was too. The space telescope was more useful this year, and the gamma ray satellite was too.

Even if we allow for the possibility that the PP headed by than can be ignored and a degree variable reconstructed in its place, (148) would have the interpretation in (151): it would denote the maximal degree d such that Neptune is more massive than d.

max (lambdax [more (massive (Neptune) x))] d)

Assuming that ACD is resolved by adjoining the constituent that contains the deleted expression to a clausal node outside the antecedent (see May 1994, Larson and May 1995), the comparative clause in (145) would have the interpretation in (151): it would denote the maximal degree d such that Neptune is more massive than d.

max (lambdax [more (massive (Neptune) x))] d)
Such an interpretation is completely impossible, however; (154) can only have the interpretation in (156), in which the comparative morpheme is retained under ellipsis.

(156) The space telescope was more useful this year, and the gamma ray satellite was more useful, too.

The problem of identity in comparative deletion is made even more complex by examples like (157), which has the interpretation paraphrased in (158), in which the antecedent for the missing material is the VP headed by want.

(157) Smith wants the novel to be 100 pages longer than her editors do.

(158) Smith wants the novel to be 100 pages longer than her editors want it to be (long).

In order to ensure that the comparative clause maps onto the interpretation paraphrased in (158), (157) must have the Logical Form shown in (159).

(159) \[IP \[Cp Op x \[VP want it to be \[DegP e \[\partial long\]]\] \[IP Smith \[VP wants the novel to be \[DegP 100 pages longer than e \]]\]]

The reconstructed material in (159) is clearly not identical to its antecedent, however: not only is the degree morpheme distinct from the degree morpheme in the antecedent, but the measure phrase 100 pages must be left out of the reconstruction. Again, VP ellipsis facts show that measure phrases cannot be left out in general. (160) has only the interpretation in (161); the reading in (162) is impossible.

(160) Smith's novel will be 300 pages long, and Jones' will be, too.

(161) Smith's novel will be 300 pages long, and Jones' will be 300 pages long, too.

(162) Smith's novel will be 300 pages long, and Jones' will be long, too.

This discussion leads to three possible conclusions: my earlier assumptions about the syntax of degree constructions are incorrect, the constraints on identity in comparative constructions are looser than those for other ellipsis constructions, such as VP ellipsis, or the assumption that the missing DegP in comparative deletion is recovered through ellipsis resolution is incorrect. The discussion so far has shown that the syntax of extended projection supports a straightforward compositional semantics for degree constructions in terms of the semantic analysis of gradable adjectives and degree morphology motivated in section 2.1; as a result, we should be hesitant to reject this syntactic analysis too quickly.

Similarly, we should be hesitant to stipulate a relaxation on the constraints typically associated with true ellipsis. This leaves us with the third conclusion, that the analysis of comparative deletion constructions as ellipsis structures is incorrect. In fact, the assumption that the missing material in comparative deletion constructions is recovered through ellipsis is incorrect. In each example of comparative deletion construction the comparative material is recovered through ellipsis from the antecedent material. This leaves us with the third possibility, that there is a separate semantic relation between the degree material and the antecedent that is not recoverable through ellipsis.

Section 2.4.2.2 provides a number of independent and compelling syntactic arguments in favor of the extended projection analysis.

The problem of identity in comparative deletion is made even more complex by the assumption that the missing material in comparative deletion constructions is recovered through ellipsis from the antecedent material. The assumption that the missing material in comparative deletion is recovered through ellipsis is incorrect. In each example of comparative deletion construction in which the interpretation is recovered through ellipsis, the antecedent is the VP headed by want.

The space telescope was more useful this year, and the gamma ray satellite was more useful in (163). In which the interpretation is recovered through ellipsis, the antecedent is the VP headed by want.

Smith's novel will be 300 pages long, and Jones' will be 300 pages long, too.

100 pages longer than e
Marcus read every book I bought, and I read every book Charles did.

Consider now (166) and (167), which are structurally parallel in the following respect: both conjuncts in the two examples are “missing” some constituent.

(166) Marcus read every book I did, and I bought every book Charles did.
(167) The table is wider than this rug is, but this rug is longer than the desk is.

The difference is that the two conjuncts in (166) have undergone VP ellipsis, while the two conjuncts in (167) are comparative deletion constructions. If comparative deletion involves ellipsis, its two conjuncts are “missing” some constituent.

The two examples are completed by examples like (174), which is identical to (167) except that the VP in the second conjunct has undergone VP ellipsis, and the comparative deletion structure in the first conjunct contains the Prepositional phrase “from the VP headed by buy.”

The table is wider than this rug is, but this rug is longer than the desk is.

This is not surprising: since there is no prior discourse, the local VP and DegP are the only available antecedents.

What is surprising, if comparative deletion involves ellipsis, is that the parallelism between (166) and (167) breaks down when we consider the interpretation of the “missing” material in the second conjuncts. The second conjunct of (166) is ambiguous: the elided VP can either locate its antecedent locally, from the VP headed by buy, resulting in the interpretation paraphrased in (170), or it can find its antecedent in the preceding clause from the VP headed by read, resulting in the interpretation paraphrased in (171).

(170)... I bought every book Charles bought.
(171)... I bought every book Charles read.

In contrast, the second conjunct of (167) is not ambiguous: the sentence has only the reading paraphrased in (172), in which the missing DegP receives its interpretation locally, from the DegP headed by long.

(172)... this rug is longer than the desk is long.

What these facts indicate is that the interpretation of the “missing” DegP in a comparative deletion structure, unlike the interpretation of the “missing” VP in VP ellipsis constructions, exhibits a “local dependency” on the “missing” DegP: the interpretation of the missing DegP in the comparative clause is determined by the interpretation of the comparative DegP.

Where these facts intersect is that the interpretation of the “missing” DegP in a comparative deletion structure, unlike the interpretation of the “missing” VP in VP ellipsis constructions, exhibits a “local dependency” on the “missing” DegP: the interpretation of the missing DegP in the comparative clause is determined by the interpretation of the DegP headed by the comparative.

More precisely, the adjective meaning that is used to compute the standard value must be the same as the meaning of the adjective that heads the comparative DegP.

This is quite surprising: since the VP marked by the comparative DegP is the only available antecedent, the local VP and DegP are the only available antecedents.

It should be observed that nominal comparative deletion constructions show similar locality effects:

(i) has only the interpretation in (ii); the reading in (iii) is unavailable.

(i) Kim bought many peaches, but Sandy bought more apples than Kim did.
(ii)...Sandy bought more apples than Kim bought apples.
(iii)*...Sandy bought more apples than Kim bought peaches.
that the comparative in the first conjunct is a subdeletion structure.

Unlike (167), (174) does allow a non-local interpretation of the missing DegP in the second conjunct. That is, the second conjunct of (174) is ambiguous between the reading paraphrased in (175) and the one paraphrased in (176).

(175)... this rug is longer than the desk is long.

(176) ... this rug is longer than the desk is wide.

This interpretive difference between (167) and (174) is extremely puzzling for the following reason. If the interpretation of comparative deletion involves reconstruction of elided material, so that comparative deletion and comparative subdeletion are structurally identical at LF, then the first conjuncts in (167) and (174) should be completely parallel in the relevant respects at LF. But if this is true, why doesn't the second conjunct in (167) display the same ambiguity as the second conjunct in (174)?

2.4.2.3 The Derivation and Interpretation of Comparative Deletion Constructions

The answer to this question, as well as the solution to the problem of identity in comparative ellipsis and justification for assuming that the comparative morpheme can have the interpretation given above in (134)b, is the following: comparative "deletion" does not involve ellipsis at all, and comparative deletion constructions are not structurally parallel to subdeletion structures at LF. Instead, the appearance of ellipsis is due to the fact that the syntactic category of the comparative operator is DegP (see Klein 1980, Larson 1985, and Lerner and Pinkal 1995 for similar analyses, in which the comparative operator is categorically an AP). That is, I claim that the comparative operator does not bind a degree variable inside DegP, as standardly assumed, rather the syntactic variable bound by the comparative operator in the comparative clause is itself a DegP. If this is correct, the Logical Form of (177) is (178), which is identical to its surface representation.

(177) Jupiter is more massive than Neptune is.

(178) Jupiter is more massive than [CP Op \[DegP e] x Neptune] x [DegP e]

An immediate consequence of this analysis is that the problem of identity in comparative ellipsis disappears. Since no ellipsis is involved in the derivation of (178), there is no need to assume a relaxation of the identity constraints on ellipsis to account for the fact that the comparative morpheme must not be part of the reconstruction (see the discussion of this point in section 2.4.2.1. The problems presented by more complex examples such as (157) (repeated below) are also eliminated.

(157) I want my dissertation to be 100 pages longer than my advisor does.

(157) is problematic for an ellipsis analysis of comparative deletion because it appears to involve two instances of non-identity: in order to generate an appropriate LF for this example, neither the measure phrase nor the comparative morpheme can be included in the reconstructed material. Given this assumption that the comparative operator is categorically a DegP, however, these problems disappear. The elided VP in the comparative clause is reconstructed under identity with the DP headed by want, but instead of copying the matrix DegP, a variable is introduced in its place, as shown in (179).

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For simplicity, I assume that the option of replacing DegP1 in (179) with a variable is an instance of vehicle change, a relation that establishes identity between a variable and another constituent in a Logical Form (Fiengo and May 1994; see Moltmann 1992a for a slightly different use of vehicle change in the derivation of the comparative clause). Alternatively, one could assume that DegP1 raises to adjoin to the matrix IP (as discussed in section 2.4.2.1). On this view, the LF of (179) is (i), in which case reconstruction of the VP headed by want directly introduces a DegP variable.

(i) [IP [DegP 100 pages longer than [CP Op \[VVVVPPPP wwwwaaaannnntttt tttttt bbbbeeee \[DDDDeeeeggggPPPP eeee]] x my advisors do]]

The interpretation of (177) is the following: comparative "deletion" does not involve ellipsis at all, and comparative deletion constructions are not structurally parallel to subdeletion structures at LF. Instead, the appearance of ellipsis is due to the fact that the syntactic category of the comparative operator is DegP (see Klein 1980, Larson 1985, and Lerner and Pinkal 1995 for similar analyses, in which the comparative operator is categorically an AP). That is, I claim that the comparative operator does not bind a degree variable inside DegP, as standardly assumed, rather the syntactic variable bound by the comparative operator in the comparative clause is itself a DegP. If this is correct, the Logical Form of (177) is (178), which is identical to its surface representation.

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(i) [IP [DegP 100 pages longer than [CP Op \[VVVVPPPP wwwwaaaannnntttt tttttt bbbbeeee \[DDDDeeeeggggPPPP eeee]] x my advisors do]]
I want my dissertation to be 100 pages longer than my advisors do. As the discussion of (157) should make clear, I am not claiming that the derivation of comparative deletion constructions never involves ellipsis ((157), for example, clearly involves VP ellipsis, since the missing constituent is interpreted as a verb phrase headed by want), only that the interpretation of the "missing" DegP in the comparative clause is not constructed on the basis of ellipsis resolution. This raises two questions. First, how is the interpretation of the "missing" DegP derived? In other words, how do we get from structures like (178) and (179), in which the comparative operator binds a DegP rather than a degree variable, to expressions that introduce a standard value? Second, how does the proposal that the comparative operator is categorically a DegP explain the facts discussed in the previous section? The answer to the second question follows directly from the answer to the first, which requires taking a closer look at the meaning of the comparative operator.

If the comparative operator is categorically a DegP, then its interpretation should be stated in terms of the basic meaning of a Degree Phrase, i.e., its interpretation should be of the same sort as other degree constructions, modulo its status as a syntactic operator. Moreover, in order to derive the correct truth conditions for comparatives, it should be the case that we end up with an interpretation of the comparative clause as a maximal degree. To make the discussion concrete, consider the LF of (177) in (178), which is repeated below.

(178) Jupiter is more massive than Neptune is e

Assuming the comparative operator occupies SpecCP (see Chomsky 1977), it must compose with C-bar. C-bar contains a DegP variable, therefore I will assume that its interpretation is derived by abstracting over DegP, as in (180) (ignoring the contribution of tense morphology and the verb be).

(180) λD[D(Neptune)]

Assuming the interpretation of C-bar to be a function of the sort in (180), the interpretation of the comparative operator can be formalized as in (181): it denotes a function from a C-bar/DegP meaning to a function from gradable adjectives to degrees (cf. Lerner and Pinkal 1995).

(181) [DegP Op]= λP[λG[max(λd[P[λx[abs[G(x)](d)]]])])]

The proposal can be illustrated by considering the derivation of the interpretation of the comparative clause in (178). The comparative operator takes C-bar as argument, as shown in (182), and the complex expression is transformed into (183) through lambda conversion.

(182) λP[λG[max(λd[λD[D(Neptune)][λx[abs[G(x)](d)]]])])]

→ λG[max(λd[λx[abs[G(Neptune)](d)]]])

→ λG[max(λx[abs[G(Neptune)](d)]])

(183) λG[max(abs[G(Neptune)](d)]]

Two aspects of the semantics for the comparative operator in (181) and the corresponding interpretation of the comparative clause in (183) are crucial. First, the core meaning of the comparative operator is that of a DegP headed by an absolute morpheme (i.e., it introduces a partial ordering on degrees). In this way, the analysis satisfies the first requirement mentioned above, and moreover reflects the fact that the meaning of the comparative clause in comparative deletion is the same as that of a DegP headed by an absolute morpheme. Second, the comparative operator is categorically a DegP (see Chomsky's 1977a, 1979) and makes more sense.
The crucial characteristic of (134)b is that the comparative morpheme supplies the meaning of the gradable adjective that heads the comparative construction as the argument to the comparative clause. This has two consequences: it provides the type of constituent needed to ensure that the standard constituent denotes a degree, and it establishes the "local dependency" observed in the previous section between the adjective that heads the comparative and the "missing" adjective meaning in the comparative clause. I will focus on the latter point in the next section; to see how this analysis derives the correct interpretation of comparative deletion constructions, let us take a closer look at the compositional analysis of (178).

According to the syntactic analysis adopted in section 2.2.1, the structural description of (178) is (184).

Assuming the interpretation of er/more in (134)b, composition proceeds as follows. Deg0 combines with AP, generating the expression in (185) as the denotation of the lower Deg'.

The comparative clause needs a gradable adjective as argument; this argument is supplied by the comparative morpheme. Lambda conversion in the standard constituent derives the property shown in (187) as the interpretation of the comparative degree construction in (178): the property of being more massive than the maximal degree such that Neptune is at least as massive as it.

3.4.4 Local Dependencies in Comparative Deletion Revisited

The final piece of the puzzle is to show how the analysis outlined in the previous section provides an explanation for the facts discussed in section 2.4.2.2. The crucial facts are exemplified by the contrast between (189) and (190).

(189) The table is wider than this rug is, but this rug is longer than the desk is.
(190) The table is longer than this rug is wide, and this rug is longer than the desk is.

Recall from the earlier discussion that the second conjunct in (189) is unambiguous, having only the interpretation paraphrased in (191), but the second conjunct in (190) is ambiguous between the reading in (191) and the one in (192).

(191) this rug is longer than the desk is long.
(192) this rug is longer than the desk is wide.

The puzzle presented by these facts for an ellipsis analysis of comparative deletion stems from the assumption that the logical form of the first conjunct in (189) is structurally parallel to the subdeletion structure in the first conjunct of (190). If this were true, and if the subject placed in the subdeletion structure in the first conjunct of (190) is identical to the subject placed in the subdeletion structure in the second conjunct of (190), then the first conjunct in (189) has the same range of possible interpretations as the second conjunct in (190) has. A derivation of a derivation under extraction of a Degree P from a subdeletion structure in the first conjunct of (190) is identical to the structure of the subject placed in the subdeletion structure in the first conjunct of (190) is ambiguous.

The crucial structural difference between (189) and (190) is that the former does not contain an occurrence of the adjective wide. It follows that only if the subject in (189) and (190) is the same. The crucial structural difference between (189) and (190) is that the latter is longer than the desk is.

Recall that examples of VP ellipsis structurally parallel to (189) are ambiguous (see e.g. (163) in section 2.4.2.1). The crucial piece of the puzzle is to show how the analysis outlined in the previous section provides a solution to this puzzle by denying the assumption that the first conjuncts in (189) and (190) are structurally parallel. According to this analysis, the logical form of the first conjunct in (189) is the same as the logical form of the second conjunct in (190).

The crucial structural difference between (189) and (190) is that the latter is longer than the desk is.

The crucial piece of the puzzle is to show how the analysis outlined in the previous section provides a solution to this puzzle by denying the assumption that the first conjuncts in (189) and (190) are structurally parallel. According to this analysis, the logical form of the first conjunct in (189) is the same as the logical form of the second conjunct in (190). The crucial piece of the puzzle is to show how the analysis outlined in the previous section provides a solution to this puzzle by denying the assumption that the first conjuncts in (189) and (190) are structurally parallel. According to this analysis, the logical form of the first conjunct in (189) is the same as the logical form of the second conjunct in (190).
According to the semantic analysis outlined in the previous section, the comparative clause in (195) has only one possible interpretation: one in which the adjective that heads the comparative construction (long, in (195)) is supplied as argument to the comparative clause, deriving the expression in (196).

(196) \[ \text{max}(\lambda d [\text{abs}(\text{long}(\text{the desk}))(d)])] \]

(196) denotes the maximal degree \(d\) such that the desk is at least as long as \(d\); thus even if the LF in (195) is derived by establishing an ellipsis relation with the DegP in the first conjunct, the only possible interpretation of this structure is the one paraphrased (191).

The crucial difference between (189) and (190)–and the reason for the ambiguity of the latter–concerns the structure of the first conjunct. Unlike the first conjunct in (189), the first conjunct in (190) is an actual subdeletion structure; as a result, the surface string in the second conjunct is compatible with two derivations: one in which the comparative clause is itself a subdeletion structure that has undergone ellipsis under identity with the first conjunct, and one in which the comparative clause is a comparative deletion construction, in which a DegP operator has moved from its base position to SpecCP. In the former case, the LF of the second conjunct of (190) is (197), in which a DegP has been reconstructed under identity with the DegP in the first conjunct; in the latter case, the LF of the second conjunct is (198), in which the comparative operator binds a DegP variable.

(197)...this rug is longer than \[ CP \text{ Op} x \text{the desk is } [\text{DegP} e \partial \text{wide}] \]

(198)...this rug is longer than \[ CP \text{ Op} x \text{this desk is } [\text{DegP} e] \]

The structure in (197) maps onto the interpretation in (192), while the structure in (198) has the interpretation in (191); as a result, the second conjunct in (190) is predicted to be ambiguous.

2.4.2.5 Summary

The basic claim of the analysis of comparative deletion that I have presented here is that the “missing” DegP in comparative deletion is not the target of an ellipsis operation, but rather a trace bound by the comparative operator, which is itself categorically a DegP. The interpretation of the comparative operator is such that after it composes with C-bar, the comparative clause denotes a function from gradable adjectives to a (maximal) degree. Assuming that the comparative morpheme er/more can have the interpretation in (134)b, the “missing” gradable adjective meaning in the comparative clause is supplied when the clause composes with Deg’ (similarly for less and as). Despite this compositional difference between comparative deletion and comparative subdeletion, the propositions derived in both types of constructions are expressions that fit within the general paradigm for degree constructions proposed in section 2.1.2. Specifically, they have the form in (199): they denote relations between two degrees, a reference value and a standard value.

(199) \[ \text{deg}(d_R)(d_S) \]

2.4.3 Phrasal Comparatives

2.4.3.1 Are Phrasal Comparatives Derived from Clausal Sources?

Phrasal comparatives are exemplified by (200)-(202).

(200) Mars is less distant than Saturn.
(201) The asteroid belt is more distant than Mars.
(202) Neptune is as bright as Uranus.

The first question that must be answered in developing an analysis of phrasal comparatives is whether they are derived from a clausal source, i.e., whether examples like (200)-(202) are structurally parallel to either subdeletion or comparative deletion at the level of phrasal comparatives.

The second question that must be answered in developing an analysis of phrasal comparatives is whether they are derived from a clausal source, i.e., whether examples like (200)-(202) are parallel to either subdeletion or comparative deletion at the level of phrasal comparatives.
The assumption that phrasal comparatives are derived from a clausal source (see Smith 1961, Lees 1961, Bresnan 1973, Lerner and Pinkal 1995, Hazout 1995) has strong semantic motivation: if comparative morphemes define relations between degrees, as suggested in section 2.1.4, then it is necessary to construct interpretations of sentences like (200)-(202) in which the complement of than denotes a degree; in (202), for example, the degree to which Uranus is bright. If the complement of than in phrasal comparatives is derived from a clausal source, then the semantic analysis of phrasal comparatives can be subsumed under the semantic analysis of either subdeletion or comparative deletion. The problem is that there is syntactic evidence to indicate that at least some phrasal comparatives are not derived from clausal sources. Hankamer 1973 presents an important argument to this effect from extraction facts. Hankamer observes that in constructions like (200)-(202), in which the surface complement of than in a phrasal comparative is interpreted as the subject of a "missing" predicate, this constituent can undergo A-bar movement. This is illustrated by (203)-(204).

(203) You finally met somebody you're taller than.
(204) Which planet is Neptune as bright as?

When the complement of than contains clausal material, extraction is impossible, however:

(205) *You finally met somebody you're taller than is.
(206) You're taller than Jorge is.
(207) *Which planet is Neptune as bright as is?
(208) Neptune is as bright as Uranus is.

Hankamer notes that the unacceptability of (205) and (207) follows from the well-known fact that the comparative clause is an extraction island. The fact that extraction is possible in the phrasal comparatives (203) and (204) indicates that these constructions do not involve ellipsis: assuming that grammatical constraints–including the calculation of chain well-formedness by the contrast between (211) and (212)–are shown by the complements in (203) and (204), then the standard expression used to determine the standard value (the overt constituent used to determine the standard expression in which the standard expression is a nominal marked with some designated case morphology) is a clause, not a proposition. In contrast, some languages such as English contain a comparative construction in which the standard expression is a nominal marked with the prepositional form than, as in (211), and a comparative construction in which the standard expression is a clause, as in (212). In all of these languages, however, whenever the complement of than is clearly clausal–i.e., when it contains either a remnant of clausal material or a full clause–the comparative must use the prepositional form. It is not surprising, then, that only the case-marking comparatives permit extraction (see Hankamer 1973:184). This is illustrated for Hungarian by the contrast between (211) and (212).

János taller Péter'Janos is taller than Peter'
(209) János magasabb Péter-nél.'Janos is taller than Peter-'abl

In all of these languages, however, whenever the complement of than is clearly clausal–i.e., when it contains either a remnant of clausal material or a full clause–the comparative must use the prepositional form. It is not surprising, then, that only the case-marking comparatives permit extraction (see Hankamer 1973:184). This is illustrated for Hungarian by the contrast between (211) and (212).
The distribution of reflexives provides a second argument against an ellipsis analysis of phrasal comparatives. As noted by Hankamer (1973), a reflexive bound by the subject can introduce the standard expression only in phrasal comparatives, not in clausal comparatives:

(213) No star is brighter than itself.

(214) *No star is brighter than itself is.

The unacceptability of (214) is not surprising: the reflexive is the subject of an embedded finite clause, and so is bound in its minimal governing category, satisfying Condition A of the Binding Theory (see Chomsky 1981, 1986). If (213) is actually a reduced clause, then assuming that Condition A must be satisfied at LF (Chomsky 1993, etc.), (213) should also be ill-formed. If the constituent headed by than has the syntax of a prepositional phrase, however, as in (215), then the reflexive is bound in its minimal governing category, satisfying Condition A.

(215) [IP no star [i is [DegP brighter [PP than [DP itself i]i]]]]

The conclusion to be drawn from these facts is that at least some phrasal comparatives have syntactic representations in which the complement of than is a nominal, rather than a clausal constituent. This result raises the following question: if the complement of than is an individual-denoting expression (i.e., a DP), and if the semantics of comparative constructions is stated in terms of a relation between degrees, as I have claimed, how is the interpretation of a phrasal comparative derived? In other words, how do comparative constructions result in terms of a relation between degrees, as I have done here?
Two solutions to the problem of interpreting phrasal comparatives have been proposed in the literature. The first approach, developed in Gawron 1995, maintains the position that phrasal and clausal comparatives (subdeletion and comparative deletion) have basically the same interpretation—\textit{the complement of than denotes a description of a degree}. However, it claims that the interpretation of phrasal comparatives is derived through ellipsis resolution in the semantic component, rather than through a reconstruction operation in the syntax.

Gawron's analysis adopts the position that phrasal comparatives have the simple syntactic structure in (215), thus maintaining an account of the facts discussed in Hankamer 1973, but derives an interpretation of the complement of \textit{than} as a description of a degree by utilizing the Higher Order Unification analysis of ellipsis developed in Dalrymple, Shieber, and Pereira 1991. Within the context of the analysis of gradable adjectives as measure functions, Gawron's proposals can be summarized as follows. The basic interpretation of the standard expression in a simple phrasal comparative is an underspecified relation between an individual and a degree; specifically, the relation is underspecified for a gradable adjective meaning. For example, the logical representation of the complement of \textit{than} in (220), prior to ellipsis resolution, is (221), where $G$ is the missing adjective meaning.

\begin{equation}
\lambda x [\max (\lambda d [\abs (G(x))(d)]) (Mars)]
\end{equation}

The problem of finding the standard value boils down to the problem of finding an appropriate function from individuals to degrees, and inserting that function into the logical representation in (221) as the value of $G$. Without going into details, the basic claim of the Higher Order Unification approach is that this function is recovered by abstracting over a parallel element in the main clause. In the case of (220), the parallel element is the subject, and the function that is recovered is the meaning of the adjective \textit{distant}. This function can then be supplied as the value of $G$ in (222), deriving (222).

\begin{equation}
\max (\lambda d [\abs (\text{distant}(Mars))(d)])
\end{equation}

(222) denotes the maximal degree $d$ such that the degree to which Mars is distant is at least as great as $d$, which is correctly identifies the standard value for (220).

A strong point of Gawron's analysis is that it provides a means of constructing an appropriate interpretation for the comparative clause using a general ellipsis-resolution mechanism, which is independently required to handle other cases of ellipsis (see section 2.4.2.2, page 126). However, we saw in the case of comparative deletion in section 2.4.2.2, that the meaning of the adjective meaning in the subject of the comparative clause need not be recovered as part of the interpretation of the entire comparative. Instead, the semantic component may introduce a new variable for the complementary of the adjective meaning during the ellipsis resolution stage, and the meaning of the adjective is then determined by the value of that variable.

The problem of finding the standard value boils down to the problem of finding an appropriate function from individuals to degrees, and inserting that function into the logical representation of the standard expression in a simple phrasal comparative. This also turns out to be a problem for the analysis, however, as phrasal comparatives show exactly the same kind of local dependency between the “missing” adjective meaning in the standard expression and the adjective that heads the comparative DegP that we saw in the case of comparative deletion in section 2.4.2.2. Recall from that discussion that a general characteristic of elliptical constructions is that any constituent of the appropriate semantic type can be recovered as the meaning of an elided constituent. For example, (223) is ambiguous between a reading in which the second conjunct means \textit{I read every book Charles read}, and one in which it means \textit{I read every book Charles bought}. This ambiguity is resolved by abstracting over a parallel element in the main clause. In the case of (220), the parallel element is the subject, and the function that is recovered is the meaning of the adjective \textit{distant}. This function can then be supplied as the value of $G$ in (222), deriving (222).

\begin{equation}
\max (\lambda d [\abs (\text{distant}(Mars))(d)])
\end{equation}

The problem of finding the standard value boils down to the problem of finding an appropriate function from individuals to degrees, and inserting that function into the logical representation of the standard expression in a simple phrasal comparative.
interpretations of phrasal comparatives, then the second conjunct in an example like (224) should also be ambiguous.

(224) The table is wider than the rug, and the rug is longer than the desk. (224) is not ambiguous, however. This sentence has only an interpretation in which the length of the rug is asserted to exceed the length of the desk; it does not have a reading in which the length of the rug is asserted to exceed the width of the desk.

The conclusion to be drawn from this example is that just as we saw with comparative deletion, there is a local dependency between the interpretation of the standard value and the adjective that heads a phrasal comparative. In effect, the standard value must be derived by applying the meaning of the adjective that heads the comparative to the complement of than.

Without additional stipulations, however, an ellipsis account of the sort proposed by Gawron cannot derive this result. At the end of section 2.4.3.1, I noted that there is evidence that phrasal comparatives are potentially ambiguous between simple phrasal ellipsis and an interpretation in which the standard value is computed by a comparative deletion structure, which does not involve ellipsis. The fact that (225) is unambiguous suggests that it does not have an analysis as an ellipsis structure, which creates a puzzle. At the end of section 2.4.3.2, I argued that there is evidence that phrasal comparatives are potentially ambiguous between simple phrasal ellipsis and a direct interpretation, which does not involve ellipsis.

Before moving on to an alternative analysis, I should point out an interesting difference between phrasal and clausal comparatives: (225) is not ambiguous. The ambiguity of (226) was explained in the following way: the second conjunct is structurally ambiguous between an analysis as a subdeletion structure that has undergone VP ellipsis and an analysis as a comparative deletion structure, which does not involve ellipsis.

As was the case with nominal comparative deletion, similar facts are observed in phrasal nominal comparatives. (i) has only the interpretation paraphrased in (ii); it cannot be interpreted as in (iii) (cf. fn. 33).

(i) Kim bought many peaches, but Sandy bought more apples than Kim.
(ii) Kim bought many peaches, but Sandy bought more apples than Kim bought apples.
(iii) Kim bought many peaches, but Sandy bought more apples than Kim bought peaches.

The ambiguity of (226) was explained in the following way: the second conjunct is structurally ambiguous between an analysis as a subdeletion structure that has undergone VP ellipsis and an analysis as a comparative deletion structure, which does not involve ellipsis.

Before moving on to an alternative analysis, I should point out an interesting difference between phrasal and clausal comparatives: (225) is not ambiguous. The ambiguity of (226) was explained in the following way: the second conjunct is structurally ambiguous between an analysis as a subdeletion structure that has undergone VP ellipsis and an analysis as a comparative deletion structure, which does not involve ellipsis.

The second approach to the problem of phrasal comparatives, developed in Heim 1985, differs from Gawron's in making an explicit distinction between the interpretation of phrasal and clausal comparatives. In Heim's analysis, clausal comparatives–both subdeletion and comparative deletion–have the same analysis: the comparative clause denotes a description of a degree, which is used to compute the standard value. Phrasal comparatives, on the other hand, have a direct interpretation, in which the comparative morpheme takes three arguments: the subject, the complement of than, and a degree property. In Heim's analysis, which is developed in the context of a relational semantics of gradable adjectives, the interpretation of an example like (227) is (227), which is evaluated with respect to the truth conditions in (228), where a and b are individuals and f is a function from individuals to degrees.

(227) more ((the asteroid belt) Mars) (\lambda x [max (\lambda d.\text{distant}(x,d))])

(228) = 1 if f(a) > f(b)

A positive result of this analysis is that it derives the local dependency between the standard value and the adjective that heads the comparative construction. The same function from individuals to degrees is used in both the phrasal and clausal comparatives, which is in contrast to the analysis developed in section 2.4.3.2. In this analysis, the standard value is computed by applying the meaning of the adjective that heads the comparative to the complement of than, which does not involve ellipsis.

In Heim's analysis, which is developed in the context of a relational semantics of gradable adjectives, the interpretation of an example like (227) is (227), which is evaluated with respect to the truth conditions in (228), where a and b are individuals and f is a function from individuals to degrees.

The second approach to the problem of phrasal comparatives developed in Heim 1985...
individuals to degrees is applied to both of the individual arguments of the comparative morpheme—the adjective that heads the comparative construction—and as a result, no variation is possible.

This approach to the semantics of phrasal comparatives can be straightforwardly implemented in a system in which gradable adjectives denote measure functions by assuming that the comparative morphemes can have the interpretation given above in (134)c, repeated below (again, I focus on the analysis of *more* for perspicuity, but my remarks hold of *less* and *as well*).

\[(134)\text{c.} \quad \text{more/more} = \lambda x \lambda y \left[ \text{more} \left( \lambda x \lambda y \left[ \text{fast} \left( \lambda x \lambda y \left[ \text{fast} \left( \text{a tornado} \right) \right] \right) \right] \right) \right] \]

The important aspect of (134)c is that the syntactic constituent used to compute the standard value has the semantic type of an individual, and a degree is derived by applying the meaning of the gradable adjective that heads the comparative construction to this individual. This analysis is not only consistent with the syntactic facts of phrasal comparatives observed in this section, it also explains the dependence between the standard value and the adjective which heads the comparative construction. Phrasal comparatives are interpreted by directly applying the adjective meaning both to the subject and to the complement of *than*, explaining the failure of phrasal comparatives to show the kind of variability in interpretation associated with true ellipsis structures.

This analysis also provides an explanation of the interpretation of structures in which there is no appropriate source for ellipsis. For example, Napoli (1983), citing Williams (see also Heim 1985), points out that metaphorical sentences like (i) have no appropriate source: (i) is interpreted as (ii), but an ellipsis analysis would require it to have the source in (iii).

(i) Mary eats faster than a tornado.
(ii) Mary eats faster than a tornado
(iii) Mary eats faster than a tornado

Within the analysis proposed here, this problem disappears. The nominal *a tornado* directly provides the standard argument, generating an interpretation for the entire degree construction as in (iv) (which I assume to receive an adverbial interpretation by virtue of its syntactic status as an adjunct).
The comparative morpheme combines with the gradable adjective and applies the adjective to each of its remaining two arguments, which are provided by the nominal argument of than and the subject, respectively. The result of the composition in (231) is (232), which has the truth conditions in (233):

\[
\text{Pluto is more distant than Mars}
\]

is true just in case the degree to which Pluto is distant exceeds the degree to which Mars is distant.

An interesting consequence of the syntactic and semantic analyses of phrasal comparatives outlined here is that it explains why the semantic role of the extracted element in examples like (217) must be the same as that of the subject.

\[
\text{Who is Max more eager to meet Susan than?}
\]

Since extraction is licensed only if the complement of than is a DP, rather than a revised clause, the comparative is interpreted by applying the AP meaning to the trace of the wh-expression. In (217), the meaning of AP is (234) (where eager to meet Susan is a function from individuals to degrees), which is the same function that is applied to the subject and the complement of than. The comparative combines with the gradable adjective and applies the adjective to each of the subjects.

\[
\text{The comparative combines with the gradable adjective and applies the adjective to each of the subjects.}
\]

\[
\text{The comparative combines with the gradable adjective and applies the adjective to each of the subjects.}
\]
2.4.4 The Phrasal/Clausal Distinction and the Scope of the Standard

A number of researchers have observed semantic differences between phrasal and clausal comparatives (see, for example, McCawley 1967, Napoli 1983, Hoeksema 1983, von Stechow 1984a, as well as Heim 1985). These distinctions are exemplified by the interpretation of phrasal and clausal comparatives in intensional contexts. For example, Napoli (1983) observes that in a context in which the speaker and hearer know that earth is 4.5 billion years old, the galaxy is 6 billion years old, and that Jones believes the Earth to be 4.5 billion years old but has no idea of the age of the galaxy, (235) is felicitous but (236) is not.

(235) Jones thinks the earth is younger than the galaxy is.
(236) Jones thinks the earth is younger than the galaxy.

This type of example is clearly related to those originally discussed by Russell 1905 (see the discussion of scope ambiguities in chapter 1), which show that the comparative clause shows scope ambiguities parallel to definite descriptions in intensional contexts. For example, (237) is ambiguous between the reading paraphrased in (238), in which Jones is mistaken about Jupiter's size, and the one paraphrased in (239), in which he has a contradictory belief about the size of Jupiter.

(237) Jones thinks that Jupiter is larger than it is.
(238) The size that Jupiter actually is greater than the size Jones thinks it is.
(239) Jones holds the belief that Jupiter exceeds itself in size.

What is important to note is that if the comparative clause in comparative deletion constructions is analyzed as a type of definite description, as claimed in section 2.4.2, then the ambiguity of (237) is expected: like other definite descriptions in intensional contexts, the comparative clause in (237) can have both a de re and a de dicto interpretation (which correspond to the readings in (238) and (239) respectively). How exactly the readings are derived will depend on the theory of the scope of descriptions; all that is important to note here is that if the comparative clause is a description, then these facts follow (see Russell 1905, Hasegawa 1972, Postal 1974, Horn 1981, Hellan 1981, von Stechow 1984a, Hoeksema 1984, Heim 1985, and Kennedy 1995, 1996b for different approaches to this ambiguity).

An important fact, observed by McCawley (1967), Hellan (1981), Napoli (1983), and Heim (1985), is that phrasal comparatives do not show a similar ambiguity: (240) has only the interpretation in (239); the de re reading in (238) is unavailable.

(240) Jones thinks that Jupiter is larger than itself.

The analyses of phrasal comparatives and comparative deletion constructions developed in the previous sections provide a straightforward explanation of these facts. Although phrasal and clausal comparatives are fundamentally the same—denoting relations between a reference value and a standard value—they also differ in an important way: the standard value in a clausal comparative is a description of a degree, as noted above; the standard value in a phrasal comparative is not (this distinction is also made by Heim (1985)). If standard-denoting expression in a phrasal comparative is not a description of a degree, therefore whatever operations are responsible for the ambiguity of (237) simply don't apply. The facts observed by Napoli (1983) can presumably be explained in the same way.

(i) a. If Jupiter were smaller than it is, it might have a solid core.
   b. If Jupiter were smaller than itself, it might have a solid core.
(ii) a. Jones could have been less obnoxious than he was.
    b. Jones could have been less obnoxious than himself.

Although the facts discussed here might be construed as another argument against an ellipsis analysis of phrasal comparatives (see e.g. Napoli 1983), Heim (1985) points out that these facts do not necessarily provide such an argument, provided that the conditions which license ellipsis are formulated in such a way as to require identity of variables in the elided constituent and antecedent (see Sag 1976). In an example like (240), this will require the world variables in the two constituents to be the same, generating the contradictory interpretation.
2.4.5  Comparatives with Less

An important aspect of the analysis of degree constructions that I have developed in this chapter is that the interpretation of the comparative independent of the interpretation of the absolute. In this sense, the analysis differs from the relational approaches discussed in chapter 1, in which the interpretation of the comparative (qua degree description or generalized quantifier) was stated in terms of the semantics of the absolute form of the adjective (see also the discussion of this point in section 2.1.2). A result of this difference is that the analysis proposed here derives the correct truth conditions for comparatives with "less" without giving up an analysis of the absolute in terms of a partial ordering relation.

Recall from the discussion in chapter 1, section 1.4.2 that an analysis of "less" comparatives in terms of restricted existential quantification fails to accurately characterize the truth conditions of these constructions if the interpretation of the absolute form is stated in terms of a partial ordering relation. Assuming that expressions of the form \( \phi(a,d) \) are true just in case the degree to which \( a \) is \( \phi \) is at least as great as \( d \), the logical representation of a sentence like (241), shown in (242), is satisfied even if Mars Pathfinder was more expensive than the space telescope, since it would be true in such a situation that for some \( d \) ordered below the degree to which the space telescope was expensive, Mars Pathfinder is at least as expensive as \( d \).

(241) Mars Pathfinder was less expensive than the space telescope.
(242) \( \exists d \left[ d < \iota_{d'. \text{expensive} \left( \text{the space telescope} \right)} \right] \left[ \text{expensive} \left( \text{Mars Pathfinder}, d \right) \right] \)

In contrast, since the analysis of comparatives developed in the preceding sections is not stated in terms of the absolute construction, this problem disappears. The truth conditions for "less" comparatives (as well as those of "more" comparatives, equatives, and the absolute construction) are formulated directly in terms of a relation between two degrees—the reference value and the standard. Given the truth conditions for "less" and "more" that I have assumed, which are stated below in (243) and (244), respectively, the logical expression (245) is satisfied if and only if the degree to which Mars Pathfinder was expensive is ordered below the degree to which the space telescope was expensive on the scale associated with the adjective "expensive."

(243) \( \text{less} \left( \text{d}_{R} \right) \left( \text{d}_{S} \right) \iff d_{R} < d_{S} \)
(244) \( \text{more} \left( \text{d}_{R} \right) \left( \text{d}_{S} \right) \iff d_{R} > d_{S} \)

It follows that (241), which has the logical representation in (245), is true if and only if the degree to which Mars Pathfinder was less expensive than the space telescope.

2.4.6  Comparative and Absolute

Before concluding this section, a few final words on the difference between comparative and absolute degree constructions are in order. Although the truth conditions of propositions constructed out of comparative and absolute adjectives are fundamentally the same—in terms of the same three constituents, a degree relation, a reference value, and a standard—they are different in that the two types of constructions are more or less limited in their means of accomplishing this. Comparative degree constructions are more flexible and adaptable, allowing for a wider range of expression and a greater variety of meanings than their absolute counterparts. This difference explains the well-known fact that in typical examples, no entailment relation holds between comparative sentences.

In contrast, since the analysis of comparatives developed in the preceding sections is not stated in terms of the absolute construction, this problem disappears. The truth conditions for "less" comparatives (as well as those of "more" comparatives, equatives, and the absolute construction) are formulated directly in terms of a relation between two degrees—the reference value and the standard. Given the truth conditions for "less" and "more" that I have assumed, which are stated below in (243) and (244), respectively, the logical expression (245) is satisfied if and only if the degree to which Mars Pathfinder was less expensive than the space telescope.
express. And the arguments (246)-(248) are valid. For example, none of the arguments in (246)-(248) are valid.

(246) A white dwarf is brighter than a brown dwarf. 
∴ A white dwarf is bright.

(247) Saturn's gravitational field is less intense than Jupiter's. 
∴ Saturn's gravitational field is (not) intense.

(248) At certain points during its orbit, Pluto is as close to the sun as Neptune.
∴ Pluto is close to the sun.

In order for arguments such as (246)-(248) to be valid, it would have to be the case that the "constructed" standards introduced by the comparatives necessarily stood in some relation to the context-dependent standards associated with the corresponding absolutes. Consider, for example, the interpretations of the premise and conclusion in (248) in (249) and (250).

(249) as (close-to-the-sun (Pluto)) (close-to-the-sun (Neptune))

(250) abs (close-to-the-sun (Pluto)) (stnd (\x. close-to-the-sun (x)) p (Pluto)))

(249) and (250) have essentially the same truth conditions: these expressions are true if the first argument of as/abs (the reference value) is at least as great as the second argument (the standard value) (see (124) and the truth conditions for the absolute given in (77), section 2.3). In order for (250) to follow from (249), then, it must be the case that the standard value in (249)–the degree to which Neptune is close to the sun–is at least as great as the standard value in (250)–a value on the scale associated with close-to-the-sun that is contextually determined based on some property of Pluto. Although it is possible that these first arguments of as/abs (the reference values) are at least as great as the second arguments, this is not a sufficient condition. These expressions are true if the...
A final point should be emphasized. As observed at the outset of this section, in order for the analysis developed here to be accepted as a general account of the semantic and syntactic properties of comparatives, it must be shown that it can be extended to the full range of comparative constructions in English, including attributive AP comparatives and nominal comparatives. Of particular importance is an evaluation of the analysis of comparative deletion with respect to these other types of comparative constructions, in particular, the hypothesis that the missing degree phrase in comparative deletion constructions indicates that the comparative operator is categorically a DegP, rather than the application of an ellipsis operation. Although this hypothesis provided a principled explanation of the semantic and syntactic properties of predicative comparative deletion constructions, whether it generalizes to nominal and attributive comparatives is a question that remains to be answered (though see Kennedy and Merchant 1997 for arguments that this analysis actually provides the basis for an explanation of some otherwise puzzling characteristics of attributive comparatives). What I hope to have demonstrated in this section is that the overall strength of the analysis of gradable adjectives and degree constructions that I have advocated in this thesis makes this a question that is indeed worth pursuing.

2.5 Conclusion

This chapter made two primary claims. First, gradable adjectives should be analyzed not as relational expressions, but rather as functions from objects to degrees. Second, degree morphemes introduce relations between degrees, and degree constructions denote properties of individuals, rather than expressions that quantify over degrees. Building on a syntactic analysis in which gradable adjectives project functional structure headed by a degree morpheme, I demonstrated that these assumptions support a straightforward compositional semantic analysis of a range of degree constructions in English. Crucially, since degrees are not arguments of a gradable adjective, and degree constructions are not analyzed as quantificational expressions of a range of degree constructions in English, clauses that feature a degree construction introduce a new constituent that contains the degree construction and the subject.

The semantic analysis outlined in section 2.1 provides support for the extended projection syntactic analysis of degree constructions developed in Abney 1987, Corver 1990, 1997, and Grimshaw 1991. As demonstrated in sections 2.3 and 2.4, the syntactic representations of degree constructions derived within this approach, in which a gradable adjective projects extended functional structure headed by a degree morpheme, can be given a transparent compositional interpretation in which the adjectival head is interpreted as a measure phrase and the degree morpheme as a relation between degrees. The adjective combines with the degree morpheme to generate an expression that denotes a relation between degrees and individuals—an expression of the same semantic type as a gradable adjective on the traditional view. This expression in turn combines with a standard-denoting expression, with the result that the degree construction denotes a property of individuals. Composition of this property with the subject generates a proposition that manifests the three-part constituency claimed in section 2.1 to be the basic interpretation of degree constructions.

A final and very important point to make is that the analysis of gradable adjectives and degree constructions that I have advocated in this thesis makes this a question that is indeed worth pursuing. In a general sense, the semantic analysis outlined in section 2.1 provides support for the extended projection syntactic analysis of degree constructions developed in Abney 1987, Corver 1990, 1997, and Grimshaw 1991. As demonstrated in sections 2.3 and 2.4, the syntactic representations of degree constructions derived within this approach, in which a gradable adjective projects extended functional structure headed by a degree morpheme, can be given a transparent compositional interpretation in which the adjectival head is interpreted as a measure phrase and the degree morpheme as a relation between degrees. The adjective combines with the degree morpheme to generate an expression that denotes a relation between degrees and individuals—an expression of the same semantic type as a gradable adjective on the traditional view. This expression in turn combines with a standard-denoting expression, with the result that the degree construction denotes a property of individuals. Composition of this property with the subject generates a proposition that manifests the three-part constituency claimed in section 2.1 to be the basic interpretation of degree constructions.

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In essence, the explanation of the distribution of gradable adjectives is of the same type as the one provided by the vague predicate analysis, which claimed that only gradable adjectives (qua vague predicates) are of the appropriate semantic type to serve as arguments to degree functions. Like the vague predicate analysis, gradable adjectives denote functions, and the interpretation of degree constructions involves the semantic composition of the degree morpheme and the gradable adjective. At the same time, by characterizing the core meaning of gradable adjectives in terms of abstract representations of measurement–i.e., scales and degrees–I have maintained the core assumption of the scalar analysis, namely, the existential composition of degree constructions. In a general sense, then, the analysis of gradable adjectives and degree constructs follows. In essence, the explanation of the distribution of gradable adjectives is of the same