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HEATHER BURNETT

Gradability in Natural Language

Logical and Grammatical Foundations

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Gradability in Natural Language

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Gradability in Natural Language

*Logical and Grammatical
Foundations*

HEATHER BURNETT

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To my parents

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General preface

Oxford Studies in Semantics and Pragmatics publishes original research on meaning in natural language within contemporary semantics and pragmatics. Authors present their work in the context of past and present lines of inquiry and in a manner accessible to both scholars whose core areas of expertise are in linguistic semantics and pragmatics, and to researchers in related and allied fields such as syntax, lexicology, philosophy, and cognitive science. The series emphasizes rigorous theoretical analysis grounded in detailed empirical investigation of particular languages.

This is a companion series to *Oxford Surveys in Semantics and Pragmatics*. The *Surveys* series provides critical overviews of the major approaches to core semantic and pragmatic phenomena, a discussion of their relative value, and an assessment of the degree of consensus that exists about any one of them. The *Studies* series equally seeks to put empirical complexity and theoretical debate into comprehensible perspective, but with a narrower focus and correspondingly greater depth. In both series, authors develop and defend the approach and line of argument that they find most convincing and productive.

In this contribution to the series, Heather Burnett investigates the semantics of gradability: the principles of meaning that provide the basis for expressions of comparison, intensification, and degree. Burnett's central thesis is that gradability can be derived from the interaction of a set of more basic, and conceptually necessary, principles governing the interpretation of context-dependent expressions and the tolerance of categorization processes. This approach contributes to a long tradition in semantics and philosophy that seeks to link the semantics of gradability to a general theory of linguistic vagueness; where Burnett pushes beyond previous work is in developing a formal framework that can explain grammatical distinctions between classes of gradable predicates that have previously been thought to require reference to an additional abstract scalar representation system. This volume challenges this view and provides a fresh and sophisticated alternative to contemporary theories of the semantics of gradability.

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Although credit is due to many many people, I have to single out Paul Égré for the enormous contributions that he has made to both the content of this monograph and my personal and professional development. I thank him for so many things, including but not limited to: introducing me to the exciting world of non-classical logics, showing me how to fill in the CNRS application form, laughing at my jokes (even the ones making fun of philosophers, Normaliens and French people), showing me how to eat a hamburger French-style (i.e. with a knife and fork) and letting me sleep in his kid's room when I was homeless in New York.¹

More generally, I thank the members of the Institut Jean Nicod at the Ecole normale supérieure in Paris (particularly members of the LINGUAE group: Emmanuel Chemla, Vincent Homer, Philippe Schlenker, Benjamin Spector, and Jérémy Zehr, as well as Claire Beyssade, Francis Corblin, Alda Mari, David Nicolas, and François Récanati) for welcoming me both as a student and as a visiting postdoctoral researcher. The time that I have spent at Jean Nicod has been incredibly rewarding (both academically and personally), and the influence of the ideas being developed in this lab can be clearly seen in the major themes explored in the book.

The first part of this book (chapters 2–5) is based on my 2012 dissertation *The Grammar of Tolerance: On vagueness, context-sensitivity and the origin of scale structure*, which was completed in the Linguistics department at UCLA. My supervisors, Ed Keenan and Dominique Sportiche, as well as Hilda Koopman, Jessica Rett, Yael Sharvit, and Ed Stabler have all made innumerable vital contributions to this project, and I will

¹ Credit for this last one is, of course, also due to Rachida, Amir, and, above all, to my roommate Isaac.

be forever grateful for their expertise, mentorship, and friendship in semantics and beyond.

The work that I began as a graduate student, I continued as a postdoc within the context of an SSHRC postdoctoral fellowship at l'Université de Montréal. In addition to being one of my closest collaborators and friends, Mireille Tremblay was the ideal postdoctoral supervisor, giving me guidance, but also an enormous amount of freedom to explore new interesting ideas and then to chase them across continents. This work never would have been possible without her.

During my postdoctoral work, I also benefitted greatly from shorter research stays in stimulating linguistics departments around the world. In the winter of 2013, I spent a very productive month working with Louise McNally and the rest of the GLiF group at the Universitat Pompeu Fabra. I would like to thank Louise, Gemma Barberà, Berit Gehrke, Scott Grimm, Laia Mayol, and Isidora Stojanovic for talking to me about adjectives and showing me how to grill and eat calçots. I also spent a very exciting couple of months at NYU in 2014, and I would like to especially thank my host, Chris Barker, as well as Dylan Bumford, Simon Charlow, Lucas Champollion, Orin Percus, Cara Shousterman, and Anna Szabolsci for many helpful academic and non-academic discussions. Salvador Mascarenhas also gets a special mention for being my linguistics/philosophy drinking buddy in both Paris and New York . . . and for coming to rescue me at the 79th Police Precinct when I got caught up in tensions associated with the rapid gentrification of Brooklyn.

As I mentioned, many of the main ideas developed in the first part of the book come from my doctoral dissertation, and earlier versions of the proposals outlined here have been published in the journals *Linguistics & Philosophy* (37:1–39) and the *Journal of Applied Non-Classical Logics* (24:35–60). Likewise, Chapter 7 takes up and extends some of the proposals found in the chapter ‘Vague determiner phrases and distributive predication’ (which appears in Marija Slavkovik and Dan Lassiter (eds.) *New Directions in Logic, Language, and Interaction*. Springer: FoLLI Lecture Notes in Computer Science 7415. pp. 175–194.) Likewise, some of the discussion concerning logical theories of vagueness and linguistics found in chapter 2 is also taken up in the (joint) handbook chapter (with Peter Sutton) *Vagueness and natural language semantics* (under review). Furthermore, during the writing of my dissertation and this book, I have been generously supported by the Social Sciences and Humanities Research Council of Canada (Doctoral fellowship (#752-2007-2382) and

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And, above all, I thank my parents and my sister Kate for all the love, support, and inspiration that they have given me over the course of my life.

List of abbreviations

AA	absolute scalar adjective
AA^P	partial absolute scalar adjective
AA^T	total absolute scalar adjective
AAA	absolute adjective axiom
BP	Be precise
CC	comparison class
CEM	classical extensional mereology
C-model	Classical model
CP	Contrast Preservation
CST	Classical Semantic Theory
DegP	Degree phrase
DegS	Degree semantics
DegTCS	Degree Tolerant, Classical, Strict
DeIS	Delineation semantics
DeITCS	Delineation Tolerant, Classical, Strict
DD	Downward difference
DP	determiner phrase
FOL	First order logic
G	Granularity
I	Incomparability
IE	Interpretive Economy
LP	Logic of Paradox
MC	Mereological Convexity
MD	Minimal Difference
M-DeITCS	Mereological Delineation Tolerant, Classical, Strict
MI	Montagovian Individual
MSH	Mereological Structure Hypothesis
NR	No Reversal
NS	non-scalar adjective
P-vague	potentially vague
PH	Pragmatic Halos
PA	Partial Axiom
RA	relative scalar adjective
S	Symmetry

SA	scalar adjective
SC	Strict Convexity
SP	Shared Parts
SWO	strict weak order
TA	Total Axiom
TC	Tolerant Convexity
TCS	Tolerant, Classical, Strict
T-model	Tolerant model
UD	Upward Difference
VP	verb phrase
wff	well-formed formula

Introduction

This book presents a new theory of the relationship between vagueness, context sensitivity, and scale structure in natural language. In particular, this work is devoted to the description and analysis of the distribution of these phenomena within and outside the adjectival domain of English and other Indo-European languages.

A more precise and developed exposition of the phenomenon known as *vagueness* will be given in Chapter 2; however, we can illustrate some of the puzzles that it raises with the following example: Suppose we take someone who is 1.9 m tall, and suppose that we agree that, because we are talking about average male heights, he is tall. Furthermore, suppose that we have a long line of people ordered based on height and that their heights differ by only 1 cm each. The 1.9 m tall man is at the front of the line, and there is someone who is only 1.5 m tall at the end. We can agree that the last person is not tall. Given this set-up, there must be some point in this line at which we move from a tall person to his not tall follower, who is 1 cm shorter than he is. But where is this point? Since adding or subtracting a single centimetre is such a small change, it seems absurd to think that changing someone's height by this much could ever serve to affect whether or not we would call them *tall*. We call relations like ' ± 1 cm' (in this context) *tolerance* relations or *indifference* relations, since they encode amounts of change that do not make a difference to categorization. When we can find a tolerance relation for an adjective, we call the adjective *tolerant*, i.e. we call *tall* a tolerant predicate because statements like (1) seem true.

- (1) For all x, y , if x is tall and x and y 's heights differ by at most 1 cm, then y is also tall.

Note, furthermore, that the negation of *tall* (*not tall*) is also tolerant: in a context such as the one described above, (2) also seems true.

- (2) For all x, y , if x is not tall and x and y 's heights differ by at most 1 cm, then y is also not tall.

Clearly the fact that both *tall* and *not tall* are tolerant creates a puzzle: why do we not conclude that both the 1.9 m man and the 1.5 m man are tall and not tall at the same time? Paradoxes of this type are known as *Sorites* paradoxes,¹ and they will be discussed in much greater detail throughout the book.

Another adjective that shows a similar pattern is *straight*: In most situations, adding a 1/10 mm bend to a stick is such an irrelevant change that it will never be sufficient to make a stick that we call *straight* not called *straight*. Thus, if we were to line up a set of sticks that differ by 1/10 mm bend from the perfectly straight ones to the really bendy ones, then (3) seems true.

- (3) For all x, y , if x is straight and x and y differ by a single 1/10 mm bend, then y is also straight.

However, unlike *tall*, whose negation is also tolerant, even though adding or subtracting a 1/10 mm bend is such a small change, the corresponding statement with *not straight* is false: in particular (4) is falsified by the case where we move from x that has a 1/10 mm bend (so is not straight) to y that has absolutely no bends.

- (4) **False:** For all x, y , if x is not straight and x and y differ by a single 1/10 mm bend, then y is also not straight.

In summary, on the one hand, adjectives like *tall* and *straight* are both tolerant, but on the other, *straight* displays an asymmetry that *tall* does not.

The second phenomenon that will be treated in this work is context sensitivity. To be more specific, we will call a predicate P *context sensitive* just in case, for some individual x , we can find a context in which P applies to x , and we can find another context in which P does not apply to x , without changing the properties of x and y . The adjectives *tall* and *straight* both have this property: someone who can be considered *tall* when we are considering jockeys might not be considered *tall* when we

¹ The name of these puzzles comes from a puzzle attributed to Eubelides of Miletus known as “the Heap” (*soros* being Greek for *heap*):

Would you describe a single grain of wheat as a heap? No. Would you describe two grains of wheat as a heap? No . . . You must admit the presence of a heap sooner or later, so where do you draw the line? (from the Stanford Encyclopedia of Philosophy.)

are considering average men. Likewise, we saw above that an object with a very small bend can be sometimes considered to be *straight*; however, in a context in which very slight bends make a large difference to our purposes, the very same object would not be considered *straight*.²

This being said, *tall* and *straight* display a different pattern when it comes to being context sensitive. For example, as discussed in Kennedy (2007) and Syrett et al. (2010) (among others), adjectives like *tall* can shift their criteria of application across contexts in a way that adjectives like *straight* cannot. If I have two objects, one of which is (noticeably) taller than the other, but neither are particularly tall, I can still use the predicate *tall* to pick out the taller of the two.

- (5) Pass me the **tall** one.

OK: even if neither/both is/are tall.

However, using *straight* in such a linguistic construction is only possible if exactly one of the two is (very close) to perfectly straight.

- (6) Pass me the **straight** one.

if neither/both is/are straight.

The third phenomenon treated in this work is scalarity. Again, *tall* and *straight* pattern alike on this dimension in that they can both appear in the comparative and many other degree constructions (7).

- (7) a. This stick is **taller/straighter** than that one.
b. This stick is **very tall/straight**.

However, once more, if we look at the full range of data concerning gradability and scale structure, *tall* and *straight* show a different pattern: for example, certain scalar modifiers like *almost* and *completely* are natural with *straight*, but not with *tall*.

- (8) a. ??John is **almost/completely** tall.
b. This stick is **almost/completely** straight.

The main goal of Chapters 2–5 is to develop an account of both the similarities and differences between various subclasses of adjectives with respect to each of these three phenomena (vagueness, context sensitivity, and scalarity). The principle subclasses that will be empirically distinguished are the following:

² Consider, for example, the barrel of a rifle that must be perfectly straight for our shots to be accurate.

- (9) **Relative scalar adjectives (RAs):**
e.g. tall, short, expensive, cheap, nice, friendly, intelligent, stupid, narrow, wide
- (10) **Total absolute adjectives (AA^T s):**
e.g. empty, full, clean, smooth, dry, straight, flat
- (11) **Partial absolute adjectives (AA^P s):**
e.g. dirty, bent, wet, curved, crooked, dangerous, awake
- (12) **Non-scalar adjectives (NSs):**
e.g. atomic, geographical, polka-dotted, pregnant, illegal, dead, hexagonal

I propose that the patterns concerning the behavior of *tall* and *straight* described above and other patterns to be discussed in the work are all reflexes of a single underlying difference in the semantics of these lexical items involving (a certain kind of) context sensitivity. Moreover, I propose that the data concerning both vagueness and scale structure can be derived from the interaction between (lack of) context sensitivity and tolerance/indifference relations associated with general cognitive categorization processes. Building on insights into the connection between context sensitivity and scalarity from the work of Klein (1980) (among others) and insights into the connection between tolerance relations and the Sorites paradox from the work of Cobreros et al. (2012b) (among others), I propose a new logical framework called *Delineation Tolerant, Classical, Strict* (DeLTCS) that captures the intimate and complex relationship between these three aspects of adjectival meaning.

Chapters 6 and 7 look at extensions of the framework developed in Chapters 2–5. An important class of the extensions we will look at concerns how the DeLTCS framework can be applied outside the adjectival domain to develop an analysis of context sensitivity, vagueness, and gradability patterns associated with constituents of the *determiner phrase* (DP) category. It has been long observed that there exist important parallels between certain kinds of adjectives and certain kinds of DPs when it comes to vagueness and scale structure. Although these parallels will be outlined in great detail in the book, we can observe a first cross-domain parallel using (among other constructions) degree modifiers that combine with constituents of different syntactic categories. For example, in many languages,³ a universal scalar modifier, such as French

³ As observed by Bolinger (1972) and Moltmann (1997), similar adjectival patterns are possible in some dialects of English (ex. *This room is all empty* \approx *This room is completely*

tou(te)s ‘all’, can combine with both adjectives like *droit* ‘straight’ and definite plural DPs like *les filles* ‘the girls’ to create a parallel maximizing interpretation.

- (13) a. La rue est **toute** droite.
 The road is **all** straight
 ‘The road is completely straight.’
 b. **Toutes** les filles sont arrivées.
 All the girls are arrived
 ‘All the girls arrived.’

Although examples such as (13) (and others to be discussed in Chapter 7) suggest that definite plural DPs and total adjectives have similar scale structure properties, we will also see that context sensitivity/vagueness/scale structure have slightly different manifestations with DPs than with adjectives. In particular, I will argue that we see a different typology of context sensitivity, vagueness, and scale structure patterns in the DP domain than in the adjectival domain. Chapters 6 and 7 are therefore devoted to capturing both the similarities (such as (13)) and the proposed differences between adjectival and DP constituents within a *mereological* extension (Simons, 1987; Hovda, 2008, among others) of the DelTCS system (called *M-DelTCS*).

I will propose that the scales associated with DPs are derived from statements about their context sensitivity and vagueness in the same basic way as with adjectives. This is what creates the observed cross-domain parallels. However, I will also propose that the different kinds of ontological relations that characterize the domains into which DPs and adjectives denote have important consequences for how the application of these constituents can vary across comparison classes and how they display the characteristic properties of vague language. In other words, by virtue of the fact that DP constituents are interpreted into domains that have mereological (i.e. part-structure) relations on them, their context sensitivity and vagueness is constrained in a way that the context sensitivity and vagueness of adjectival constituents is not. In turn, by virtue of the logical structure of the M-DelTCS framework, these differences in context sensitivity and vagueness will be translated into differences in scale structure. Based on these results, I conclude that

empty). However, adjectival *all* is not fully productive in English in the way that its counterparts in the Romance languages (or even in German) are. Indeed, Moltmann (1997) refers to English *all* as ‘deficient’ with respect to its cognates in other Indo-European languages.

the *Delineation TCS system* (and its mereological extension *M-DelTCS*) provides a broad and versatile framework for analyzing the connections between context sensitivity, vagueness, and gradability that we observe in natural language phenomena across different syntactic categories.

1.1 Organization of the book

Chapter 2 (*Vagueness and linguistic analysis*) serves as an introduction to one of the main empirical phenomena to be analyzed in the monograph and the formal tools that will be used in the analysis. As such, it has two main parts: in the first part (Sections 2.2–2.3), I present the empirical phenomenon known as *vagueness* in the linguistics and philosophical literatures, and I outline why this phenomenon appears so threatening to our classical semantic theories in logic and linguistics. In the second part of the chapter (Sections 2.4–2.5), I present the basic account of the puzzling properties of vague language that I will adopt in this work: Cobreros et al.’s (2012b) *Tolerant, Classical, Strict* (TCS) similarity-based non-classical logical framework. I then present a similar framework that has been very influential in linguistics: Lasnik’s (1999) *Pragmatic Halos* framework. I give a comparison between the two approaches and argue that, while Cobreros et al.’s (2012b) analysis (as applied to the interpretation of English) is empirically superior, they share many of the same driving intuitions. I therefore suggest that one way of looking at TCS is as a more nuanced version of the halos approach. Readers that are already familiar with the puzzles associated with vagueness and their proposed solutions within TCS can easily skip this chapter without any consequences for their understanding of the rest of the book.

Chapter 3 (*Context sensitivity and vagueness patterns*) presents the main empirical patterns associated with adjectival context sensitivity and vagueness. In line with previous work on the topic, I argue that the different scale structure classes of adjectives in (9)–(12) vary with respect to comparison class-based context sensitivity. I argue that to properly understand this variation, it is useful to adopt two patterns of comparison class-based context sensitivity: (what I will call) *universal* context sensitivity and *existential* context sensitivity. Intuitively, predicates that are universally context sensitive show a greater range of meaning variation than predicates that are existentially context sensitive. In this chapter, I argue that three of the four scale-structure subclasses presented above can be distinguished based on their context