

THE LOGICAL AND EMPIRICAL FOUNDATIONS  
OF  
BAKER'S PARADOX

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DOCTOR OF PHILOSOPHY

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# Abstract

This dissertation examines the logical and empirical foundations of the learnability problem known as *Baker's Paradox* (Pinker 1989, in reference to Baker 1989). Baker's Paradox arises from the simultaneous assumption of three premises: (i) That there are productive generalizations in language (*productivity*), (ii) that there are arbitrary exceptions to those generalizations (*arbitrariness*), and (iii) that negative evidence is not available to the language learner (*no negative evidence*). On the logical side, the focus is on how and why Baker's Paradox is paradoxical, the relationships between the premises, what follows from each of the premises, and the space of possible solutions. On the empirical side, the goal is to question the second premise: arbitrariness.

The central thesis is that the premise of arbitrariness is not well-founded. To show this, I survey a range of phenomena that have been argued to manifest arbitrary exceptions, and present evidence to the contrary. The argument proceeds by identifying the criteria governing the patterns involved, and showing that the items in question fail to meet these criteria.

The first case study addresses putative arbitrariness in the realm of the English causative alternation, relating transitive *break*, for example, to intransitive *break* (Chapter 2). I argue that Levin and Rappaport Hovav's (1995) analysis of the causative alternation, which uses a distinction between *internal* and *external causation*, can be used to explain the behavior of the putative arbitrary exceptions in this domain.

In Chapter 3, I investigate constraints on the productivity of the ditransitive construction, as in *give John the book*. Here there are some semantic restrictions, but it also appears that there is a “morphophonological constraint,” which can be elucidated by nonce word experiments manipulating the form of the word, which this chapter includes. The experimental results make it possible to narrow down the set of possible ways of stating the “morphophonological constraint” and provide further evidence for its existence, an important step in the argument against arbitrariness in this domain.

Putative cases of arbitrariness in the realms of prepositions and adjectives are addressed in Chapters 4 and 5, respectively. Chapter 4 addresses the claim that prepositions can arbitrarily fail to strand (as in *Who did you speak to?*) or pied-pipe (as in *To whom did you speak?*). Chapter 5 addresses the claim that adjectives differ arbitrarily in their ability to function either prenominal (e.g. *That is a mere/\*asleep child*) or predicatively (e.g. *That child is asleep/\*mere*). In both domains, I show that the behavior of the items in question can be understood on the basis of general principles of English grammar.

I conclude that there is no evidence from any of these domains for the necessity of learning arbitrary exceptions to productive patterns. This conclusion about the linguistic situation leads to a view of the language learner as one who prefers explanatory generalizations over individual stipulations: the *explanation-seeking learner*.

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# Contents

<b>Abstract</b>	<b>v</b>
<b>Acknowledgements</b>	<b>vii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 The phenomena of interest . . . . .	6
1.1.1 “Benign” exceptions . . . . .	6
1.1.2 “Embarrassing” exceptions . . . . .	9
1.2 The solution space . . . . .	12
1.2.1 Arbitrariness vs. criteria-governed productivity . . . . .	12
1.2.2 Conservatism vs. negative evidence . . . . .	13
1.2.3 Arbitrariness and negative evidence . . . . .	15
1.2.4 Arbitrariness and conservatism . . . . .	16
1.2.5 Conservatism and Attentiveness . . . . .	16
1.3 Roadmap . . . . .	18
<b>2 The Causative Alternation</b>	<b>20</b>
2.1 Defining the criteria . . . . .	23
2.1.1 Pinker’s (1989) narrow-range rules . . . . .	23
2.1.2 Levin and Rappaport Hovav’s (1995) analysis . . . . .	25

2.1.2.1	Internal vs. external causation . . . . .	25
2.1.2.2	Direction of derivation . . . . .	26
2.1.2.3	Linking rules . . . . .	28
2.1.2.4	Non-caused eventualities . . . . .	33
2.1.2.5	Agency restriction on detransitivization . . . . .	34
2.1.2.6	Causativization of manner-of-motion verbs . . . . .	35
2.1.2.7	Causativization of internally-caused change of state verbs . . . . .	36
2.1.3	Summary . . . . .	36
2.2	Explaining the exceptions . . . . .	37
2.2.1	Non-pertinent types of arbitrariness . . . . .	37
2.2.2	Diagnostics . . . . .	42
2.2.2.1	Existing diagnostics of internal causation . . . . .	42
2.2.2.2	Direction of Force Principle . . . . .	42
2.2.3	Intransitive-only putative exceptions . . . . .	47
2.2.3.1	Internally caused verbs . . . . .	47
2.2.3.2	Non-caused verbs . . . . .	52
2.2.4	Transitive-only putative exceptions . . . . .	52
2.3	Conclusion . . . . .	54
<b>3</b>	<b>Ditransitivity</b>	<b>56</b>
3.1	The puzzle . . . . .	56
3.2	Criteria for ditransitivity . . . . .	59
3.3	Applying the semantic criteria . . . . .	61
3.4	Identifying the morphophonological constraint . . . . .	63
3.4.1	The prosodic weight hypothesis . . . . .	64
3.4.2	Two-lexicon hypothesis . . . . .	67

3.4.3	The morphological complexity hypothesis . . . . .	68
3.4.4	The formality hypothesis . . . . .	69
3.5	Previous nonce study: Gropen et al. (1989) . . . . .	70
3.6	Experiment 1: Prosodic weight in English . . . . .	74
3.6.1	Methods . . . . .	75
3.6.2	Results . . . . .	77
3.6.3	Summary: Experiment 1 . . . . .	80
3.7	Experiment 2: Prosodic weight in nonce verbs . . . . .	81
3.7.1	Methods . . . . .	81
3.7.2	Results and discussion: Acceptability . . . . .	85
3.7.3	Results and discussion: Response times . . . . .	87
3.7.4	Summary: Experiment 2 . . . . .	88
3.8	Experiment 3: Etymology in nonce verbs . . . . .	90
3.8.1	Methods . . . . .	91
3.8.2	Results and discussion: Constructed etymology . . . . .	98
3.8.3	Results and discussion: Perceived etymology . . . . .	101
3.8.3.1	Word-level: Perceived Latinateness . . . . .	103
3.8.3.2	Participant-level: Etymology score . . . . .	104
3.8.3.3	Perceived Latinateness . . . . .	106
3.8.3.4	Summary: Perceived etymology . . . . .	109
3.8.4	Follow-up study: Morphological complexity . . . . .	109
3.8.4.1	Methods . . . . .	110
3.8.4.2	Results and discussion . . . . .	111
3.8.5	Follow-up study: Formality . . . . .	114
3.8.5.1	Methods . . . . .	115
3.8.5.2	Results and discussion . . . . .	116
3.8.6	Summary: Experiment 3 . . . . .	117

3.9	Conclusion . . . . .	119
3.10	Appendix: Experimental materials . . . . .	121
3.10.1	Paragraphs for Experiment 2 . . . . .	121
3.10.2	Filler paragraphs for Experiment 2 . . . . .	123
3.10.3	Paragraphs for Experiment 3 . . . . .	125
<b>4</b>	<b>“Odd Prepositions”</b>	<b>130</b>
4.1	Introduction . . . . .	130
4.2	Straightening out the data . . . . .	133
4.2.1	Typographical error regarding <i>off</i> . . . . .	133
4.2.2	Pied-piping with <i>since</i> . . . . .	134
4.2.3	Stranding with <i>out</i> . . . . .	136
4.2.4	Stranding with <i>off</i> . . . . .	137
4.2.5	The new picture . . . . .	137
4.3	Explaining the new picture . . . . .	138
4.3.1	<i>since</i> and <i>during</i> . . . . .	138
4.3.2	<i>ago</i> . . . . .	144
4.3.3	<i>notwithstanding</i> . . . . .	146
4.3.4	<i>out</i> and <i>off</i> . . . . .	150
4.4	Summary and conclusion . . . . .	158
<b>5</b>	<b>Adjectives</b>	<b>161</b>
5.1	Predicativity . . . . .	163
5.1.1	The Predicativity Principle . . . . .	164
5.1.2	Applying the Predicativity Principle . . . . .	170
5.2	Prenominality . . . . .	178
5.2.1	<i>a-</i> adjectives . . . . .	178
5.2.1.1	Morphological generalization . . . . .	178

5.2.1.2	Phrasality . . . . .	181
5.2.1.3	Characterization . . . . .	186
5.2.1.4	Metrical factors . . . . .	189
5.3	Conclusion . . . . .	190
<b>6</b>	<b>Conclusion</b>	<b>193</b>
6.1	Goals . . . . .	193
6.2	Empirical foundations of Baker’s Paradox . . . . .	195
6.2.1	Range of phenomena . . . . .	195
6.2.2	Consequences of the range of phenomena . . . . .	197
6.2.3	Types of criteria governing productivity . . . . .	201
6.2.4	Domain-specific findings . . . . .	202
6.3	Logical foundations of Baker’s Paradox . . . . .	205
6.3.1	The theoretical landscape . . . . .	205
6.3.2	Explanations for non-arbitrariness . . . . .	206
6.3.2.1	Architectural limitations . . . . .	207
6.3.2.2	Non-Attentiveness . . . . .	209
6.3.2.3	The explanation-seeking learner . . . . .	211
6.4	In a nutshell . . . . .	217

# List of Tables

3.1	Experiment 1: Materials . . . . .	76
3.2	Experiment 1: Mean acceptability ratings by verb and construction . . . . .	80
3.3	Experiment 2: Selected nonce verbs . . . . .	82
3.4	Experiment 3: Nonce verbs . . . . .	94
3.5	Experiment 3: Fixed effects in the basic linear regression model of rating $z$ -score . . . . .	108
4.1	Behavior of odd prepositions according to Culicover (1999:82) . . . . .	132
4.2	Behavior of odd prepositions (revised) . . . . .	138
5.1	Properties of selected $a$ - adjective stems . . . . .	180

# List of Figures

2.1	The broad-range rule for the causative alternation (Pinker 1989) . . .	24
2.2	A narrow range rule for the causative alternation (Pinker 1989) . . .	24
3.1	Gropen et al. (1989): Mean acceptability ratings by construction and verb shape . . . . .	73
3.2	Experiment 1: Mean acceptability ratings by construction and word shape . . . . .	79
3.3	Experiment 2: Mean acceptability ratings by construction and word shape . . . . .	86
3.4	Experiment 2: Response times by construction and word shape . . . .	87
3.5	Experiment 2: Response times by acceptability judgment, fillers only	89
3.6	Experiment 3: Mean acceptability rating $z$ -score by construction and word shape . . . . .	99
3.7	Etymology questionnaire: Frequency of response type by word shape	102
3.8	Etymology questionnaire: Proportion of “Latin” and “Old English” responses by word . . . . .	104
3.9	Experiment 3: Effect of etymology score on mean acceptability rating $z$ -score by subject . . . . .	106
3.10	Experiment 3: Mean morphological complexity rating by word shape	112

3.11 Experiment 3: Effect of morphological complexity on acceptability of ditransitive construction, relative to prepositional dative, by word . . .	113
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# Chapter 1

## Introduction

This dissertation is devoted to the language learnability problem known as *Baker's paradox* (Pinker 1989, in reference to Baker 1979). It comprises three premises:

1. Productivity
2. Arbitrariness
3. No negative evidence

To put it briefly, the paradox arises if one assumes that there are arbitrary exceptions (*arbitrariness*) to productive generalizations (*productivity*), and that negative evidence is not available to the language learner (*no negative evidence*). The purpose of this dissertation is to examine the logical and the empirical foundations of Baker's Paradox, by analyzing its logical structure and implications for learning, and questioning its empirical assumptions about the linguistic knowledge to be acquired. The central claim is a denial of the second premise: arbitrariness.

The arbitrariness premise states that there are arbitrary exceptions to productive patterns, presupposing the presence of *productivity*. A pattern is *productive* if an unbounded number of items can, in principle, instantiate the pattern. For example,

an unbounded number of verbs can be used in the *double object* (or *ditransitive*) construction (e.g. *I gave John a book*). One can show that a given pattern is productive by showing that a newly coined word can be used to instantiate the pattern. For example, when the verb *text* was coined, meaning *to send a text message*, it was immediately available for use in the double object construction (e.g. *text me your address*). Less recently, Wasow (1981) pointed out that if the verb *satellite*, meaning “to transmit messages via satellite” were invented, then it would be usable as a double object form. This example was “prophetic” (Pinker 1989:17), because such a verb was subsequently invented, with the expected syntactic behavior.<sup>1,2</sup>

The ditransitive construction, like many productive generalizations, is subject to certain restrictions. For example, verbs such as *donate* and *explain* are awkward as ditransitive verbs, despite being eligible for use in a dative construction with the preposition *to*:

- (1) a. \*The man donated the church money.  
       b. The man donated money to the church.
- (2) a. \*The doctor explained me the situation.  
       b. The doctor explained the situation to me.

Are these restrictions simply idiosyncratic facts about *donate* and *explain*, which have to be learned individually? If so, then they are *arbitrary exceptions*. Under the premise of arbitrariness, there are arbitrary restrictions on productive generalizations that must be stipulated for individual words. The alternative view, which I am

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<sup>1</sup>The productivity of the process by which novel verbs are coined from nouns, in addition to pragmatic limitations on it, is illustrated in detail by Clark and Clark (1979).

<sup>2</sup>Zwicky (1971:232) provides a memorable illustration of what it means to be productive: Imagine a new communication verb *greem*; then “it will be possible to greem for someone to get you a glass of water, to greem to your sister about the price of doughnuts, to greem ‘Ecch’ at your enemies, to have your greem frighten the baby, to greem to me that my examples are absurd, and to give a greem when you see the explanation.”

advocating in general in this dissertation, is that verbs like *donate* and *explain* are subject to general criteria governing the productivity of the ditransitive construction.

In the domain of ditransitivity, there is an etymological generalization regarding the set of verbs that fail to show the syntactic property in question: Verbs deriving from Latin tend not to be ditransitive. Suppose that this generalization were correct, and that there were no other explanation for why *donate* is unacceptable as a ditransitive verb. Under this scenario, it could be argued that *donate* is not an “arbitrary exception,” because its behavior falls under the scope of a larger generalization. However, this sense of “arbitrariness” is not the sense that is relevant for questions about learning. Because the learner of English presumably has no way (implicitly or explicitly) to acquire knowledge of the etymology of particular words, an etymological generalization is insufficient to render these restrictions non-arbitrary from a learning perspective. If etymological origin is the only factor determining whether or not a verb can function as a ditransitive, and there is no tangible reflex of etymology that a learner could use to distinguish ditransitive verbs from non-ditransitive verbs, then there are arbitrary exceptions to be acquired in this domain (see Pinker 1989 for further discussion).

Under the third premise of Baker’s Paradox, “no negative evidence,” learners do not use negative evidence to acquire their native language. *Negative evidence* can be defined as evidence against the grammaticality of some sentence type, that is, evidence that it is ungrammatical. Evidence that *donate* is ungrammatical as a ditransitive verb would thus be an example of negative evidence.

Is it truly a “paradox”? The reasoning by which the conjunction of the three premises leads to a contradiction is laid out by Schütze (1997:122) as follows:

If subcategorization is unpredictable [arbitrariness], then it must be learned for each verb individually. With no negative evidence available [no negative evidence], the child would have to limit herself to repeating

subcategorization frames perceived in parental speech. But this contradicts [productivity] (i.e. the child will use verbs with unattested subcategorization frames).

Although there are some small differences between Schütze's assumptions and the ones advanced in this dissertation, this quotation articulates one way to derive a contradiction from the simultaneous assumption of all three premises: The conjunction of the second and third premises (arbitrariness and lack of negative evidence) implies non-productivity, which of course, contradicts the first premise (productivity). One minor difficulty with this particular way of explaining how Baker's Paradox is a paradox is that it is cast in terms of subcategorization, even though the realm of Baker's Paradox extends beyond just subcategorization phenomena. A somewhat more important difficulty stems from the fact that the idea of arbitrariness depends on the idea of productivity; the premise of arbitrariness asserts that there are arbitrary exceptions to productive patterns. Hence it is impossible to imagine arbitrariness in the absence of productivity.

Here is another way to derive a contradiction from the conjunction of the three premises: The conjunction of productivity and absence of negative evidence implies the negation of arbitrariness. Why is this so? If a pattern is productive, then there is a process (in an abstract sense) that generates instances of that pattern, so long as certain criteria are satisfied. Arbitrariness means that there are items that satisfy the criteria, yet do not undergo the process. Negative evidence can be used to place limitations on the items that undergo a process. If there is no negative evidence, then there is no source of limitations on the process other than the criteria governing the productivity of the pattern,<sup>3</sup> which implies that there can be no arbitrary exceptions. With productivity, but without negative evidence, the learner is stuck with an overly general grammar.

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<sup>3</sup>Negative evidence is a conceivable source of evidence regarding the criteria of the pattern, so an even stronger statement is possible here.

The process corresponding to productivity can be analogized to the flow of substance through a filter: Any particle below a certain size can fit through the filter. Arbitrary exceptions can be seen as particles that are small enough to fit through the filter, which, for some reason, still fail to pass through it. Because the filter cannot restrict the passage of these items, there must be some additional mechanism to keep them back. If there were no mechanism for keeping particles back other than the filter, then every particle small enough to fit through the filter would pass through it. This outcome corresponds to what would happen in the presence of productivity, in the absence of negative evidence: an overly general grammar, and no arbitrary exceptions.

The preceding paragraphs illustrate ways of showing that the three premises cannot be simultaneously maintained, and that they do, indeed, form a paradox. How should this paradox be resolved? Which of the premises should be denied? There is plenty of evidence against the “no negative evidence” premise. However, as I will argue, this strategy for resolving Baker’s Paradox is compatible with another strategy, namely, denial of arbitrariness. I will argue further in favor of a joint solution, denying both.

Although it is useful to understand why it is a paradox and how it can be resolved, there is a more important underlying question, which is how the phenomena that appear to instantiate Baker’s Paradox in a given language – restrictions on productive patterns – are acquired by speakers of that language. In order to answer this question, it is necessary to go beyond merely resolving the paradox and to determine how many of the premises of the paradox are true, and which ones.

## 1.1 The phenomena of interest

Baker’s Paradox can be instantiated in a variety of domains, but only certain exceptions to productive rules give rise to the learning problem: those that Baker (1979) called “embarrassing,” and not those that Baker called “benign exceptions.” Although this distinction is useful, I propose an alternative way of conceptualizing it. While Baker characterizes the difference between “benign” and “embarrassing” exceptions based on optional vs. obligatory transformational rules, I suggest that the two classes should be distinguished based on whether they comprise restrictions that can be learned through categorical preemption.

### 1.1.1 “Benign” exceptions

The “arbitrariness” premise of Baker’s Paradox states that there are arbitrary exceptions to productive patterns. However, some arbitrary exceptions to productive patterns are consistent with this premise, namely, those that Baker (1979) refers to as “benign exceptions.” Baker’s Paradox – and arbitrariness in particular – arises only with “embarrassing” exceptions.

Baker characterizes the “benign” class as exceptions to obligatory transformational rules. Baker’s example of a “benign” exception is *how come*, a *wh*- phrase which exceptionally fails to trigger subject-auxiliary inversion, an obligatory rule. Subject-auxiliary inversion after *how come* is ungrammatical, as indicated by the asterisk in (3b):

- (3) a. How come he’s late?  
 b. \*How come is he late?

This exception to the rule that *wh-* phrases (*who*, *what*, *where*, etc.) trigger subject-auxiliary inversion is “benign” because it can be learned through observation of sentences in which inversion does not take place after *how come*.<sup>4</sup>

The learner can use the following logic to acquire obligatory rules: Either the input structure (e.g. an uninverted question) or the output structure (e.g. an inverted question) is grammatical, but not both. Given this exclusive disjunction between the options, it suffices to learn that one option is grammatical, in order to learn that the other option is ungrammatical. I suggest that this exclusivity is the crucial feature of “obligatory rules” that makes them “benign,” rather than the presence of obligatory rules per se.

Mutual exclusivity between two alternatives makes it possible for one form to *preempt* the other. The type of preemption in which the grammaticality of one form implies the ungrammaticality of another can be called *categorical preemption*. Categorical preemption stands in contrast to *statistical preemption*, which Goldberg (2006:93) defines in terms of “repeated witnessing” of competing forms. In categorical preemption, unlike statistical preemption, witnessing the preempting form only once could, in principle, be sufficient to learn that the preempted form is ungrammatical as an expression of the relevant meaning. For example, a learner with an excellent memory who is very astute could learn that *\*goed* is ungrammatical as the past tense of *go*, simply by hearing *went* once, as long as the learner knows that the two have (or would have) the same meaning. Statistical preemption, by contrast, is a potential mechanism for acquiring contrasts in grammaticality between forms that are not necessarily mutually exclusive.

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<sup>4</sup>An alternative analysis of this case is that *how come* is not a *wh-* phrase in the relevant sense, but a complementizer, so what has to be learned is not that *how come* exceptionally fails to trigger inversion, but the category of *how come* (Ginzburg and Sag 2000). Baker’s logic still stands, however, assuming that the learner has somehow acquired the exclusive disjunction between the grammaticality of the inverted and non-inverted forms.

Categorical preemption typically occurs in morphological paradigms. In a morphological paradigm, there is a matrix of slots, and each slot contains exactly one form. For example, the present tense paradigm for the verb *go* consists of a matrix of slots corresponding to the singular and plural forms for first, second, and third person subjects. The grammaticality of *goes* as a third person singular present tense form is evidence against the grammaticality of, for example, *go* as a third person singular present form, because only one form can fill this slot. In other words, *goes* preempts *go* as a third person singular present form. Another example comes from number inflection on nouns: For every noun, there is a unique singular form and a unique plural form. This means that the grammaticality of a given plural form gives evidence against the grammaticality of another potential form for the plural. Thus, the grammaticality of *feet* gives evidence against the grammaticality of *\*foots*.

As DiSciullo and Williams (1987:10-14) point out, inflectional paradigms provide the “clearest cases” of this type of phenomenon (which they refer to as “blocking” rather than “preemption”).<sup>5</sup> However, Di Sciullo and Williams also argue that such exceptions are not limited to the domain of morphology, and list several examples of preemption in syntax. A relatively straightforward example of preemption in syntax comes, I believe, from the grammar of temporal expressions, which are analyzed by Fillmore (2002). Fillmore points out that *last* and *next* can be combined with *year*, *month*, and *week* (e.g. *last year*, *next year*, etc.), but not *day*; English speakers use *yesterday* and *tomorrow* instead of adverbial *\*last day* and *\*next day*.<sup>6</sup> *Yesterday* and *\*last day* can be seen as competing for the same slot in a paradigm.

Competition between forms for a single slot in a paradigm gives rise to exclusivity between those forms. As discussed above, exclusivity, coupled with evidence *for* the

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<sup>5</sup>The choice of the term “preemption” over “blocking” here is motivated by the connotation of the term “blocking” as a restriction on forms, rather than form/meaning pairs, whereas “preemption” relates to form/meaning pairs (Clark and Clark 1979; Clark 1987).

<sup>6</sup>It seems that *yesterday* preempts *\*last day* only when the noun *day* is overt: *the day before last* and *the day before yesterday* both seem acceptable.

grammaticality of a given means of expressing a given function, gives rise to evidence *against* the grammaticality of another form. The logic can be schematized as follows (exclusive disjunction is notated with  $\oplus$ ): if  $A \oplus B$ , and  $A$ , then  $\neg B$ . It is worth noting that because this reasoning results in the conclusion that a given form is ungrammatical, it can be seen as indirectly providing a type of negative evidence, through positive evidence.<sup>7</sup> This does not seem to be the type of negative evidence whose existence (or use) is denied by the “no negative evidence” premise, however.

To summarize, the class of exceptions that Baker called “benign” can be recast as the set of restrictions that arise through categorical preemption, rather than as exceptions to obligatory rules. Categorical preemption relies on mutual exclusivity between forms, coupled with positive evidence for one form.

### 1.1.2 “Embarrassing” exceptions

According to Baker (1979), “the benign exceptions invariably involve rules that are obligatory. By contrast, the embarrassing exceptions are in connection with optional rules” (p. 546). Such optional transformational rules would rewrite (4a) as (4b), or (5a) as (5b), or (6a) as (6b).

- (4) a. I gave a book to John.  
       b. I gave John a book.
- (5) a. The child seems to be happy.  
       b. The child seems happy.
- (6) a. It is likely that Robin will win.  
       b. Robin is likely to win.

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<sup>7</sup>This point echoes a point embodied in Marcotte’s (2005) slogan, “positive evidence as negative evidence,” which highlights the false dichotomy between positive and negative evidence.

These rules are “optional” in the sense that they can transform the (a) structure into the (b) structure, but are not required to operate, so the (a) structure could also surface. If these rules were allowed to operate indiscriminately, then they would falsely allow unacceptable dative constructions like (7b), or the use of *happen* without *to be* as in (8b), or subject-raising with *probable* as in (9b).

- (7) a. I donated a book to the library.  
 b. \*I donated the library a book.
- (8) a. The child happens to be happy.  
 b. \*The child happens happy.
- (9) a. It is probable that Robin will win.  
 b. \*Robin is probable to win.

The words *donate*, *happen*, and *probable* can be seen as exceptions to the optional transformational rules that convert the (a) sentences into the (b) sentences.

With optional rules such as these, the grammaticality of the (a) sentence does not imply the ungrammaticality of the (b) sentence; sentences of the (a) type and the (b) type can peacefully coexist. Consider the inability of *donate* to undergo the dative alternation, for example. The dative alternation “rule” is “optional” in the sense that some verbs appear in both the double object construction and the prepositional object construction (e.g. *give*). Thus, the use of a verb in the prepositional object construction does not tell the learner that use of it in the double object construction is ungrammatical, unlike in the case of an “obligatory rule.” When learners hear the verb *donate* with a prepositional object, therefore, they do not acquire a basis for concluding that *donate* in the double object construction is ungrammatical.

I suggest that exclusivity between forms is the defining feature of the relevant class of phenomena (Baker’s “embarrassing exceptions”) rather than optional rules.

This class of phenomena can be cast as the class of restrictions on productive patterns that do not arise through categorical preemption. For these restrictions, there is no conventional near-synonymous alternative form that outcompetes the ungrammatical form in question for the same slot, and yet, the form is ungrammatical.<sup>8</sup>

This recharacterization of the set of relevant phenomena brings into the scope of the discussion constructions that are unlikely to be related to other constructions by transformational rules even under transformational assumptions, such as the attributive (or “prenominal”) adjective construction as in (10b).<sup>9</sup>

- (10) a. This man is tall.  
       b. Here is a tall man.

Adjectives that fail to appear attributively such as *aghast* (\**an aghast man*) can be considered forms that are not categorically preempted, and are therefore among the phenomena of interest. (Being of interest, examples like *aghast* are discussed in Chapter 5.)

In summary, Baker’s Paradox arises only with a certain type of phenomenon: restrictions on productive patterns that do not arise through categorical preemption. These are the cases for which there is no conventional near-synonymous preempting form.

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<sup>8</sup>I use “restriction” instead of “exception” because the latter connotes idiosyncrasy, begging the central question.

<sup>9</sup>In fact, it was proposed by McCawley (1964) that these constructions were related by a transformational rule (the “Adjective Shift Rule”), which rewrites a noun phrase with a relative clause containing an adjective as an attributive adjective, but this analysis has long been discredited due to the non-synonymy of predicative and prenominal forms (e.g. Bolinger 1967, Levi 1978).

## 1.2 The solution space

As Baker’s Paradox arises from the simultaneous assumption of three premises, there are three possible solutions to it: Denying the first, second, or third premise. However, the space of possible answers to the question of how restrictions on productivity are acquired has a slightly different structure. I will argue that there are two orthogonal dichotomies, one between arbitrariness and criteria-governed productivity, and one between conservatism and negative evidence. These theoretical choices are independent, so it is not necessary to choose between the “arbitrariness” and “no negative evidence” premises; in fact, I propose rejecting both.

### 1.2.1 Arbitrariness vs. criteria-governed productivity

The answer to the question of how restrictions on productivity are acquired depends in part on whether or not those restrictions are arbitrary, that is, whether or not the premise of arbitrariness holds. Denying arbitrariness can be called the *criteria-governed productivity* approach to Baker’s Paradox (Pinker 1984, 1989), because it explains restrictions on productive patterns by specifying criteria limiting the productivity of the pattern.

The criteria-governed productivity approach to Baker’s Paradox involves arguing against the existence of arbitrary exceptions by showing, for a given putative arbitrary exception to a productive pattern, that the item fails to meet the criteria governing the productivity of the pattern. For example, if one of the criteria for functioning as a ditransitive verb is for the verb to describe a transfer of possession, then any verb that does not describe a transfer of possession would fail to meet the criteria governing the productivity of the pattern. An exception to a productive pattern is only arbitrary if it fails to instantiate the pattern despite meeting its criteria.

The criteria-governed productivity approach is the one I advocate in this dissertation. My central thesis is that arbitrary exceptions (of the non-categorical preemption, or “embarrassing” variety) do not exist; rather, the restrictions on productive patterns that have been observed follow from criteria governing the productivity of the pattern.

### 1.2.2 Conservatism vs. negative evidence

To argue against arbitrariness is not to argue for the “no negative evidence” premise. Cross-cutting the dichotomy between arbitrariness and criteria-governed productivity is a dichotomy between negative evidence, on one hand, and conservatism, on the other. I suggest that the choice between conservatism and negative evidence is determined by whether or not there is a stage of overgeneralization. Either children do overgeneralize at some stage, but then cut back, or they are conservative, and never overgeneralize. If they do overgeneralize at first, they need negative evidence in order to change their grammar, regardless of whether the grammars they end up with contain arbitrary exceptions. Although the choice between these theoretical options is open in principle, there is strong evidence for the presence of an overgeneralization, hence, for the role of negative evidence.

There is a great deal of evidence that children are indeed conservative at a very young age (Akhtar 1999; Akhtar and Tomasello 1997; Berman 1978; deVilliers 1985; Dromi 1987; Olguin and Tomasello 1993; Tomasello 1992; Tomasello et al. 1997; Lieven et al. 1997; Ingram and Thompson 1996). However, there is also a great deal of evidence that children begin to generalize – and overgeneralize – from age 2 on. There are plenty of attested examples in spontaneous child speech (e.g. Bowerman 1988), and there is experimental evidence in support of this as well (Maratsos et al. 1987; Braine et al. 1990; Pinker et al. 1987; Gropen et al. 1989, 1991, 1996; Brooks and Tomasello 1999; Hochberg 1986). The notion that children go through an overgeneralization

stage is relatively uncontroversial (although according to Pinker’s (1989) “minimalist hypothesis,” there is in fact no overgeneralization stage, and children’s errors are either “one-shot innovations” or result from incorrect verb meanings). Under the assumption that overgeneralization does take place, children need negative evidence in some form in order to develop adult-like grammars.<sup>10,11</sup>

Other arguments have been made against the absence of negative evidence as well. Although there are some findings suggesting that negative evidence is not available to children (Brown and Hanlon 1970, Braine 1971, Hirsch-Pasek et al. 1984, Bowerman 1988), there is strong support for the existence of negative evidence of various types (see Chouinard and Clark 2003 for evidence and a review).

Based on these considerations, I conclude that the “no negative evidence” premise cannot be maintained and that some form of negative evidence is at work. Negative evidence need not take the form of explicit corrections; it could be obtained either *directly* through corrective feedback, or *indirectly* through statistical computations over patterns of speech (Schütze 1997, Rohde and Plaut 1999, i.a.). But negative evidence in some form – evidence against the grammaticality of certain sentence types – seems to be a logical consequence of the existence of an overgeneralization stage, and empirically supported as well.

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<sup>10</sup>The only other solution to what Babyonyshev et al. (2001) call “the problem of late knowledge” is to hypothesize innate grammatical principles which take time to mature (Babyonyshev et al. 2001; Borer and Wexler 1987). I will ignore this possibility in the absence of strong evidence for it, as I do not take it to be the null hypothesis.

<sup>11</sup>Marcotte (2005:4) seems to see negative evidence as opposed to innateness: “if negative evidence is unavailable, then the child must cut down on overgeneralization through some method that requires no evidence, usually taken to be innately specified.” He attributes such a theory to Pinker (1989), who posited certain innate properties, but I do not believe this attribution is accurate, because Pinker’s innatist assumptions were not intended as an explanation for why children recover from errors. As far as I can tell, the only innatist explanation for error recovery is the idea that grammatical principles take time to mature.

### 1.2.3 Arbitrariness and negative evidence

Because each of the premises correspond to different ways of resolving the paradox, one might take them to be mutually exclusive, but they are not. Denying arbitrariness does not force one to adopt or deny the idea of “no negative evidence.” Negative evidence could be used to acquire general constraints on productive patterns after a stage of overgeneralization. On the other hand, the use of negative evidence also does not follow logically from the non-existence of arbitrary exceptions: Supposing that overgeneralization never occurred, it would be conceivable that the learner was conservative in such a way as to keep productivity restricted on the basis of general criteria, rather than individual words.

However, arbitrariness and negative evidence are not completely unrelated ideas. The question of arbitrariness affects the *type* of negative evidence that it would be necessary for learners to use. If there are arbitrary exceptions, then the type of negative evidence that is needed concerns specific words. In that case, the negative evidence in question would have to be construed as evidence against the grammaticality of the particular combination of the word with the target construction. If arbitrary exceptions do not exist, then a different type of negative evidence is necessary for learning the appropriate restrictions. General criteria governing the productivity of a pattern could be learned through negative evidence construed as pertaining to entire classes of words, whether directly through feedback, or indirectly. For a description of such an approach, Mazurkewich and White (1984) suggest that “children may initially overgeneralize, but they eventually identify the criteria that define the lexical class appropriate to the rule. When they do, they limit productive use of the rule to lexical items of the right class, and errors cease” (Bowerman 1988:82–83). Under this scenario, non-arbitrariness and negative evidence co-exist.

To summarize, the implications of the existence of arbitrary exceptions do not pertain to *whether* negative evidence is used in language learning, but *what type*

of negative evidence is being used. If arbitrary exceptions do exist, then negative evidence must be construed as pertaining to the use of a particular word in a particular construction. If arbitrary exceptions do not exist, it may be that negative evidence (implicit or explicit) is taken as relevant to some semantic class.

#### 1.2.4 Arbitrariness and conservatism

Just as the issue of arbitrariness affects the type of negative evidence a learner would need to use, it also affects the type of conservatism that would be involved in learning. Supposing that arbitrary exceptions do exist, and that these restrictions are learned through conservatism on the part of the learner (without negative evidence), so-called *strict lexical conservatism* would be required (Pinker 1989). According to this idea, learners never use a word in a construction unless they have witnessed the word in the construction. This scenario is rather impossible to imagine, however, because strict lexical conservatism would contradict the premise of productivity (i.e. that the pattern is productive), which arbitrariness relies on.

Supposing that arbitrary exceptions do not exist, and maintaining the assumption that restrictions on productivity are learned through conservatism, a less strict variety of conservatism would be at play. According to this idea, learners might not use a word in a construction unless it has a feature of words that have been witnessed in the construction.

#### 1.2.5 Conservatism and Attentiveness

To complete the discussion of the space of theoretical possibilities regarding how restrictions on productive patterns are learned, let us consider Culicover's (1999) idea of the *Conservative Attentive Learner*. Culicover argues that arbitrary lexical idiosyncrasies abound in English and concludes, based on the existence of such arbitrariness,

that the learner must be *conservative* and *attentive*. A *conservative* learner, broadly speaking, is one who does not over-generalize; an *attentive* learner is one who pays attention to the use of individual words in individual constructions.

The relationship between arbitrariness and conservatism has already been discussed. A corollary of the fact that the “arbitrariness” and “no negative evidence” premises are orthogonal is that the ideas of arbitrariness and conservatism are not so intricately linked as Culicover (1999) makes out, because conservatism is the flip-side of negative evidence. The nature of the relationship between arbitrariness and conservatism is the same as the nature of the relationship between arbitrariness and negative evidence. In particular, the relationship is logically orthogonal.

To the extent that arbitrariness and conservatism are related issues, it is far from being the case that arbitrariness implies conservatism, as Culicover (1999) suggests. Rather, arbitrariness seems inconsistent with conservatism, because, as discussed above, the type of conservatism that would be required to learn arbitrary exceptions is strict lexical conservatism. Strict lexical conservatism is inconsistent with productivity, and therefore, arbitrariness. Conservatism is certainly not a consequence of arbitrariness.<sup>12</sup>

The idea of attentiveness to individual lexical items is more intrinsically related to the question of arbitrariness than either conservatism or negative evidence. If there are arbitrary exceptions, then the learner must be attentive to the use of individual words in individual constructions, and furthermore encode and store such information. To put it simply, arbitrariness implies attentiveness. This means that lack of

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<sup>12</sup>By the same token, an implicational relationship could be argued to exist between arbitrariness and negative evidence. If there were arbitrary exceptions and they were learned without any negative evidence, restrictions would be acquired solely through strict lexical conservatism. Strict lexical conservatism would contradict the “Productivity” (i.e., that the pattern is productive), which the “Arbitrariness” premise relies on. In any case, both the existence and non-existence of arbitrary exceptions are at least consistent with a view of learning that involves negative evidence.

attentiveness on the part of the learner is a possible explanation for lack of arbitrariness. However, there are other possible explanations, which will be discussed in the final chapter.

### 1.3 Roadmap

To support the criteria-governed productivity approach to Baker's Paradox, I survey a range of phenomena that have been adduced in support of the premise of arbitrariness. For each one, I aim to show that the restrictions that have been observed do not manifest arbitrary exceptions, by identifying the criteria governing the patterns involved, and showing that the items exhibiting these restrictions fail to meet the criteria governing the pattern.

The first case study focuses on the English causative alternation, relating transitive *break*, for example, to intransitive *break* (Chapter 2). Although semantic criteria have been proposed for predicting whether or not a given verb undergoes the causative alternation (Pinker 1989; Levin and Rappaport Hovav 1995), it has been claimed that these criteria do not fully capture the set of alternating verbs, and that the learner must acquire knowledge of certain arbitrary lexical exceptions (e.g. Bowerman and Croft 2008). I argue that Levin and Rappaport Hovav's (1995) semantic criteria for participating in the causative alternation in fact capture the set of alternating verbs well, correctly excluding the putative arbitrary exceptions.

In Chapter 3, I investigate constraints on the productivity of ditransitivity, as in, for example, *give John the book*. In this domain, there are some semantic restrictions, but it also appears that there are restrictions based on the form of the verb. Verbs of Latinate origin such as *donate* tend to be unacceptable as ditransitives, and it has been suggested that this etymological generalization could be learned based on

aspects of the form of the verb that would be observable to the learner: In particular, Latinate verbs tend to be *longer* than verbs of native origin, as measured by either prosodic weight (Grimshaw and Prince 1986; Grimshaw 2005) or morphological complexity (Harley 2006). The problem in this domain, therefore, lends itself to experiments involving nonce words in which meaning is held constant and the form of the word is manipulated. Building on Gropen et al.'s (1989) finding that monosyllabic nonce words like *moop* are more acceptable as ditransitives than trisyllabic ones like *dorfinize*, I present two nonce word experiments with adult native English speakers, to investigate the roles of prosodic weight, morphological complexity, perceived etymology, and formality in governing the productivity of ditransitivity.

Chapter 4 focusses on the behavior of prepositions. This investigation targets one of the cases discussed in Culicover's (1999) book *Syntactic Nuts*, in which he argues for the existence of a range of idiosyncrasies in English. He claims in particular that prepositions can differ arbitrarily in their ability to strand (as in *Who did you speak to?*) or pied-pipe (as in *To whom did you speak?*), but I show in Chapter 4 that the behavior of the prepositions he discusses can be understood on the basis of general principles of English grammar.

In Chapter 5, I investigate a putative case of arbitrariness involving adjectives. This case is brought up by Goldberg (2006), who argues that adjectives differ arbitrarily in their ability to function either prenominal (e.g. *That is a mere/\*asleep child*) or predicatively (e.g. *That child is asleep/\*mere*). Again, I argue that the behavior of these words can be understood on the basis of general principles.

I conclude that there is no evidence from any of these domains for the necessity of learning arbitrary exceptions to productive patterns. This conclusion about the linguistic situation leads to a view of the language learner as one who prefers explanatory generalizations over individual stipulations: the *explanation-seeking learner*.

## Chapter 2

# The Causative Alternation

The first instance of Baker’s Paradox I will discuss is the English *causative/inchoative alternation*. A *causative alternation* relates pairs of transitive and intransitive verbs sharing a root, where the transitive variant can be interpreted as, roughly, “cause to V-intransitive.” For example, the verb *break* has both a transitive and an intransitive use, illustrated in (1a) and (1b) respectively.

- (1) a. John broke the vase.  
b. The vase broke.

The intransitive variant in this case describes an eventuality in which the *theme* participant (the vase) undergoes a change of state, becoming, for example, broken; this type of meaning is called *inchoative*. The transitive variant describes the causation of this state; hence, it is called *causative*. The causative alternation of principal interest in this chapter relates causative and inchoative verbs, and is called the *causative/inchoative alternation*, but I abbreviate it to “the causative alternation.”

The productivity of this alternation can be illustrated by the fact that there are many verbs that undergo it (hundreds are listed in Levin 1993, §1.1.2.1), and by the fact that novel verbs alternate. New verbs entering the language, such as *de-Bushify*,

show the alternation; (2a) is attested<sup>1</sup> and grammatical constraints do not prevent people from saying (2b).

- (2) a. We have to de-Bushify U.S. foreign policy in Iraq.  
 b. U.S. foreign policy in Iraq is slowly de-Bushifying.

I anticipate (2b) being attested soon after Barack Obama takes office next month.

Despite the productivity of the alternation, not all intransitive verbs have associated causative transitive variants; consider *giggle*:

- (3) a. \*Don't giggle me!  
 b. I giggled.

Likewise, there are some transitive verbs without associated intransitive variants, like *lose*:

- (4) a. I lost my key.  
 b. \*My key lost.

Thus, although it is productive, the causative alternation does not produce every imaginable pair of verbs such that one describes the causation of the eventuality described by the other. This situation makes for an instantiation of Baker's Paradox, comprising the following premises: (i) that the alternation is productive (*productivity*), (ii) that there are some verbs that arbitrarily fail to undergo the alternation despite meeting the criteria governing its productivity (*arbitrariness*), and (iii) that no evidence regarding the inability of certain verbs to undergo the alternation is available for the learner (*no negative evidence*).

The purpose of the present chapter is to deny the "arbitrariness" premise for the instantiation of Baker's Paradox in this domain. This is not an uncontroversial

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<sup>1</sup>[www.neilrogers.com/news/articles/2004070918.htm](http://www.neilrogers.com/news/articles/2004070918.htm)

position to take; Braine and Brooks (1995) and Bowerman and Croft (2008) argue for the opposite. Since an arbitrary exception is a verb that simply fails to undergo the alternation despite meeting the criteria governing the productivity of the alternation, it is necessary to show either that a given verb does undergo the alternation or that it does not meet the associated criteria, in order to show that it is not such an exception. Thus, a crucial step in the argument either for or against arbitrariness is to establish what these criteria are. Establishing the criteria is the focus of §2.1, which explains how the distinction between *internal* and *external causation* is related to status of a verb as alternating or non-alternating, largely following Levin and Rappaport Hovav (1995). In §2.2, I will apply these criteria to examples that have been held up as putative arbitrary exceptions, and show that these examples fail to meet the criteria for participating in the alternation.

In order to render the non-arbitrariness claim falsifiable, it is necessary to have a means for determining whether or not a verb meets the criteria. One of the challenges in doing so stems from a lack of reliable independent diagnostics for internal vs. external causation. An additional contribution of this chapter is a semantic diagnostic for distinguishing internal and external causation. Although I limit my attention to cases that have been claimed to be arbitrary exceptions in the literature, rather than addressing every verb in English, I conclude from my examination of proposed counterexamples that the onus is on proponents of arbitrariness premise to find new counterexamples, and moreover to establish that the criteria for participating in the alternation are met in these cases.

## 2.1 Defining the criteria

Whether or not a verb meets the criteria for undergoing an alternation depends, of course, on what the criteria for undergoing the alternation are. Pinker’s (1989) characterization of the semantic distinctions relevant to the causative alternation, discussed in §2.1.1, have been very influential; even recently, arguments for arbitrariness in the causative domain have presupposed his *narrow-range rules* to represent the semantic criteria for undergoing the causative alternation. §2.1.2 describes the more up-to-date characterization of the criteria offered by Levin and Rappaport Hovav (1995); this is the set of criteria that should be taken as the basis for arguments either in favor of or against arbitrariness.

### 2.1.1 Pinker’s (1989) narrow-range rules

According to Pinker’s (1989) proposal, children have a *broad-range rule*, which provides the necessary conditions for a verb to alternate, along with a set of *narrow-range rules*, which provide the sufficient conditions. The broad-range rule for the causative alternation is shown in Figure 2.1 (taken from Marcotte 2006; Pinker repeats the structure of the caused event on the righthand side rather than using a coindexation tag as shown in the figure). It relates two “thematic cores,” i.e., classes of verb meanings that are systematically related to particular types of argument structures. It permits interconversion between (i) a verb describing a ‘dynamic’ event (say,  $e_1$ ), in which some participant  $Y$  acts, and (ii) a verb describing a complex event in which  $Y$  is acted upon (say,  $e_2$ ), of which  $e_1$  is an effect. Being a broad-range rule, it specifies only the necessary conditions for a verb to undergo the causative alternation; not all lexical semantic representations matching one of the thematic cores subject to the broad-range rule can be converted to a representation matching the other thematic core, but all instances of this rule match this general pattern.

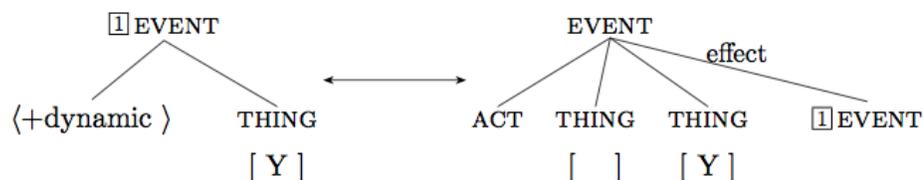


Figure 2.1: The broad-range rule for the causative alternation (Pinker 1989)

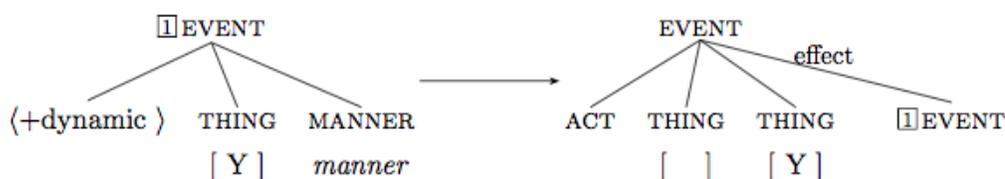


Figure 2.2: A narrow range rule for the causative alternation (Pinker 1989)

The lexical semantic representation of a verb must also match a thematic core described by a *narrow-range rule* in order to alternate. There are some verbs whose meaning is consistent with one or the other side of the broad-range rule, which are not predicted to have associated transitive or intransitive forms. Broad-range rules drop away by the time adulthood is reached, and only narrow-range rules are left; hence, narrow-range rules constitute Pinker’s claim about adult knowledge.

A narrow-range rule for verbs of manner of motion such as *roll* is given in Figure 2.2 (again, taken from Marcotte 2006). In the case of *roll*, the *manner* element would be *rolling*. This rule allows all manner of motion verbs to alternate. Pinker lists two narrow-range rules for the causative alternation, pertaining to two verb classes:

- (5) Verb classes with narrow range rules
  - a. change of state verbs: *melt, open, break, shrink, shatter, ...*
  - b. manner-of-motion verbs: *slide, skid, float, roll, bounce, ...*

The following semantic classes *lack* narrow range rules, according to Pinker:

- (6) Verb classes lacking narrow range rules
- a. inherently directed motion verbs: *go, come, rise, fall, exit, ascend, leave, arrive, ...*
  - b. change-of-existence verbs: *appear, disappear, expire, vanish, ...*
  - c. action verbs: *jump, walk, talk, climb, drink, sing, ...*
  - d. verbs of emission: *glow, glisten, sparkle, blaze, shriek, buzz, bubble, leak, ooze, smell,....*

This system of narrow-range rules may appear quite intricate and “arbitrary” in a sense. However, by claiming that the causative alternation is governed by narrow-range rules, Pinker is claiming that the causative alternation is not arbitrary, but predictable based on these semantic criteria, and advocating a solution to Baker’s Paradox that involves denying arbitrariness (criteria-governed productivity), just as this dissertation aims to do. Even if the criteria that he proposes do not perfectly capture which verbs alternate and which verbs do not, the larger point that the causative alternation is predictable based on semantic criteria may still hold, and I argue that in fact, it does.

## 2.1.2 Levin and Rappaport Hovav’s (1995) analysis

### 2.1.2.1 Internal vs. external causation

Despite being narrow in range, Pinker’s classes do not always make the right cuts in the right locations. A more accurate account relies on the contrast between *internally caused* and *externally caused* eventuality types (Smith 1970; Levin and Rappaport Hovav 1995). An *internally caused* eventuality is one in which “some property inherent

to the argument of the verb is ‘responsible’ for bringing about the eventuality” (Levin and Rappaport Hovav 1995:91). Agentive intransitive verbs such as *play* and *speak* (Pinker’s “action verbs”) are internally caused because the subject argument is the agent of the event.<sup>2</sup> Verbs do not have to be agentive to be internally caused; some nonagentive verbs taking animate arguments such as *blush* and *tremble* are also internally caused, because the eventuality comes about as a result of bodily physical processes. Even verbs with inanimate arguments can be internally caused. These include verbs of emission, such as *burble* (sound emission), *flash* (light), *stink* (smell), and *ooze* (substance). The eventualities described by these verbs come about solely because of the subject argument: “For example, only embers, lights, and certain substances glow since only they have the necessary properties” (ibid, p. 92).

In contrast, *externally caused* verbs “imply the existence of an ‘external cause’ with immediate control over bringing about the eventuality described by the verb: an agent, an instrument, a natural force, or a circumstance” (Levin and Rappaport Hovav 1995:92). Prototypically alternating verbs such as *break* and *open* fall into the externally caused class.

### 2.1.2.2 Direction of derivation

Externally caused verbs are basically causative, hence transitive, according to Levin and Rappaport Hovav (1995), and are subject to a detransitivization process deriving the intransitive variant. Evidence for the treatment of the inchoative variant of the causative/inchoative alternation as derived from the causative variant comes from a typological study of four verbs including *break* and *laugh* in sixty languages by Nedjalkov (1969), who finds that transitive causative *break* is usually morphologically unmarked, while for *laugh*, the transitive causative form is usually morphologically

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<sup>2</sup>“Internally caused” and “externally caused” are not really properties of verbs, but rather of the eventualities they describe, but this is a convenient shorthand.

marked (Levin and Rappaport Hovav 1995:87–88). For *break*, the intransitive is identical to the transitive in 19 out of 60 languages, and morphologically derived from the transitive in 22 out of 60 languages. (In the remaining languages, the transitive is derived from the intransitive for *break*.) By sharp contrast, the causative form of *laugh* is morphologically marked in 54 out of 60 languages (Levin and Rappaport Hovav 1995:87–88).

The issue of which form is derived is important because it is relevant to the issue of what putative arbitrary exceptions in this domain would be exceptions *to*. Since transitive verbs are the “input” to the rule generating the causative alternation, exceptions to this rule would constitute transitive causative verbs that do not detransitivize. If there were intransitive verbs that failed to show transitive forms despite being externally caused, they would constitute exceptions to the generalization that externally caused verbs are basically transitive.

Levin and Rappaport Hovav (1995) assume that the semantic representation corresponding to the intransitive variant is derived from that of the transitive variant through a detransitivization process that converts a representation like (7a) to a representation like (7b).<sup>3</sup> In these representations, unbound variables (also called “open variables”) are the event participants that end up linked to argument positions and expressed syntactically. The number of open variables corresponds to the number of syntactic arguments, so existentially binding one of the variables corresponding to a transitive verb renders it intransitive.

- (7) a.  $[[x \text{ DO-SOMETHING}] \text{ CAUSE } [y \text{ BECOME } STATE]]$   
 b.  $\exists x [[x \text{ DO-SOMETHING}] \text{ CAUSE } [y \text{ BECOME } STATE]]$

For example, the transitive variant of the externally caused verb *break* has the representation in (7a) with *BROKEN* filling in for *STATE*. To derive the intransitive

<sup>3</sup>Lexical decompositions using a CAUSE primitive are motivated by considerations discussed by e.g. Dowty (1979).

variant of *break*, the causer variable  $x$  is existentially bound, producing a structure like (7b). After existential binding, there is only one unbound variable, so the formula represents the meaning of an intransitive verb. Notice that this analysis, along with those of Chierchia (2004) and Koontz-Garboden (2007), treat externally caused verbs as having semantics involving causation even in their intransitive variants.<sup>4,5</sup>

### 2.1.2.3 Linking rules

According to Levin and Rappaport Hovav (1995), the reason that internally caused verbs fail to alternate has to do with *linking rules*. Linking rules relate positions in the semantic representation associated with a verb with positions at the level of *argument structure*, which consists of a list of the participants that are expressed as syntactic arguments in the clause headed by the verb. Argument structure is commonly assumed to contain a distinguished position for the *external argument*, which is normally mapped to the subject position (Williams 1980; Grimshaw 1990). The first element in the list of *internal arguments* is mapped to direct object position when the external argument is mapped to subject position, but can otherwise surface as the subject of the clause.

Using these assumptions about argument structure, Levin and Rappaport Hovav (1995) posit a linking rule that maps the *immediate cause* to the external argument position (the Immediate Cause Linking Rule). As an external argument, the immediate cause surfaces as the syntactic subject, whether it is an internal cause or an

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<sup>4</sup>Chierchia (2004) argues that modification by *da sè* ‘by itself’ in Italian is a diagnostic for the existence of a CAUSE eventuality in the semantics of the verb, and in particular, implies that the antecedent is the *sole cause* of the event. But there are examples that cannot easily be accommodated even under this characterization, e.g. *The baby finally walked by itself*. There is no support for *walk* as a causative verb. Modifiability with *by itself* under the ‘without outside help’ interpretation does not seem to be a reliable diagnostic for the presence of causative structure in the verb (or for internal vs. external causation, as mentioned in an earlier footnote).

<sup>5</sup>See also Koontz-Garboden (2007:265–268) for another argument for the presence of CAUSE in the semantics of alternating verbs from the *feel-like* construction in Albanian.

external cause. The causer of an externally caused eventuality (e.g. the breaker in a breaking event) and the causer of an internally caused eventuality (e.g. the giggler in a giggling event) both count as the immediate cause, so they are both mapped to subject position. The non-causer argument of an externally caused verb is mapped to an internal argument by the Default Linking Rule, which maps an argument to the internal argument position if no other rule has applied. The internal argument position at argument structure corresponds to the direct object of a clause, except when the causer is existentially bound, in which case it is expressed as the subject. (In the latter case, since the subject corresponds to an internal argument, the verb is *unaccusative*; see Burzio 1986.)

The Immediate Cause Linking Rule explains why internally caused verbs cannot have lexical causatives, as follows (Levin and Rappaport Hovav 1995:144):

The Immediate Cause Linking Rule associates the single argument of [internally caused verbs] with the external argument position in the argument structure. The causative counterpart of such a verb would involve the introduction of an external cause, which itself must be the external argument of the causative verb by the Immediate Cause Linking Rule. Since the linking of the internal cause argument would not be affected by the introduction of the external cause, the external cause would compete for the single external argument slot in the argument structure with the verb's own argument. The unavailability of sufficient positions for the two causes would prevent the existence of lexical causative uses of internally caused verbs.

Under this explanation for the inability of verbs describing internally caused eventualities to form lexical causatives, a clash arises from competition between the internal and the external cause for the external argument position.

As noted by Levin and Rappaport Hovav (2005:70), the concept of immediate cause can perhaps be identified or replaced with Van Valin and Wilkins's (1996) notion of *effector*, which is defined as "the dynamic participant doing something in an event" (Van Valin and Wilkins 1996:289), and corresponds to a particular position

in the predicate decomposition structure (the first argument of the predicate **do'**). This notion is more general than agency, and also includes inanimate causers such as natural forces and instruments. Van Valin and Wilkins argue that the notion of effectorhood is more relevant to argument realization than the notion of agency, which they take to be a cancellable pragmatic entailment rather than a lexical specification in most cases (although some verbs, like *murder*, lexicalize agency). The Immediate Cause Linking Rule can be recast using the notion of effectorhood as follows:

(8) **Effector Linking Principle**

The effector corresponds to the external argument; all other roles are linked to the internal argument position.

Levin and Rappaport Hovav's (1995) explanation for why internally caused verbs fail to alternate would apply in the same way under this assumption. That is, the internal and external causes are both effectors, and would therefore compete for the external argument position.<sup>6</sup>

Levin and Rappaport Hovav (1995) note that another explanation for the inability of internally caused verbs to form lexical causatives comes from the notion that lexical causatives must express direct causation (Pinker 1989). Lexical causatives, unlike periphrastic causatives with *make*, are incompatible with interpretations under which there is an intervening cause (Shibatani 1976; Wolff 1999). For example, the lexical causative in (9a) is compatible with a smaller range of interpretations than the periphrastic causative in (9b).

- (9) a. John broke the glass.  
 b. John made the glass break.

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<sup>6</sup>Role and Reference Grammar has its own theory of linking, which incorporates the notion of the semantic *macroroles* Actor and Undergoer. Semantic macroroles determine which argument is expressed as the *privileged syntactic argument* (which is roughly equivalent to the notion of grammatical subject). For present purposes, however, it is not necessary to introduce this additional concept into the theoretical framework.

Only (9b) is compatible with a scenario in which John sneezed, scaring the cat, causing the cat to jump onto the table, breaking the glass. (9a) is not compatible with this scenario (or to use (9a) in this scenario would constitute an unusual conceptualization of the event).<sup>7</sup> This *directness constraint* (that lexical causatives must express direct causation)<sup>8</sup> could be used to derive the incompatibility of internally caused verbs with lexical causatives: The internal cause could be seen as an intervening cause, making causation indirect. For example, the internal cause of a giggling event is the giggler. Causation of a giggling event by an outside agent or force would therefore necessarily be indirect, because the giggler is an intervening cause. Since lexical causatives must express direct causation, an indirectly caused eventuality would not be expressible as a lexical causative.

Rather than being in competition with the explanation based on direct causation, the explanation based on conflicting immediate causes can be seen as a particular way of explaining the directness constraint: The directness constraint can be re-interpreted as a requirement that an effector be linked to an external argument position. Thus, not only does the Effector Linking Principle in (8) predict that internally caused verbs do not alternate, it also allows the direct causation constraint to be derived as a consequence.

Levin and Rappaport Hovav (1995) argue for a linking rule system that is slightly more complex than (their version of) the Effector Linking Principle because there is a class of internally caused verbs that are unaccusative, namely, internally caused

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<sup>7</sup>It would seem that indirect causation is not entirely incompatible with lexical causatives, since lexical causatives can be modified by *indirectly*, as in *John indirectly broke the glass*, which explicitly asserts indirectness of causation (Ivan Sag, p.c.). Such a case may still be conceptualized differently from the corresponding periphrastic causative, however, perhaps attributing more responsibility to *John* (Beth Levin, p.c.).

<sup>8</sup>This statement is not completely accurate; it must be revised to account for the fact that in languages with morphological causatives such as Japanese and Hungarian, a single word can express indirect causation. Shibatani's (1976) distinction between *lexical* and *productive* causatives might be useful toward this aim.

change of state verbs such as *bloom*. If the argument of an internally caused change of state verb were an effector, then it would be expected to be mapped to the external argument position, counter to fact. Levin and Rappaport Hovav (1995) explain the unaccusativity of such verbs using ordered linking rules. They posit a rule linking arguments that undergo a directed change to the internal argument position (the Directed Change Linking Rule), which takes precedence over the rule linking the immediate cause to the external argument position. The participant in the eventuality described by an internally caused change of state verb is subject to both linking rules, because it is both an immediate cause and also the undergoer of a directed change. Since the Directed Change Linking Rule applies first, the participant is linked to the internal argument position.

Another possible explanation for the unaccusativity of internally caused change of state verbs would posit that their theme argument is not in fact an effector, even though the argument of internally caused verbs generally is. This latter solution receives support from the fact that internally caused change of state verbs actually do have a restricted type of lexical causative (Wright 2002). The following corpus examples, taken from Wright (2002:341), illustrate this:

- (10) a. Early summer heat blossomed fruit trees across the valley.  
 b. Salt air and a few other common pollutants can decay prints.  
 c. Raindrops selectively erode clay particles.  
 d. The onset of temperatures of 100 degrees or more, on top of the drought, has withered the crops.

The availability of lexical causative uses of these verbs (along with their unaccusativity) can be explained if the undergoer of the change is not an effector. Under this assumption, there would be no clash between the causer and the causee arising from competition for the external argument position. (Note: This analysis would imply

that not all internal causes are effectors; only subjects of unergative verbs like *giggle* are.) This assumption simplifies the linking rule system, making it possible to maintain the Effector Linking Principle, rather than having to use ordered linking rules.

#### 2.1.2.4 Non-caused eventualities

Although internal vs. external causation is the primary semantic distinction relevant to the causative alternation, the picture is somewhat more complicated because not all intransitive verbs can be classified as either internally caused or externally caused. There is a third class, which we might call *non-caused*. Like internally caused verbs, they fail to alternate. This class includes verbs of existence and appearance, such as *appear*, *emerge*, *exist*, *flourish*, and *thrive*, along with verbs of spatial configuration such as *stand* and *sit*, in their stative uses. About these verbs, Levin and Rappaport Hovav (1995:148–149) say that “the notions of external and internal causation do not seem relevant to their semantic characterization.” In a footnote (Chapter 4, fn. 7, p. 298), they suggest that verbs of inherently directed motion such as *come* and *go* should also be classified in this way:

It is interesting that there is no need to subdivide the verbs of inherently directed motion according to internal and external causation in order to account for their properties. In fact, the meaning of these verbs seems to leave open whether they are to be understood as denoting internally or externally caused eventualities ... These verbs lexicalize a direction, rather than a means or manner. Means or manner, when lexicalized in the verb, can determine whether or not a verb will be agentive, and hence whether the verb can describe an internally caused eventuality, but direction, it seems, does not have this effect. In this respect these verbs are more like verbs of existence and appearance.

I take this discussion to imply that verbs of inherently directed motion fall into this third class, neither internally nor externally caused, but non-caused.

### 2.1.2.5 Agency restriction on detransitivization

Further complicating the picture is that not all externally caused verbs can be detransitivized; it appears that verbs that require their subject argument to be an agent such as *assassinate* cannot.

- (11) a. John assassinated JFK.  
 b. \*JFK assassinated.

According to Levin and Rappaport Hovav (1995:102), the relevant generalization is that “the transitive causative verbs that detransitivize are those in which the eventuality can come about spontaneously without the volitional intervention of an agent.” Thus, the causative alternation is governed by the following pair of generalizations (punctuation mine; op. cit: 105).

- (12) a. If the eventuality described by a verb has an external cause, the verb is basically transitive.  
 b. Moreover, if this eventuality can occur without the direct intervention of an agent, then the external cause does not have to be expressed in the syntax.

The first generalization concerns which verbs are basically transitive, and the second generalization concerns which of those detransitivize.

Why don't verbs that lexicalize agency detransitivize? Levin and Rappaport Hovav (1995:108) suggest the following answer: “If the verb lexically specifies something about the nature of the external cause, then it cannot be lexically bound, and the intransitive form of the verb would not be attested.” I believe that a potentially more explanatory solution lies in Marcotte's (2005) proposal that when an externally caused verb is detransitivized, it is not the doer of the causing event that is existentially bound, as in (7b), but rather the entire causing event, as in (13):

(13)  $\exists x$  [[ $x$  CAUSE [ $y$  BECOME *STATE*]]

In (13), the entire causing event is existentially bound, whereas in (7b), only the effector role is existentially bound. When the entire causing event is existentially bound, the effector role is no longer part of the representation, because the causing event is no longer specified as an action carried out by an effector. Suppose that the agency entailment is specified as a constraint on the effector role. This is plausible, because being an effector is a necessary condition for exhibiting agency (see Van Valin and Wilkins 1996). Without an effector role in the representation, the verb cannot express an agency entailment for it.

### 2.1.2.6 Causativization of manner-of-motion verbs

For Levin and Rappaport Hovav (1995), “the causative alternation” refers only to those transitive/intransitive pairs that are derived in the same way that the two argument structures for *break* are derived, that is, detransitivization (or not) of an externally caused verb. Other “causative pairs” – pairs of verbs  $v$  and  $v'$  such that  $v$  means *cause to v'* – may be derived in other ways. In addition to the causative alternation, “English has a more restricted phenomenon of causativization of agentive verbs of manner of motion in the presence of a directional phrase” (p. 119), for example:

(14) The general marched the soldiers to the tents.

Levin (1993) calls this the *induced action alternation*. This causativization process produces transitive uses of verbs like *walk*, *gallop*, *jump*, and *march* despite the fact that they are internally caused. In this case, the transitive variant seems to be derived from the intransitive variant, as evidenced by the fact that in many languages, the transitive variant of this type of verb is morphologically marked (Levin and Rappaport Hovav 1995).

### 2.1.2.7 Causativization of internally-caused change of state verbs

The existence of the lexical causatives of internally-caused change of state verbs, as shown in (10), brings up the issue of the correctness of the generalization that only externally-caused verbs undergo the causative alternation. These would appear to exemplify non-externally-caused verbs undergoing the causative alternation. However, these transitive uses do not seem to be related to the intransitive uses via the causative/inchoative alternation, but rather by a separate process. One difference between these causatives and *break*-type causatives is that these show a narrower range of subjects than *break*-type verbs; the causer is always a natural force, rather than an agent (Wright 2001), perhaps due to the fact that only natural forces are capable of directly causing these events, as proposed by Levin (2007). Another difference between the causative variants of internally vs. externally caused change of state verbs is apparent in Hebrew, where the transitive variant of these internally caused change-of-state verbs is marked, as Doron (2003) shows. This evidence suggests that unlike externally-caused verbs like *break*, internally caused change of state verbs may participate in a causative alternation in which the transitive variant is derived from the intransitive variant.

### 2.1.3 Summary

To summarize, externally caused verbs (e.g. *break*) undergo the causative alternation unless they are agentive (e.g. *cut*); internally caused verbs (e.g. *laugh*) and non-caused verbs (e.g. *come*) do not. Furthermore, in addition to the causative alternation proper (the causative/inchoative alternation), there is a causativization process that applies to agentive verbs of manner of motion in the presence of a directional phrase (e.g. *march ... to the tents*). There is also a productive process (perhaps only for some speakers) that transitivizes intransitive internally caused change-of-state verbs

(e.g. *Strong winds eroded the cliffs*). In the following section, I advance the claim that these are the generalizations that a learner must acquire, and that it is not necessary to memorize arbitrary exceptions to them.

## 2.2 Explaining the exceptions

Now that the productive generalizations driving the causative alternation(s) in English and the criteria governing them have been established, the question of whether or not there are arbitrary exceptions to them can be addressed.

### 2.2.1 Non-pertinent types of arbitrariness

Some of the examples that have been brought up in support of the idea of arbitrariness are not arbitrary exceptions in the relevant sense. Again, an arbitrary exception is a verb that fails to have a use as part of a productive pattern, despite meeting the criteria associated with it. From the perspective of Baker's Paradox, these are the exceptions of interest.

*Positive exceptions* constitute a type of "arbitrariness" that is worth distinguishing from the type of exception that is of interest. In some cases, it appears as if an internally caused verb has both transitive and intransitive variants, but in fact there are two senses of the verb, one which is internally caused and one which is externally caused. Levin and Rapaport Hovav list the following examples:

- (15) a. The baby burped.  
       b. The nurse burped the baby. (Smith 1970:107)
- (16) a. The doorbell buzzed/rang.  
       b. The postman buzzed/rang the doorbell.

- (17) a. The flashlight beamed/shone.  
 b. We beamed/shone the flashlight.

In the case of *burp*, notice that it can only be used when the burper is incapable of burping without outside help, for example, under certain circumstances, as a baby. This is evidence that transitive and intransitive *burp* have two separate senses, which supports the idea that transitive and intransitive *burp* are two separate lexical items.

Positive exceptions do not give rise to Baker's Paradox, but they could present a learning problem if they were too numerous. As Braine and Brooks (1995:365) put it, if the rate of positive exceptions is too high, this would make "the category induction problem facing the child infeasible." (By "the category induction problem" I assume Braine and Brooks mean "problem of inducing categories based on observations.") If there are 20 verbs in a given class, and all of the verbs but one alternate, then a constraint on the class is learnable through statistical association between class membership and failure to alternate. If 10 of the 20 verbs are positive exceptions, then there would be no statistical association between class membership and alternating status. On other other hand, if those 10 verbs form a coherent subclass on their own, then they are not positive arbitrary exceptions, and an association between semantic class and syntactic behavior can be identified.

Braine and Brooks (1995) point to verbs like *walk*, *march*, and *gallop* as systematic positive exceptions to Pinker's non-alternating narrow-range subclass of "volitional or internally caused action" verbs ("action verbs"). Unlike *burp*, these verbs are not positive arbitrary exceptions; it is *not* the case that they simply happen to have a dual classification as internally and externally caused. Rather, they are subject to their own productive rule, which has different properties than the causative/inchoative alternation. The existence of such exceptions does not mean that the learning problem is infeasible.

The classification of a verb as internally or externally caused can also be seen as “arbitrary” in the sense that a verb that is internally caused can have a translation equivalent in another language that is externally caused. As Levin and Rappaport Hovav (1995:98–99) emphasize:

The distinction between internally and externally caused eventualities is a distinction in the way events are conceptualized and does not necessarily correspond to any real difference in the types of events found in the world. In general, the relation between the linguistic description of events and the events taking place in the real world is mediated by the human cognitive construal of events, which is what we take our lexical semantic representations to represent.

One example they give is *deteriorate*, which for them (and me) is conceptualized as internally caused, but for some people apparently is conceptualized as externally caused, as the attested sentence *The pine needles were deteriorating the roof* suggests. This flexibility only exists within a certain semantic range; an agentive verb like *run* should not be conceptualizable as externally caused.

Another example is the Italian translation equivalent of the English verb *blush*, *arrossire*, which describes essentially the same type of event, but *arrossire* is conceptualized as an externally caused change of state verb, and *blush* is conceptualized as an internally caused verb, as Levin and Rappaport Hovav (1995:9,159–160) point out, building on observations by McClure (1990). This difference in semantic classification is supported, firstly, by the morphology: *arrossire* = *a* + *rosso* + *ire* contains the word for ‘red’ and literally means ‘become red’, whereas *blush* describes an ongoing activity. Moreover, *blush* and *arrossire* have different aspectual properties: in English, one can blush *for ten minutes*, but not *in ten minutes*; in Italian, the reverse holds. Thus, in English, *blush* describes an *activity* in Vendler’s (1957) sense, while in Italian, *arrossire* describes an *accomplishment*. Concomitantly, *arrossire* takes the auxiliary *essere* ‘be’ as opposed to *avere* ‘have’, showing that it is an unaccusative verb, as

predicted by its semantic classification as externally caused, rather than internally caused. There is therefore a sense in which the categorization of a verb as internally or externally caused is arbitrary. This sense of arbitrariness is the one evoked in de Saussure's (1916) phrase, "the arbitrariness of the sign." The classification of a verb as internally or externally caused depends on the conceptualization of the event that the verb names. Only because it is necessary to learn the meaning of each verb is it necessary to learn for each verb whether or not it is internally caused.<sup>9</sup>

That the semantic classification of a verb into one category or another is to some extent arbitrary does not imply the existence of arbitrary exceptions to a productive generalization. For example, take the generalization, "externally caused verbs have transitive forms." This generalization is consistent with any semantic classification of a given verb, so long as the verb behaves syntactically in accordance with the generalization. Suppose that *deteriorate* is externally caused; under this assumption, the generalization is satisfied so long as *deteriorate* has a transitive form. On the other hand, if *deteriorate* is internally caused, then the generalization does not require the verb to have a transitive form, and can be satisfied if it does not. Under either assumption, the generalization can be satisfied.

What constitutes an arbitrary exception in the domain of the causative alternation? In fact, there are two instantiations of Baker's Paradox in this domain, corresponding to the pair of productive generalizations governing the causative alternation given in (12), repeated here:

- (18) a. If the eventuality described by a verb has an external cause, the verb is basically transitive.
- b. Moreover, if this eventuality can occur without the direct intervention of an agent, then the external cause does not have to be expressed in the syntax.

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<sup>9</sup>See also Pinker (1989:302) for discussion.

Generalization (18a) predicts that any verb that is externally caused should have a transitive use. Any externally caused verb that fails to exhibit transitivity would then constitute an arbitrary exception to this particular productive generalization. Generalization (18b) would be violated by any externally caused verb without a required agent that does not have an intransitive use.

In a critique of Pinker (1989), Bowerman and Croft (2008) argue for the existence of arbitrary exceptions of both types – transitive and intransitive – claiming that “there are verbs that satisfy the restrictions and yet do not alternate,” (p. 284). The verbs they point to are *go*, *disappear*, *cling*, *glow*, *die*, *knock (down)*, and *lose*. In order to show that these verbs “satisfy the restrictions,” it is necessary to apply independent diagnostics to evaluate their semantic classification. For example, a verb that fails to exhibit a transitive form can be argued to be an arbitrary exception to the rule that externally caused verbs are basically transitive, only if it can be shown to be externally caused. Regardless of whether one is arguing for arbitrariness or non-arbitrariness, it is necessary to establish whether or not the item meets the criteria governing the pattern, in order to make a valid argument.

Reliable diagnostics for evaluating internal vs. external causation are not easily found, but there are several types of evidence that can be used, and I propose an additional test as well in §2.2.2.2. The available evidence indicates that the verbs that have been held up as putative arbitrary exceptions actually fail to meet the criteria governing productivity in this domain, and therefore need not be individually memorized as exceptions.

## 2.2.2 Diagnostics

### 2.2.2.1 Existing diagnostics of internal causation

How does one establish that a given verb is internally or externally caused? One potential diagnostic suggested by Levin and Rappaport Hovav (1995) is the interpretation of *by itself* as a modifier of the verb. As they point out, when modifying a verb like *laugh*, *by itself* receives an interpretation meaning roughly “alone” or “unaccompanied,” as in *the baby cried by herself*. With an externally caused verb like *open*, a sentence like *the door opened by itself* receives an interpretation according to which there is no cause for the opening of the door other than the door itself. According to Levin and Rappaport Hovav’s (1995) interpretation, the *by itself* phrase has the effect of co-identifying the external cause with the undergoer when it receives the “without outside help” interpretation. A problem for this assumption is the availability of the “without outside help” reading with clearly agentive verbs such as *eat*: *The baby ate all by herself!* This means that the interpretation of *by itself* is not a reliable diagnostic for internal vs. external causation.<sup>10</sup>

Another independent diagnostic for establishing the status of a verb as internally caused is suggested by Atkins and Levin (1995), who use corpus data to investigate the range of intransitive subjects with which verbs appear: The eventualities that are internally caused tend to have intransitive subjects limited to things that “have (or can be conceived of as having) ‘self-controlled’ or ‘autonomously-controlled’ bodies” (Atkins and Levin 1995:101). Their findings are included in the discussion below.

### 2.2.2.2 Direction of Force Principle

I would like to offer an additional way to identify internally caused eventualities, having to do with direct vs. indirect causation. A definitional feature of an internally

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<sup>10</sup>It may be that allowing the ‘without outside help’ reading for *by itself* is a necessary but not sufficient condition for being externally caused (Beth Levin, p.c.).

caused eventuality is that it cannot be directly caused by an outside entity (i.e., an entity distinct from the affected participant), since the direct cause either is or comes from within the affected participant. By showing that an eventuality can only indirectly be caused by an outside entity, one can argue for the status of an event as internally caused.

Direct vs. indirect causation is related to the individuation of events, in the following way: “When the causation is direct, [a] sequence of events can be viewed as a single event; otherwise, it cannot be viewed as a single event” (Wolff 2003). The idea that events are delimited on the basis of *causal chains* is put forth by Croft (1990, 1991). Croft (1991:169) explains the concept of a causal chain as follows: Atomic “events... have causal directionality, and they can be linked into a series of causally related events such that the endpoint or affected entity of the causally-preceding atomic event is the initiator of the next atomic causal event. This series I will call a *causal chain*.” This notion underlies the concept of the *simple event*, which is characterized using Lakoff’s (1987) idea of an “idealized cognitive model” as follows:

**(19) The Idealized Cognitive Model of a Simple Event**

- a. Simple events are segments of the causal network.
- b. Simple events involve individuals acting on other individuals (transmission of force).
- c. Transmission of force is asymmetric, with distinct participants as initiator and endpoint.
- d. Simple events are nonbranching causal chains.
- e. Simple events are independent; that is, they can be isolated from the rest of the causal network.

(Croft 1991:269, Croft 1998:47–48)

The idea of *isolation* from the rest of the causal network, mentioned in the final point, is key to the identification of simple events. “In order for an event to be easily isolable from the causal network, it must be conceptualized as not having a clear prior cause and not itself causing another event – that is, the event must have a clear starting point and a clear endpoint” (Croft 1990:58). If two events are part of the same simple event, and one causes the other, then the causation is direct; if the two events are not part of the same simple event, then the causation is indirect.

To facilitate the process of identifying simple events, I propose the following principle:

(20) **Direction of Force Principle**

When direction of force changes from one event in a causal network to the next, the event bringing about the change in direction of force constitutes a starting point for a simple event.

If a resulting event primarily involves motion in the same direction that the force of the causing event was exerted in, then the resulting event can be conceived of as directly caused by the causing event. Otherwise, an intermediate cause is posited.

For example, in the case of breaking a vase with a hammer, the hammer-moving event along with the breaking event primarily involves motion in the same direction in which the hammer is swung. But when internally caused events are caused by an outside force, there is often a change in the direction of action. For example, if my roommate makes me laugh, her joke can be seen as moving “in” toward my face, causing breath and sound to come “out” away from my face, in the opposite direction. The resulting event involves motion in the opposite direction from the causing event. In the case of verbs of emission, what is emitted comes “out” in all directions, whereas any outside force would come “toward” or “in” from some particular direction. Blushing involves less motion, but can be seen as the result of

blood (or redness) filling the face, from within the body. To directly cause this to happen from the outside would involve directing blood or redness into the face. (This could perhaps be done from within the body; if blushing facilitated some medical procedure, and a doctor could send blood into the face, we might speak of “blushing” people, transitively.)

Support for the importance of direction in the conceptualization of events comes from a study carried out by the Event Representation Group at the Max Planck Institute in Nijmegen, reported by Bohnemeyer (2003). In this study, speakers of typologically diverse languages were asked to describe short video clips of motion events. Speakers of Dutch-like languages were found to package more information about a motion event into a single clause than speakers of languages like Yucatec. For example, what Dutch speakers could describe with a direct translation of “X moved from A via B to C,” Yucatec speakers would describe with something like “X was at A, then passed by B, then went to C.” However, all speakers in the study used multiple clauses to describe events with changes of direction. For example, to describe a motion from A to C via B, in which B is north of A and C is east of B, multiple clauses are required (examples (21a) and (21b) are adapted from Bohnemeyer’s example 13; examples (21c) and (21d) are control sentences showing that it is not the way that *north* or *east* is used that is the problem in (21a)):

- (21) a. \*X moved north via B east to C.  
 b. X moved north via B and then east to C.  
 c. X moved via B east to C.  
 d. X moved north via B to C.

The same point is illustrated by the contrast between (22a) and (22b) (examples adapted from Bohnemeyer’s example 11).

- (22) a. The ball rolls up (the wall) ?(and) over the top.

- b. The ball rolls up (the wall) \*(and) down the other side.

While *up* and *over* describe motion in the same (or similar) direction(s), *up* and *down* describe motion in opposite directions. When the sentence describes motion in opposite directions, multiple clauses are necessary (and this is provided by the inclusion of *and*).

Bohnmeyer (2003:101) adduces these data in support of the existence of a universal *Unique Vector Constraint*. According to this constraint, “all direction vectors denoted in a single simple clause referring to a single continuous motion event must be collinear and of the same polarity,” where the *direction vectors* denoted in a clause are determined by the motion of a moving *figure* either with respect to one or more static *grounds* (Talmy 1985; Jackendoff 1983) or the motion of a figure with respect to a frame of reference defined with terms such as *up*, *down*, *north*, or *left*.

The principle in (20) could be seen essentially as applying the same constraint to single events, rather than single clauses. However, it is important to keep in mind that the relevant movement is not carried out by what is normally thought of as a “figure,” and it certainly is not always carried out by a participant that is expressed in the sentence. In the case of glowing, for example, the emitted light is not what would normally be thought of as a “figure” – at least, it is not expressed in the sentence. The Direction of Force Principle applies to the motion of (possibly abstract) entities or substances that characterize the direction of movement for an event, but are not necessarily syntactically expressed. Otherwise, it has a great deal in common with Bohnmeyer’s Unique Vector Constraint.

### 2.2.3 Intransitive-only putative exceptions

#### 2.2.3.1 Internally caused verbs

With this in mind, let us consider whether Bowerman and Croft's (2008) examples are arbitrary exceptions. *Cling* and *glow* are verbs whose inabilities to function as transitives (*\*to cling something (to something else); \*to glow something*) are argued to be arbitrary gaps. If so, they would be counterexamples to the generalization that externally caused verbs are basically transitive, and they should be externally caused. I argue that *cling* and *glow* are, rather, internally caused. *Glow* is a prototypical verb of light emission; verbs of emission are internally caused because what is emitted comes from within the object. As for *cling*, an object clings to something by exerting a certain combination of forces on what it is clinging to, allowing continued attachment. These forces cannot be exerted from the outside; the attachment is therefore the result of forces internal to the object clinging.

Another critique of Pinker's (1989) narrow-range subclasses comes from Braine and Brooks (1995:364), who argue for the status of the following as arbitrary exceptions: "several verbs denoting extrinsic changes of physical state (e.g. *subside*, *wither*, *shrivel*, *fluctuate*) as well as manner of motion (e.g. *quiver*, *totter*, *ripple*, *revolve*, *waver*, *stumble*, *oscillate*, *vibrate*)." The inability of these verbs to alternate can be explained based on their status as internally caused.

The verb *stumble* can be argued to be internally caused on grounds of the range of subjects it takes: It is restricted to entities that are capable of walking-like motion, all of which are animate creatures with legs. The act of stumbling crucially involves taking steps; it is "to miss one's footing" (Oxford English Dictionary). Steps cannot be taken by any agent or force outside the legged creature that is stepping.

Some of Braine and Brooks's (1995) examples are "shake" verbs, whose semantic classification was addressed by Levin and Rappaport Hovav (1995) and in a corpus

study by Atkins and Levin (1995). Levin and Rappaport Hovav (1995:100–101), addressing the contrast in syntactic behavior between *shake* and *shudder* (*shake* has both transitive and intransitive uses and *shudder* has only an intransitive use), argue for a difference in semantic classification between these two verbs as follows:

Not only is the set of things that shudder to a large extent a subset of the set of things that shake, but it is a subset precisely in a way that is consistent with the classification of *shudder* as describing an internally caused eventuality. Things that shudder usually can be thought of as having a “self-controlled” body; they include people, animals, and, perhaps by forced extension, the earth, engines, machinery, and vehicles. In contrast, leaves, teacups, and furniture, none of which can be said to have a “self-controlled” body, can only shake. This distinction is relevant because the type of movement characteristic of shaking or shuddering can be internally caused only with those things that have self-controlled bodies.

This argument provides independent evidence for the analysis of *shudder* as internally caused; an eventuality that is internally caused should only be used with subjects that are capable of causing it. They also find that *quake* and *shiver* are restricted in the types of subjects they appear with.

Atkins and Levin (1995) study the distribution of seven “shake” verbs: *quake*, *quiver*, *shiver*, *shudder*, *tremble*, *shake*, and *vibrate*. *Quiver* – one of Braine and Brooks’s (1995) putative arbitrary exceptions – and *tremble* are also found with subjects that could be thought of as “self-controlled,” suggesting an internally caused classification. These verbs are also often found with subjects that describe body parts. Atkins and Levin (1995:102) argue that the use of these verbs with body parts as subjects is consistent with an internally caused classification of these verbs, on the basis that “the event is conceived of as initiated in that person’s body”; for example, “a hand does not tremble as a direct response to an external stimulus; rather, a hand trembling is a manifestation of a more-often-than-not involuntary emotional or physical reaction, which is itself a response to an external stimulus.”

*Quiver* and *tremble*, along with *fluctuate*, *totter*, *revolve*, *ripple*, and *oscillate* fall into a semantic class of verbs describing cyclical motion. Here a distinction is necessary: Not all verbs describing cyclical motion lack transitive forms; for example, *spin* and *rotate* have transitive uses as well as intransitive uses (e.g. *to spin/rotate a wheel*). What distinguishes the alternating verbs (*spin* and *rotate*) from non-alternating verbs like *totter* and *revolve* is that the former do not involve change in location, but only motion around an axis located at the center of the object. Since the location of the object does not (necessarily) change in a spinning or rotating event, there is a sense in which the object is not (necessarily) “moving.” This sense of movement can be referred to as *translation*. When there is no translation, there is no change in direction. By contrast, the motion of verbs like *totter* and *revolve* involves cyclical changes of location and direction. Verbs describing cyclical changes of location can be argued to be internally caused on the grounds that they involve eventualities in which the motion of an object in one direction causes it to move in a new direction. If an object is tottering back and forth, it must move “back” in order to move “forth.” In other words, motion in one direction is dependent on motion in the other. Thus, the eventualities described by these verbs involve self-caused motion.

This argument can be tightened using the Direction of Force Principle. The direction of force causing the motion changes along with the motion itself, so according to the Direction of Force Principle, an outside entity cannot directly cause the motion unless the outside entity changes the direction of the force it is exerting along with the motion of the object. With a *totter*-type verb, for an outside cause to constantly exert force in the direction of motion, it would have to alternately exert force in one direction, and then the opposite.<sup>11</sup>

As for *vibrate*, Atkins and Levin (1995) find that it is listed in several dictionaries

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<sup>11</sup>Under such a scenario, *totter* is actually attested as a transitive verb: “I lifted the briefcase ostentatiously onto the tabletop, angled it on-end, and tottered it into his awaiting grasp” – from “A Different Kind of Careful” by M. Stanley Bubien, from *Story Bytes* Issue #59, March 2001, p. 7.

as an alternating verb, and they find it used as a transitive verb in corpora as well. This verb is a *spin*-type verb, because vibration involves motion around a potentially unmoving axis. For example, when a string vibrates, the position of the string at rest defines the axis around which motion of the string takes place, and this axis can remain in the same location throughout the vibrating event. The string itself, therefore, does not undergo translation and, in this sense, does not move. It is unlike verbs like *totter* in this crucial way, and is therefore not internally-caused, hence eligible for use as a transitive verb.

The verbs *subside*, *wither*, and *shrivel* can be conceived of as internally caused because the motion they describe involves a force pulling from within, rather than pushing from without. Any external force would push from the outside, so subsiding, withering, and shrivelling cannot be caused directly by an outside force, according to the Direction of Force Principle.

Although their critique is mainly directed at Pinker (1989), Bowerman and Croft (2008) also address the internal/external causation distinction directly, and argue that it does not fully capture the set of alternating vs. non-alternating verbs, and that there are certain arbitrary exceptions to be learned. They claim that the verb *overflow* constitutes an example of an externally caused, non-alternating verb. They illustrate the unacceptability of transitive *overflow* with the following example of an overgeneralization error from Bowerman's daughter Christy:

(23) You're gonna overflow the spoon with medicine (Christy 6;7).

I argue that *overflow* is internally caused (in general; but see below). When something overflows, there is a container and some substance, and the volume of the substance begins to exceed the capacity of the container. This eventuality can be seen as internally caused because the contents of objects that overflow can be construed as inseparable from the container. For example, one can think of the water in a toilet as

part of a toilet, or the liquid in a glass as part of the glass. The substance becomes part of the container (or the object as a whole), and they become cognitively inseparable. Thus, the outward motion of the substance originates within the overflowing entity. To cause overflowing as an outside entity would involve a change of direction of force: an outside entity would exert force from the outside in toward the overflowing entity, and then the overflowing substance would move out away from it. This chain of events could not be construed as direct causation by the Direction of Force Principle. *Overflow* therefore fits the characterization of internally caused eventualities.<sup>12</sup>

I agree with Bowerman's judgment that *overflow* cannot be used transitively, although there does seem to be a productive class of examples especially in relation to computer memory buffers, where the subject can be either an agent, as in (24a), a computer program, as in (24b), or data, as in (24c).<sup>13</sup>

- (24) a. The break-in occurred when the hacker overflowed the buffer of a system daemon running as root.
- b. A simple script overflowed the buffer on the IIS 4.0 Web server.
- c. Input larger than 512 bytes overflowed the buffer.

The computer security-related sense of *overflow* exhibited in (24) is metaphorical, so the forces involved are not literal, and they are not subject to the laws of physics. In comparison to liquid overflowing, this sense of *overflow* describes an event that can be much more directly controlled. A computer hacker executing a buffer overflow has greater control over the contents of a buffer, and the metaphorical substance with which it is filled. Agency is known to have an impact on the perception of causation

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<sup>12</sup> *Overflow* is open to multiple construals; the meaning of *overflow* could be construed as externally caused if the contents are not conceived of as part of the container. There seem to be some speakers on the internet who allow transitive *overflow* even with participants like toilets; these speakers may conceive of this verb as externally caused.

<sup>13</sup>(a) [www.securityfocus.com/infocus/1416](http://www.securityfocus.com/infocus/1416); (b) [books.google.com/books?isbn=0849320429](http://books.google.com/books?isbn=0849320429); (c) [www.theatlantic.com/issues/2002/09/mann.b.htm](http://www.theatlantic.com/issues/2002/09/mann.b.htm)

as direct, as Wolff (2003) shows experimentally: Native English speaking participants were found to be more likely to describe a video scenario using a lexical causative (transitive verb) rather than periphrastic causative (*make* + intransitive verb) when the causer of the event was depicted in the scenario as sentient. A computer hacker has a particularly high degree of agency in a buffer overflow attack, and is therefore more construable as a direct causer.

### 2.2.3.2 Non-caused verbs

Some of the examples listed by Braine and Brooks (1995) that fail to show transitive uses are not internally caused, but rather fall into the non-caused class, along with verbs like *appear* and stative *stand*. These are *go*, *die*, and *disappear*. *Go* is a verb of inherently directed motion, a subclass of the non-caused class, and *die* and *disappear* are verbs of disappearance, which are also non-caused. The inability of these verbs to alternate falls under the generalization that verbs that are not externally caused do not undergo the alternation.

### 2.2.4 Transitive-only putative exceptions

Some of the putative arbitrary exceptions offered by Braine and Brooks (1995) are transitive verbs that fail to show intransitive variants. They bring up *knock down* and *lose* as examples of arbitrary restrictions on the use of verbs as intransitives:

- (25) a. I knocked my block tower down.  
       b. \*My block tower knocked down.

- (26) a. I lost my key.  
       b. \*My key lost.

In this section, I argue that neither one of these cases is idiosyncratic.

The phrase *knock down* differs in at least two ways from causative alternation verbs like *break*. First, *knock* falls into the class of *verbs of surface contact* (e.g. *strike, hit, kick, punch, slap, whack*), whereas *break* is a member of the class of *verbs of damaging* (also including *crack, shatter, splinter*, etc.). Verbs of surface contact differ in several ways from verbs of damaging, as Fillmore (1970) demonstrated. The *hit*-type verbs specify a means or manner of carrying out an action rather than the result of an action (Levin and Rappaport Hovav 1991; Rappaport Hovav and Levin 1998). Since they do not specify a result, they are not causative; hence, they are not externally-caused. Since *knock* falls into the *hit* class, one might expect *knock down* not to detransitivize, assuming that the particle has no impact on this ability.

To make a stronger argument, it is necessary to compare it to other uses of ‘surface contact’ verbs with particles like *down*. Here are several examples:

- (27) a. They struck the sign down.  
 b. \*The sign struck down.
- (28) a. He kicked the chair over.  
 b. \*The chair kicked over.
- (29) a. John punched his teeth out.  
 b. \*His teeth punched out.

The non-detransitivizability of *knock down* appears to fall under a quite regular pattern: Verbs of surface contact in combination with particles like *down* fail to detransitivize.

Why is *lose* unacceptable as an intransitive verb? Like *break*, this verb could be considered causative, because its meaning does entail a change of some kind: A sentence like *I lost my keys* could be paraphrased, *I caused myself not to know where my*

*keys are*. However, it specifies a change of state on the part of the subject, rather than the object. Losing a game also entails a change of state on the part of the subject rather than the game. *Lose* is unlike *break* and *open* in this respect. I argue that this is a crucial difference; in order to alternate, a verb must be not only a change of state, but a verb that specifies a change of state on the part of the object. Support for the relevance of such *affected agents* for argument realization comes from Saksena (1980), who shows that affected agents are realized with different case-markers than non-affected agents in Hindi causatives. In these terms, the inability of *lose* to de-transitivize falls under the generalization that verbs with affected agents such as *eat* and *drink* do not show intransitive forms: *\*The food ate*; *\*The drinks drank*. This generalization arguably follows from the characterization of the criteria for detransitivization, because if a verb specifies a change of state for the agent, it cannot come about spontaneously without the involvement of the agent.

### 2.3 Conclusion

I conclude that the verb class distinctions described in §2.1 are sufficient to explain the phenomena that have been adduced in favor of arbitrariness. These are the verb class distinctions that the learner must acquire, along with the classification of each verb into these classes. Nothing needs to be memorized about the participation or non-participation of a given verb in the causative alternation *per se*.

This argument depends on the correctness of the characterization of the criteria for undergoing the causative alternation; if the state of the art changes, then these arguments will have to be revisited. By the same logic, any argument for arbitrariness relying on an incorrect characterization of the criteria does not go through. A crucial part of the argument either for or against the status of a given item as an arbitrary exception is to establish that it does or does not meet the relevant criteria, as best we

understand them, using independent diagnostics. I have shown using such diagnostics that the argument for arbitrariness in the domain of the causative alternation is not empirically well-founded, and have illustrated what type of evidence would be necessary to establish the existence of arbitrary exceptions.

An additional outcome of the investigations in this chapter is a richer understanding of the criteria governing the productivity of the causative alternation, and in particular, the nature of the distinction between internal vs. external causation. Investigating these putative exceptions is useful not only for evaluating the “arbitrariness” premise of Baker’s Paradox, but for the sake of understanding the phenomena themselves.

# Chapter 3

## Ditransitivity

### 3.1 The puzzle

The dative alternation, illustrated in (1), has served as another paradigmatic example for Baker’s Paradox. It relates *prepositional dative* structures like (1a) to *double object* (or *ditransitive*) structures like (1b).

- (1) a. I gave a book to John.  
b. I gave John a book.

The puzzle of interest in this chapter concerns the ability of a verb to license the double object construction, as in (1b).

The double object construction is productive, as evidenced by the fact that when a new verb enters the language, it can be used ditransitively. For example, when the verb *text*, meaning *to send a text message*, entered English, it was extended to the double object construction (*text me your address*). For another example, recall Wasow’s (1981) “prophetic” idea that the verb *satellite* would be invented, meaning “to transmit messages via satellite,” and that it would be usable as a double object form. There is experimental evidence for the productivity of the double object

construction as well from Gropen et al. (1989) and Braine et al. (1990).

There are some constraints, however, on what verbs can be used ditransitively. Even very recently, these constraints have been claimed to be arbitrary; at the outset of their article, Wonnacott et al. (2008:166) claim, “Adult language incorporates both regular, abstract operations and patterns that are idiosyncratic or specific to particular lexical items.” This claim is illustrated with the dative alternation; they go on to claim that “certain verbs are unexpectedly ungrammatical in the ditransitive,” listing *donate*, *carry*, and *push* as examples. These are not the only claims of this type; Wonnacott et al. (2008:167–168) write, “Several researchers have pointed out that some of the postulated class criteria are inconsistent, so that they do not capture the full pattern of verb-structure co-occurrences (Bowerman 1988, Braine and Brooks 1995, Goldberg 1995: Chapter 5). The general conclusion is that, although there are strong correlations between the two, verb distribution cannot be reduced to verb semantics (or a combination of semantic and perceptual cues).” This quotation shows that the existence of arbitrary exceptions in this domain has recently been taken as given. The purpose of this chapter is to argue that the putative examples of arbitrary exceptions can be understood on the basis of general criteria governing the productivity of the double object construction.

Which verbs do Bowerman, Braine and Brooks, and Goldberg claim to be exceptions? Bowerman (1988:84) criticizes the criteria-governed productivity approach to Baker’s Paradox, in response to Pinker (1984, 1987), claiming that “the subsets proposed for rules with lexical exceptions are themselves dotted with gaps: items that fully conform to the semantic/morphological conditions on the rule, but that still do not undergo the rule.” Bowerman continues, “For dative alternation, such an item is *choose*. . . . Many speakers find something distinctively odd about ‘shifted’ indirect objects with *choose*, as in *I chose you a book at the library sale*. Yet *choose* satisfies the putative semantic/morphological restrictions on verbs that allow dative

alternation...” *Choose* is the only example she lists. I will argue in §3.3 that the meaning of *choose* does not in fact conform to the semantic criteria governing the double object construction; the beneficiary of an act of choosing is not in fact a prospective possessor.

Goldberg (1995) discusses two semantic classes that are not uniform in their ability to function ditransitively. She points out that “verbs of permission” do not all allow the ditransitive construction:

(2) Sally permitted/allowed/\*let/\*enabled Bob a kiss.

Likewise, “verbs of refusal” are not all double-object-friendly:

(3) Sally refused/denied/\*prevented/\*disallowed/\*forbade him a kiss.

Since these verbs do not have corresponding *to*-dative forms, theories that derive the double-object form from the prepositional dative form such as Pinker’s can essentially ignore these cases. But these do constitute exceptions to a productive pattern, so they are relevant to the discussion here.

Another potential set of arbitrary exceptions is found among Latinate verbs. The verb *donate*, for example, is a classic counterexample to the notion that semantic criteria can be used to predict participation in the double object construction. Despite ostensibly having the requisite semantics, *donate* is awkward as a ditransitive verb. This example falls under a historical generalization about which verbs undergo the dative alternation: Roughly speaking, verbs of Latinate origin are unacceptable in the double object construction (e.g. *\*donate the library \$100*). Pinker’s (1989:45–46) historical explanation goes as follows:<sup>1,2</sup>

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<sup>1</sup>Ironically, *donate* did not enter the language in the way that Pinker describes; it is a back-formation from *donation*.

<sup>2</sup>McFadden (2002) and Polo (2002) give more nuanced accounts of the historical development of the dative alternation through Middle English; Polo (2002) argues that it is the loss of case marking on pronouns (which followed the loss of case marking on lexical nouns) that eliminated dative case from the grammar.

According to Visser (1963), in Old English the order “VP NP-dat NP-acc” was more common than the order “V NP-acc NP-dat.” In Middle English the case markers eroded, resulting in a “V NP[Goal] NP[Theme]” verb phrase similar to the double-object construction of contemporary English. Very few verbs appeared in the prepositional form “VP *to* NP NP” in early Middle English. But in the fourteenth and fifteenth centuries many new verbs entered the language as borrowings from French, which marked the goal phrase with the preposition *à*. When these verbs were assimilated into English, the French argument structure was translated, and thus the preposition *to* (the translation of *à*) was used to mark the goal argument. Native verbs were then allowed to take this argument structure as well... Thus the verbs that take the double-object form are the ones that were already in the language when that form came into being, and the verbs that fail to take that form came into the language more recently from French (and Latin as well), accompanied by a French-like argument structure.

Presumably children lack a collective racial memory for the history of the language...

If the generalization governing verbs’ ability to take the double-object form is *purely* historical, then there are arbitrary exceptions in this domain from the learner’s perspective. Are there any visible cues that a learner could use to predict that Latinate verbs tend to be unacceptable as ditransitive verbs? This question is taken up in §3.4 and the remainder of the chapter.

## 3.2 Criteria for ditransitivity

As is much discussed, many of the observed restrictions on the use of verbs as ditransitives can be accounted for on the basis of semantic constraints. One such constraint is that in order to be usable ditransitively, a verb’s semantics must entail a transfer of possession, or entail future possession, setting aside “negative” verbs like *deny* and *refuse* (Green 1974; Krifka 1999). This restriction on ditransitivity holds for the benefactive alternation, which relates ditransitive forms to prepositional forms involving

*for*, as well as the dative alternation proper. *Cut* is an example of a benefactive alternation verb:

- (4) a. Cut a slice of bread for Mary.  
 b. Cut Mary a slice of bread.

In (4), there is a transfer of possession. Some benefactive verbs, such as *mend*, do not undergo the alternation:

- (5) a. Mend these socks for him.  
 b. \*Mend him these socks.

Mending does not entail a transfer of possession, which explains why (5) is unacceptable.

According to Krifka (1999), manner-of-motion verbs like *push*, *shove*, *carry*, *pull*, and *lower*, along with communication verbs like *yell*, *shout*, *assert* and *claim* are incompatible with the double object construction because their meaning specifies manner for both the caused and the causing event, whereas their alternating counterparts *throw*, *pass*, *hand*, *teach*, *tell*, *promise*, and *show* specify manner only for the causing event. For example, because the causer continuously imparts force on the causee in a pulling event, *pull* describes manner for both the causing and caused events. In contrast, *throw* describes only the manner of the causing event, specifying that the projectile must be released.

It appears that Latinate verbs such as *donate* and *explain* satisfy these semantic criteria, but fail to alternate for reasons having to do with their phonological or morphological properties. Pinker (1989), incorporating work reported in Gropen et al. (1989), argues that verbs like *donate* are subject to a “morphophonological constraint,” which has to do with the form of the verbs. The question of how this constraint should be stated is the focus of the nonce word experiments reported later in this chapter.

### 3.3 Applying the semantic criteria

Bowerman's example, *choose* (as in *\*I chose you a book*) can be accounted for based on the requirement that a dative verb describe a transfer of possession. *Choose* is like *mend*; it is a benefactive verb whose meaning is unrelated to a transfer of possession.

Other verbs that have been argued to constitute arbitrary exceptions include *carry* and *push*. These involve a transfer of possession, but they fall under a different semantic constraint on the double object construction. Because *carry* and *push* describe continuous imparting of force, they fall into the *pull* class.

The case of verbs of permission such as *permit* and *allow* is somewhat more complicated. Here, an abstract kind of transfer of possession can be said to be involved in the sense that the subject "gives" the recipient permission to carry out some activity:

(6) Sally permitted/allowed Bob a kiss.

As Goldberg (1995) points out, *let* and *enable* are quite semantically similar to *permit* and *allow*, and yet do not license ditransitives.

(7) \*Sally let/enabled Bob a kiss.

This is not the only difference between *permit* and *allow* on one hand, and *let* and *enable* on the other. In contrast to *permit* and *allow*, the verbs *let* and *enable* do not function as dative verbs at all:

(8) \*Sally let/enabled a kiss to/for Bob.

(9) ?Sally permitted/allowed a kiss to Bob.

(Granted, *permit* and *allow* are not perfectly acceptable with a *to*-PP, but I find the contrast between (8) and (9) quite sharp.) The ungrammaticality of (8) suggests that *let* and *enable* do not have the appropriate semantics to participate in the double

object construction.<sup>3</sup> Although there are verbs that occur solely in the double object construction, such as *deny*, the indirect object is always a maleficiary (*cost, forbid, charge*) or a prospective maleficiary (*begrudge, spare, wager*) with these verbs; in all of these cases the candidate for serving as an indirect object either loses something or is in danger of losing something.<sup>4</sup> Outside of the maleficiary type of case, failure to exhibit either a *to* dative or a *for* dative form can be taken as an indication that a verb lacks the appropriate semantics.

Further support for the idea that semantic properties of *let* and *enable* play a role in their inability to license ditransitives comes from uses of *permit* and *allow* with inanimate subjects. With subjects describing abstract situations like the weather, *permit* and *allow* are like *enable* in not allowing the double object construction:

- (10) a. \*The weather permitted/allowed us a visit.  
 b. The weather permitted/allowed a visit.

In comparison, when the subject is animate, as in (11), the double object construction is acceptable:

- (11) a. The president permitted/allowed us a visit.  
 b. The president permitted/allowed a visit.

I suggest that the uses of *permit* and *allow* shown in (10) manifest verb senses that fall in the semantic class of *let* and *enable*. In particular, these senses do not describe a transfer of possession, but merely an enablement relation between two situations. Because a situation cannot possess anything, transfer of possession is impossible in these senses.

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<sup>3</sup>*Enable* is also phonologically long and arguably morphologically complex, so the “morphophonological constraint” is another possible explanation for its behavior.

<sup>4</sup>Levin (1993:47) lists several others including *issue (ticket/passport)* and *write (check)*, but I disagree with the judgments of these as ungrammatical in the prepositional form.

*Refuse* and *deny* fall into another semantic class in which Goldberg (1995) argues that there are arbitrary exceptions. Goldberg points out that other “verbs of refusal,” namely *prevent*, *disallow*, and *forbid*, are not acceptable as ditransitives.<sup>5</sup> All of these may be subject to a finer semantic analysis as well, but they are also subject to the “morphophonological constraint,” described below.

### 3.4 Identifying the morphophonological constraint

Pinker (1989), incorporating work reported in Gropen et al. (1989), argues that verbs like *donate* are subject to a “morphophonological constraint,” which has to do with the form of the verbs. Evidence that it exists and is productive comes from a nonce word experiment by Gropen et al. (1989), described in detail in §3.5. Their result suggests that verbs like *donate* are subject to a general constraint, and therefore do not constitute individual arbitrary exceptions to the productivity of the double object construction.

Quite a few approaches have been taken to the question of how exactly to characterize the morphophonological constraint. Pinker (1989:123) suggests that there might be a semantic explanation deriving from the fact that non-alternating Latinate stems have “more complex, more abstract, and less basic” meanings, although he “would not be prepared to push the point.” The idea that a semantic factor underlies the unacceptability of Latinate verbs in the double object construction has not been proven or disproven, as far as I know, although the Gropen et al. (1989) results that I will report in §3.5 do speak against it, to the extent that they show that verb *form* affects dativizability independent of semantics.

For a syntactic approach, Randall (1987) pursued the possibility that the restricted class of verbs shares a syntactic feature such as omissibility of the recipient. *Donate*

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<sup>5</sup>*Forbid* may be acceptable as a ditransitive; cf. *I forbade him chocolate*.

allows the recipient to be omitted while *give* does not; this leads one to hypothesize that verbs that allow the recipient to be omitted do not occur in double object constructions. This generalization has many counterexamples, though; *tell*, for example, allows the recipient to be omitted and easily allows the double object construction.

The most prevalent hypotheses locate the predictability of double object licensing in the form of the verb. The following sections describe these hypotheses.

### 3.4.1 The prosodic weight hypothesis

One of ways in which verbs like *give* differ from verbs like *donate* has to do with metrical phonology. *Donate* has two syllables, while *give* has only one. The idea that number of syllables and stress pattern might be important to the double object construction is explored by Green (1974) and Zwicky and Pullum (1986), and rejected by both. Green (1974:78) rejects this hypothesis on the basis of the observations that “*carry, cable, promise* and several other words permit both external and internal direct objects.” Zwicky and Pullum (1986) also list *offer, advance, deliver, guarantee, telephone,* and *radio* in this category, and point out counterexamples in the other direction as well: *lift, raise, lisp, yell, prove,* and *voice* are monosyllabic verbs that fail to alternate.

Grimshaw (2005), building on Grimshaw and Prince (1986), argues for a more subtle metrical classification of verbs, sensitive not to syllables, but to the more abstract notion of the metrical *foot*. Grimshaw’s generalization is that verbs containing only one metrical foot alternate (if they have the appropriate type of semantics), whereas verbs that contain more than one metrical foot do not alternate. This analysis distinguishes among verbs with a strong-weak pattern based on whether the second syllable bears secondary stress; *donate* does, but *promise* does not, hence *donate* contains two

feet whereas *promise* contains only one.<sup>6</sup> Feet in English are trochaic, so in general, verbs with a weak-strong syllable pattern such as *explain* contain multiple feet, but there is one exception: a syllable containing only a schwa vowel can be extrametrical, so in verbs like *assign* or *allot*, the verb is only one foot because the first syllable does not project a foot.<sup>7</sup> According to Grimshaw's *prosodic weight* hypothesis, the productivity of the dative alternation is limited to verbs whose prosodic weight is no more than one foot.

Why should number of feet matter? Several answers have been given to this question. Pesetsky (1995) posits a null affix *-G*, which licenses ditransitivity. Like other affixes, its attachment is phonologically restricted; in particular, it imposes a restriction on the prosodic weight of its stem requiring that it not exceed one foot. Because *donate* is too heavy, *-G* does not attach to it; hence the ditransitive construction is blocked.

Anttila (2007) posits a direct link between syntax and phonology to explain this correlation, making crucial use of the following two principles:

- PARSE(Goal): The goal NP must be prosodically parsed together with its syntactic head.
- \*TERNARY: No ternary prosodic phrases.

Taken together, these constraints rule out ditransitive *donate* with lexical recipients. The first constraint, PARSE(Goal), requires that in a sentence like *Donate the man money*, there is a phonological constituent containing the verb and the goal/recipient: *donate the man*. The goal/recipient forms its own phonological constituent. Since *donate* contains two feet, this yields a ternary structure: [(do)(nate) (the man)]. This

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<sup>6</sup>This pronunciation is variable; some speakers, especially British English speakers, pronounce *donate* with stress on the second syllable.

<sup>7</sup>Grimshaw seems implicitly to analyze *advance* as having only one foot, despite the fact that *d Vance* is not a possible syllable in English.

analysis ties Grimshaw and Prince’s metrical observation together with other metrical effects on the dative alternation: Verbs that are longer than one foot are acceptable with unstressed recipients, and heavy NP shift only occurs with long dative verbs in corpora of spontaneous speech.

Grimshaw (2005) distances herself from the idea that prosodic structure conditions the dative alternation directly. Rather, she proposes that native English speakers have two lexicons, the G(ermanic) and the R(omance) lexicons: “Under this view, properties of the individual verbs do not determine their ability to appear in the NP-NP configuration. Properties of the verbs do determine their assignment to a (sub-)lexicon, and their (sub-)lexicon membership determines their complement possibilities, along with several other properties” (Grimshaw 2005:120). Thus, prosodic weight is an observable, reliable cue to this classification.

These theories make slightly different predictions, but they all take the prosodic weight hypothesis for granted, and derive it as a consequence. Is this a desirable consequence of a theory? Grimshaw (2005) claims that *all* verbs that are dominated by a single prosodic foot alternate, provided that they have the right kind of semantics to be used in the double object construction. This claim implies that there should be no verbs of the type Zwicky and Pullum claim that *prove* and *voice* are, namely, non-alternating monosyllables which should have every right to alternate as far as semantics is concerned. About these verbs, Grimshaw (2005:125) says only that “the issue turns” on whether or not they have the right semantics. I assume that they fall into the *say* class, along with verbs such as *say*, *admit*, and *confess* (Levin 1993:46–47).

There are plenty of multiple-foot verbs that do alternate, such as *catapult*, *radio*, *satellite*, *semaphore*, *telecass*, *telegraph*, and *telephone*. There seems to be both a prosodic and a semantic generalization about these (Anttila 2007). The semantic generalization is that verbs that describe transfer by modern technology can be ditransitive regardless of prosodic structure (Green 1974; Gropen et al. 1989; Krifka 1999).

The phonological generalization is that these multiple-foot, non-alternating verbs all (a) have initial stress and (b) start with a disyllabic foot. Pinker (1989:119) classifies these as *instrument of communication* verbs, one of the “dativizable subclasses insensitive to the morphophonological constraint.” Other multiple-foot verbs that do alternate are *begrudge*, *deny*, and *refuse*. These all have a negative meaning, which may explain their syntactic behavior; Pinker also lists this as a dativizable subclass insensitive to the morphophonological constraint. The set of alternating 2-foot verbs also includes *allocate*, *bequeath*, *guarantee*, and *recommend*. These can be analyzed as verbs of ‘future having’, which is another dativizable subclass insensitive to the morphophonological constraint according to Pinker (1989). This is the explanation Grimshaw (2005) suggests for *allocate* and *guarantee*, and it is a potential explanation for *recommend* as well.<sup>8</sup> Grimshaw considers *bequeath* a positive exception; Pinker (1989) considers it a verb of future having.

In summary, the positive counterexamples to the prosodic weight hypothesis – verbs that do alternate despite being heavy – seem to fall into a limited set of semantic classes. The negative counterexamples – verbs that fail to alternate despite being prosodically light – may also be subject to a semantic analysis. Thus, the prosodic weight hypothesis appears to be relatively successful from the perspective of the English lexicon.

### 3.4.2 Two-lexicon hypothesis

Recall Grimshaw’s (2005) idea that native English speakers have two lexicons, the G(ermanic) and the R(omance) lexicons. Let us call this idea the *two-lexicon hypothesis*. Although this hypothesis can be seen as a more elaborated or specific version of the prosodic weight hypothesis, it is more resilient in the face of counterexamples

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<sup>8</sup>This explanation might also hold for many of the verbs Grimshaw classifies as having only one foot because of an initial extrametrical schwa: *allot*, *allow*, *assign*, *award*, and *advance*.

such as *bequeath*, since prosodic weight may stand alongside other cues to lexicon membership status.

### 3.4.3 The morphological complexity hypothesis

Another potential “criteria-governed productivity” approach to this instance of Baker’s Paradox relies on morphological features. Gropen et al. (1989) point out that Latinate dative verbs all contain morphemes from a certain finite list, including *per* and *con*. This leads to the *morphological complexity* hypothesis, that verbs must be monomorphemic in order to alternate. Pinker (1989) also cites Storm (1977) for the idea that verbs must be monomorphemic in order to undergo the dative alternation, and points out: “This largely coincides with the proposal that dativizable verbs must be (morphologically) non-Latinate, since the morphological definition of Latinate is that it consist of combinations of Latinate prefixes and stems. However, it differs in cases where a verb is composed of two or more native morphemes” (Pinker 1989:47).

Harley (2006) also argues that the reason that Latinate verbs such as *exhibit* do not alternate is that they are morphologically complex. She ties together the observation that many of the non-alternating verbs are multi-morphemic with the observation that many of the non-alternating verbs do not take particles when they occur solely with a direct object, as in *give/\*donate the money out*.<sup>9</sup> According to Harley’s analysis, the multimorphemic verbs that fail to take the double object construction contain incorporated particles, so *exhibit* has the same structure as *show off*. This analysis explains why *exhibit* does not co-occur with *off*, and generally predicts that morphologically complex verbs will not allow particles. This generalization has a striking degree of support, but there are some counterexamples: *explain away*, for example,

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<sup>9</sup>The observation that “a particle with a Latinate verb is uncommon” is pointed out by DiSciullo and Williams (1987).

is an acceptable combination of a particle and a morphologically complex verb.

Harley's analysis also accounts for the fact that *give* does not allow particles in the double object construction as in (12), through a general prediction that particles should not appear in double object constructions.

(12) \*Give them out the money.

Harley's analysis bears a great deal of similarity to Keyser and Roeper's (1992) proposal, which makes the same prediction in roughly the same way. There are, however, cases in which particles do occur in double object constructions without any problem:

(13) Send him up a drink!

Harley's particular analysis does not predict that this should be possible, counter to fact, so this is not a desirable prediction to make. However, she may be correct in her claim that what distinguishes alternating from non-alternating verbs is their level of morphological complexity.

#### 3.4.4 The formality hypothesis

Another feature that may distinguish Latinate from non-Latinate vocabulary is stylistic. Latinate vocabulary is more formal than native vocabulary, as shown by a number of observations. First, native verbs tend to be high in frequency, whereas Latinate verbs are less frequent. Second, as DeForest and Johnson (2001) show, Jane Austen uses Latinate vocabulary as a device for depicting class among her characters. Third, class differences with respect to Latinate vocabulary do not occur only in novels; Corson (1984) finds class differences in the use of Latinate vocabulary in a study of 12- and 15-year-olds in England. Finally, as Pinker (1989:121) relays:

I remember a cover story on Aretha Franklin in *Time* magazine in the mid-1960s, which described her in performance, "perspiration streaming

down her face.” An irate reader wrote in: “Aretha does not perspire. Aretha sweats.”

Alongside evidence that Latinate vocabulary is more formal than native vocabulary, there is evidence that the prepositional dative construction is more formal than the ditransitive construction. Bresnan et al. (2007) found a significant difference between spoken corpora (the Switchboard corpus; Godfrey et al. 1992) and written corpora (the Wall Street Journal corpus) after controlling for a large number of other factors; the written corpus favors the prepositional dative structure.

A possible explanation for the morphophonological restriction on ditransitivity would therefore be in terms of *stylistic discord* (Silva and Zwicky 1975). According to this hypothesis, the relative formality of Latinate vocabulary conflicts stylistically with the relative informality of the double object construction. In this case, the restriction would not be about Latinate vocabulary *per se*; rather, the fact that many of the non-alternating verbs are Latinate would be explained on the basis of their tendency to be formal in style.

### 3.5 Previous nonce study: Gropen et al. (1989)

There is a limited degree to which we can evaluate the hypotheses listed above merely by looking at lists of English verbs, because semantic factors are difficult to evaluate (partially due to the malleability of verb meanings) and impossible to control. If the morphophonological constraint – stated in terms of prosodic weight, etymology, morphological complexity or formality – is real, then it should govern the productivity of the double object construction. This means that native English speakers should differentiate among novel verbs based on their formal shape.

Gropen et al. (1989) found evidence for the psychological reality of the morphophonological constraint using a judgment task involving nonce words. In this

experiment, 64 adult native English speakers read nonce verbs in paragraphs, and then judged the acceptability of the nonce verb in a series of sentences. Gropen et al. invented two classes of nonce verbs:

- Monosyllabic: *norp*, *pell*, *moop*, *tonk*
- Trisyllabic: *calimode*, *repetrine*, *orgulate*, *dorfinize*

These two classes vary along several dimensions: number of syllables, and, concomitantly, number of feet (the three-syllable ones have two feet; the one-syllable ones have only one), along with morphological complexity (*-ate* and *-ize* being recognizable morphemes). One might argue that the trisyllabic class generally “feels” more Latinate than the monosyllabic as well, perhaps because of their spelling, sound inventory or phonotactic properties. All of the hypotheses discussed above would predict the two classes of verbs to behave differently with respect to the double object construction.

Gropen et al. embedded the nonce verbs in paragraphs such as the following:

- (14) John, the star player of the Boston Whalers, was eager to begin the match against the New York Maulers. He knew that he would be facing their champion – Ben – also adept at using the **pell**. And sure enough, at a critical point in the game, John summoned all of his strength and **pelled** the disc to Ben.
- (15) Sue, who had wanted the deed to the house for twenty years, was very excited when her lawyer called with the good news. Her lawyer told her that Bob, the current owner, was ready to begin **pellation**, the formal (and only legal) process by which she could obtain the house from him. After Bob had finally **pelled** the house to Sue, she **pelled** her duplex to Francis.

After reading a paragraph, the participants judged a series of 11 sentences, including a double object form and a prepositional dative. They used a 7-point scale, ranging from -3 to 3.

In these two paragraphs, the nonce verb is used in a *to*-dative construction (e.g. *she pelled her duplex to Francis*), but in half of the paragraphs in their experiment, the verb is used in a *for*-dative construction instead (e.g. *she pelled her duplex for Francis*). The paragraphs also varied by whether the meaning was *possessive*, as in (14) and (15), or *non-possessive*, involving a purely spatial or benefactive goal. There were two paragraphs of each type (*to*-possessive, *for*-possessive, *to*-non-possessive, *for*-non-possessive) for a total of eight; (14) and (15) are the only two paragraphs with transfer-of-possession semantics using *to*.

Their key finding holds within the set of paragraphs with transfer-of-possession semantics, in which the nonce verb was presented in a *to*-dative construction. For nonce verbs introduced in such paragraphs, the acceptability of the double object construction, relative to the *to*-dative construction, was related to the number of syllables in the nonce verb. The difference in ratings between one- and three-syllable verbs in the double object construction was significantly larger than the difference in ratings between one and three-syllable verbs in the *to*-dative construction. In other words, there was a significant interaction between construction and number of syllables, such that three-syllable nonce verbs were particularly unacceptable in the double object construction. A graph showing that result is in Figure 3.1. (There was also a statistical main effect of construction, but this could have been due to the fact that the nonce verbs were modelled in the *to*-dative construction.)

Gropen et al.'s findings are important because they show that speakers selectively generalize nonce verbs to the ditransitive construction based on the shape of the word. This in turn supports the existence of a morphophonological constraint on the productivity of the dative alternation, and the general idea that the form of the verb, independent of its semantics, governs the productivity of the dative alternation. However, their study had several limitations. First, only two paragraph items are relevant to the result, (14) and (15); it would be dangerous to base any far-reaching

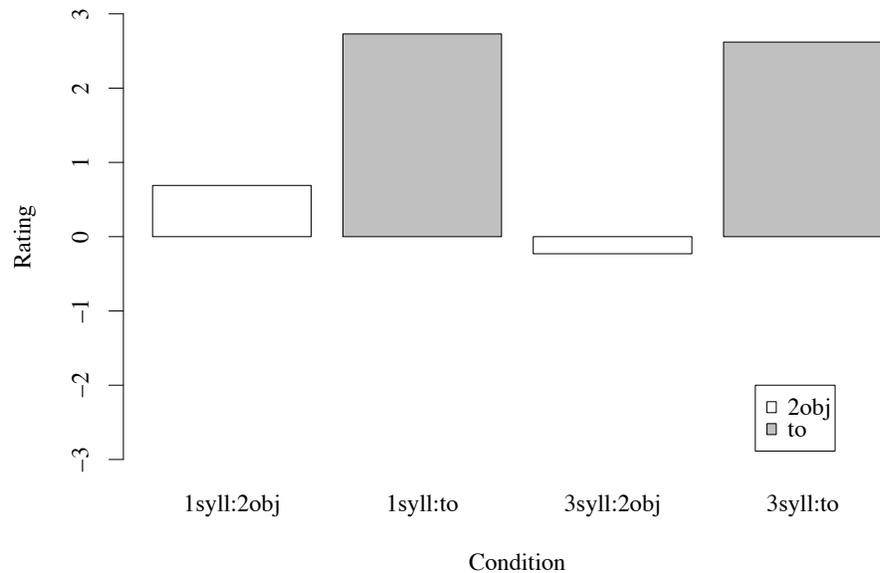


Figure 3.1: Gropen et al. (1989): Mean acceptability ratings by construction and verb shape

conclusions about learnability on this small sample. Second, the verb forms differed in many ways other than in number of feet, so the results, even if they are reliable, do not distinguish among the hypotheses discussed above. The two-lexicon hypothesis would point to the fact that two of their four three-syllable verbs, *orgulate* and *dorfinize*, contain recognizable Latinate suffixes (*-ate* and *-ize*, respectively), and the others, *repetrine* and *calimode*, arguably sound Latinate as well. The monosyllabic verbs *moop*, *tonk*, *pell*, and *norp* do not sound Latinate at all. On this hypothesis, the reason for Gropen et al.'s result is the contrast in apparent etymology of the verbs. Proponents of the morphological complexity hypothesis would point to the recognizable suffixes in *orgulate* and *dorfinize* and suggest that the fact that the two verb classes were not equivalent in morphological complexity is the underlying cause for the contrast in judgments. The prosodic weight hypothesis could also account for their result; the monosyllabic verbs contained only one metrical foot, and the trisyllabic verbs contained more than one.

The factor or factors responsible for the effect may in fact not have been any of these; it is conceivable that number of syllables was a driving factor. It is possible, given just these results, that only nonce verbs with three syllables or more are judged unacceptable as ditransitives. If this were the case, then we would be left without an explanation for the non-alternating status of *donate* and *explain*. Therefore, it is worthwhile to confirm that the constraint that Gropen et al. identified applies to two-syllable cases like *donate* and *explain* as well.

Another goal of the present work is to specify the precise nature of the driving factor(s), and determine whether the contrast Gropen et al. observed is due to prosodic weight, morphological complexity, apparent etymology, some combination of these, or none of the above. The experiments described below were aimed at teasing these potential explanations apart.

### 3.6 Experiment 1: Prosodic weight in English

As just discussed, Gropen et al.'s key result is consistent with Grimshaw's (2005) hypothesis that prosodic weight conditions the productivity of the ditransitive construction, but their data is consistent with several other hypotheses as well. One way to evaluate Grimshaw's hypothesis is to carry out another nonce word study in which everything but prosodic weight is held constant. I report on such a study in §3.7.

Before addressing that question, however, I will address whether or not the observations that support the prosodic weight hypothesis for English hold. Are 1-foot verbs really more acceptable than 2-foot verbs as ditransitives? Finding such a contrast is a precondition for asking the further question of whether prosodic weight governs the productivity of the ditransitive construction. This section reports on an acceptability study designed to answer this question.

### 3.6.1 Methods

**Participants.** 16 adult native English speakers drawn from the Stanford University community participated in this experiment, immediately after participating in Experiment 2 (see §3.7). They completed Experiment 2 before Experiment 1 to avoid any influence that Experiment 1 might have had on the outcome of Experiment 2. The participants received \$14 in exchange for an hour of participation, during which they participated in both experiments.

**Verbs.** The materials included twelve verbs of differing PROSODIC WEIGHT. Six of the verbs had one prosodic foot and six had two prosodic feet. All of the verbs had two syllables, and half had a strong-weak stress pattern and half had a weak-strong stress pattern:

- 1-foot verbs: *allot, assign, award, signal, render, promise*
- 2-foot verbs: *provide, entrust, present, dictate, donate, forfeit*

Each of the one-foot verbs had a corresponding two-foot verb from the same semantic class, so the two verb sets were roughly matched with respect to semantic content. As the purpose of this experiment was merely to verify claims that are generally agreed upon in the literature, all of the 1-foot verbs were listed as alternating according to Levin (1993), and all of the 2-foot verbs were listed non-alternating.

**Sentences.** For each verb, there were two sentences, differing in CONSTRUCTION: double object dative, as in (16a), or prepositional dative, as in (16b).

- (16) a. The teacher will forfeit the student the trophy after the game.  
 b. The teacher will forfeit the trophy to the student after the game.

FEET	VERB	RECIPIENT	THEME	MODIFIER
1	allot	the employees	the shares	according to seniority
1	assign	his colleague	the task	to save time
1	award	the Russian	the medal	in the contest
1	signal	the program	the error	under most circumstances
1	render	the client	the services	following the agreement
1	promise	the hitman	the cash	within thirty days
2	provide	the landlord	the rent	by the first
2	entrust	the parliament	the decision	without a veto
2	present	the chairman	the check	at the meeting
2	dictate	the assistant	the message	in five minutes
2	donate	the charity	the proceeds	after the concert
2	forfeit	the student	the trophy	after the game

Table 3.1: Experiment 1: Materials

The sentences were all uniform with respect to animacy and definiteness, which Brennan et al. (2007) found to play a role in the choice between alternants of the dative alternation. In every sentence, the theme argument (e.g. *the trophy*) was inanimate and the recipient argument (e.g. *the student*) was animate. Both the theme and the recipient were definite.<sup>10</sup> Table 3.1 lists the components of each sentence. Each participant saw each verb only once, in just one of the two constructions (double-object or prepositional dative).

In addition to the target sentences, there were 48 filler sentences. The fillers were comparable to the test sentences in complexity and acceptability overall, but exhibited a slightly wider range of acceptability than the test sentences.

**Procedure.** The participants first read the instructions, of which the following is an excerpt:

<sup>10</sup>Unfortunately, length was not totally controlled; the theme argument has a mean length of 1.8 syllables in the 2-foot condition and a mean length of 1.5 syllables in the 1-foot condition. However, the two sets of NPs do not differ significantly in length according to a Welch Two Sample *t*-test ( $p = 0.4$ ).

Welcome. In this experiment, you'll be reading some sentences on the computer screen.

Read each sentence OUT LOUD, and press the space bar when you are finished.

After you are done reading the sentence aloud, you will see a question, asking you how natural the sentence is. Rate the sentence on a scale from 1 to 7, with 1 as the worst and 7 as the best. Use 1 if the sentence isn't even English. Use 7 if the sentence sounds perfectly natural, and rolls right off the tongue. You can use either the mouse or the keyboard to give your ratings.

Then you will see a question about the sentence you just read. To answer the question, press the "Y" key for YES or the "N" key for NO. You will be reminded which key is yes and which is no. Try to answer as quickly and accurately as possible.

If you are unsure of the answer (or if you think that both answers are right), try to pick the better answer.

Following three practice items, participants judged a series of 60 sentences, including 12 test sentences and 48 filler sentences. On each trial, the participant read the sentence aloud, rated it on a 1-7 scale (7 being the best), and then answered a yes-or-no comprehension question. Participants then received feedback regarding whether or not their answer was correct.

### 3.6.2 Results

The data were analyzed using a mixed-effects linear regression model conditioned on CONSTRUCTION and PROSODIC WEIGHT, with crossed random effects for PARTICIPANT and ITEM. The model was created using the `lmer` command in `lme4` package from the R statistical library (Baayen 2008). This type of modelling obviates the need for averaging over participants or items prior to analysis. The significance values reported are based on Markov chain Monte Carlo sampling of the posterior distribution

of the model parameter in question with 10,000 simulations, given by the `pvals.fnc` command from the R `languageR` library. This technique leads to good  $p$ -value estimates for datasets of all sizes (Baayen 2008). The model coefficient,  $B$ , is reported along with the significance value  $p$ .

Treating PARTICIPANT as a random effect is a way of taking into account the fact that some participants tend to give higher ratings than others, but it does not deal with the fact that participants vary in how wide a range of the rating scale they made use of. To take this type of difference between participants into account, the participants' ratings were converted into  $z$ -scores, which express the rating given to an item in terms of standard deviations away from the participant's mean rating. Formally, the definition of  $z$ -score is:

$$z = \frac{x - m}{s}$$

In our case,  $x$  is the rating in question,  $m$  is the mean score given to all sentences in the experiment including fillers, and  $s$  is the standard deviation of those ratings.

The interaction between CONSTRUCTION and PROSODIC WEIGHT was evaluated using a mixed-effects linear regression model of RATING  $z$ -score with crossed random effects for PARTICIPANT and ITEM. According to this model, the expected interaction between CONSTRUCTION and PROSODIC WEIGHT is significant ( $B = 0.38$ ,  $p = .011$ ). The mean acceptability ratings by CONSTRUCTION and PROSODIC WEIGHT are shown in Figure 3.2. As the graph suggests, 2-foot verbs were judged less acceptable than 1-foot verbs in the double object construction, but not in the *to*-dative construction.

There was also one main effect favoring the prepositional dative construction over the double object construction ( $B = 0.40$ ,  $p < .001$ ), which may have to do with the fact that both participants were expressed with definite lexical noun phrases. When the theme and the recipient are both lexical noun phrases, the prepositional dative

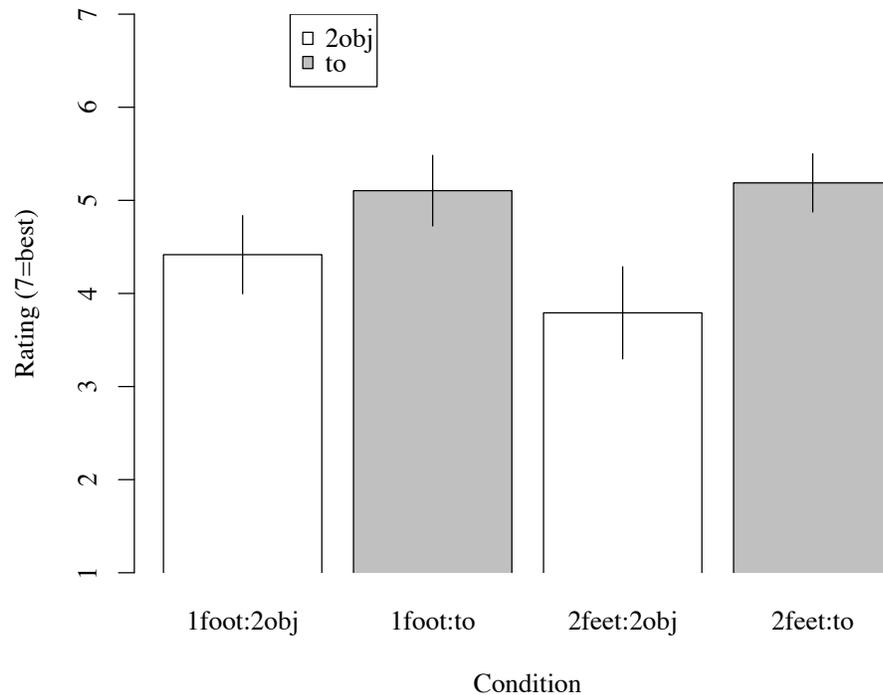


Figure 3.2: Experiment 1: Mean acceptability ratings by construction and word shape

is favored in both spoken and written corpora (Bresnan et al. 2007). There was no significant main effect of prosodic weight ( $B = -0.34$ ,  $p = 0.17$ ).

Table 3.2 lists the mean acceptability ratings assigned to each verb in each construction, and the differences between those means. Although the general trend is for 1-foot verbs to have smaller differences than 2-foot verbs, there are some exceptions. For example, participants did not rate the double object construction worse than the prepositional dative construction with *provide*. This is not entirely unexpected; Quirk et al. (1985:1210) state that there is a double object use of *provide* that is restricted to American use, a claim verified in a corpus study by Mukherjee (2001). Mukherjee also shows that *provide* is more common with *for* and *with* complements than with *to* complements in British and American corpora. This suggests that *to* complements may be dispreferred with *provide*.

FEEET	VERB	2OBJ	TO	DIFFERENCE
1	<i>allot</i>	4.750	5.375	0.655
1	<i>assign</i>	5.125	5.625	0.500
1	<i>award</i>	4.625	5.250	0.625
1	<i>promise</i>	5.000	5.000	0.000
1	<i>render</i>	3.625	5.125	1.500
1	<i>signal</i>	3.375	4.250	0.875
2	<i>dictate</i>	4.125	5.500	1.375
2	<i>donate</i>	3.500	5.500	2.000
2	<i>entrust</i>	2.750	5.125	2.375
2	<i>forfeit</i>	2.000	4.500	2.500
2	<i>present</i>	5.500	5.625	0.125
2	<i>provide</i>	4.875	4.875	0.000

Table 3.2: Experiment 1: Mean acceptability ratings by verb and construction

### 3.6.3 Summary: Experiment 1

On the whole, participants found 2-foot verbs less acceptable than 1-foot verbs in the double object construction, as expected. This result is not surprising, given that it merely confirms uncontroversial judgments from the literature, but it does provide statistical confirmation of those claims. It also shows that acceptability ratings given on a 1-7 scale can be used to detect differences in behavior between verb classes. This supports the validity of the acceptability judgment-based methodology used in the experiments that I will discuss next. Moreover, since the participants in Experiment 1 also participated in Experiment 2, this result shows that, overall, the participants in Experiment 2 are sensitive to the differences between English verbs that have been discussed in the literature.

## 3.7 Experiment 2: Prosodic weight in nonce verbs

Recall Gropen et al.'s (1989) finding that one-syllable nonce verbs like *moop* were more acceptable as ditransitives than three-syllable nonce verbs like *calimode*. This finding is consistent with several hypotheses, including Grimshaw's (2005) prosodic weight hypothesis. Experiment 1 supported the presence of a correlation between prosodic weight and ditransitivity in the realm of English verbs. This result makes the prosodic weight hypothesis worth exploring in the realm of nonce verbs, where other factors such as morphological complexity and number of syllables can be controlled.

The prosodic weight hypothesis (in its strictest version) predicts that a two-syllable, morphologically simple verb like *feffam*, pronounced with a schwa vowel in the second syllable, should be more acceptable as a ditransitive verb than a two-syllable, morphologically simple verb like *feffame*, with a long tense vowel in the second syllable. The morphological complexity hypothesis, on the other hand, would not predict a difference between these two. Experiment 2 was designed to help distinguish between these two hypotheses.

### 3.7.1 Methods

**Participants.** There were 16 participants in Experiment 2, all of whom also participated in Experiment 1.

**Verbs.** There were 16 pairs of verbs, differing only in PROSODIC WEIGHT (1 foot or 2 feet). Examples are shown in Table 3.3. In the 1 foot condition, the verb was spelled without a final silent 'e' and pronounced with a short, unstressed (schwa) vowel. In the 2 foot condition, the word was spelled with a silent 'e' and pronounced with a long vowel. For example, the verb *dassude* was pronounced with an [u:] vowel in the second syllable; *dassud* was pronounced with a schwa vowel. Care was taken to

1 FOOT	2 FEET
<i>feffam</i>	<i>feffame</i>
<i>zeepik</i>	<i>zeepike</i>
<i>dassud</i>	<i>dassude</i>
<i>laundib</i>	<i>laundibe</i>
...	...

Table 3.3: Experiment 2: Selected nonce verbs

ensure that the vowel was tense when long, so that the two pronunciations would be clearly distinguishable.

**Paragraphs.** Each verb was randomly assigned to a paragraph describing its meaning, following Gropen et al.’s (1989) paradigm. Here are two example paragraphs:

- (17) Sue, who had wanted the deed to the house for twenty years, was very excited when her lawyer called with the good news. Her lawyer told her that Bob, the current owner, was almost ready to **feffame**, the formal (and only legal) process by which she could obtain the house. She hoped that Bob would **feffame** the house to her rather than his daughter.
- (18) John, the star player for his team, was eager to face their rival. He knew that it would be very important for him to **dassude**. And sure enough, it was the deciding moment of the game when John summoned all of his strength and was able to **dassude** the disc to his teammate, Ben.

The full list of paragraphs is given in the appendix, §3.10.1. In addition to the 16 “test” paragraphs, there were 16 “filler” paragraphs. These also contained nonce verbs, and are listed in the appendix, §3.10.2.

In every paragraph, the verb appears twice, first intransitively, and later in a *to* dative construction. The choice to introduce the verb intransitively was based on the

assumption that an intransitive use of a verb is relatively uninformative about how the verb can be used. An alternative design choice would have been to leave out the first mention entirely, but this would have introduced a potentially important difference between the present design and that of Gropen et al. (1989), and would have made it more difficult to make comparisons between the present work and theirs. On the other hand, introducing the nonce verb as a noun, as Gropen et al. do in some cases, would have complicated the analysis, because as Gropen et al. suggest themselves, denominal verbs may behave differently with respect to the morphophonological constraint.

The paragraphs were recorded in two versions, one with a short unstressed vowel in the second syllable of the nonce word, and one with a long vowel bearing secondary stress. The first version corresponds to the 1-foot condition, and the second version corresponds to the 2-foot condition.

**Sentences.** Each paragraph was associated with four sentences. For the test paragraphs, a *to*-dative and a double object dative were among the four; these were the “test” sentences. Whether the sentence was a double object dative or a prepositional dative was one of the main variables of interest, namely, CONSTRUCTION. The other two sentences contained other constructions: a passive with the theme as the subject, a passive with the recipient as the subject, an imperative transitive, or an intransitive. The sentences were presented without the final ‘e’ in the 1-foot condition and with the final ‘e’ in the 2-foot condition. For example, here is the set of sentences associated with paragraph (17):<sup>11</sup>

- (19) a. Bob decided to feffam(e) his daughter the apartment instead.  
 b. Bob decided to feffam(e) the apartment to his daughter instead.  
 c. The apartment was feffamed to Bob’s daughter instead.

<sup>11</sup>Because the past tense is spelled ‘ed’ when the verb lacks the final ‘e’, there is no spelling difference between the two conditions in the past tense, as in (19c).

- d. Feffam(e) the apartment!

Examples (19a) and (19b) are the test sentences; (19c) and (19d) are the filler sentences. In this case, one of the filler sentences is a passive with the theme as subject (19c), and one of the filler sentences is an imperative transitive (19d). Thus, two of the sentences for each test paragraph were “filler” sentences; these did not contain dative constructions. All four of the sentences for each filler paragraph were filler sentences, so there were three times as many filler sentences as test sentences in total.

**Procedure.** Subjects first read the instructions, of which the following is an excerpt:

In this experiment, you'll be hearing some passages over the headphones. Each passage will teach you the meaning of a new word.

You will see a cross on the screen while the recording is going. (If the recording does not start right away, please be patient.)

Then you will see a sentence containing the new word. Please read the sentence OUT LOUD, as naturally as you can.

Having learned this new word, give your opinion about how natural the sentence is, on a scale from 1 to 7. Use “1” if the sentence sounds absolutely terrible and could never be an English sentence. Use “7” if the sentence rolls right off the tongue without a problem.

The important thing to focus on is how the word is used in the sentence, not the word itself. Don't worry if you aren't sure; just go with your gut reaction.

After three trials for practice, there were 32 experimental trials. On each trial, participants listened to a recording of a paragraph over the headphones. A crosshair appeared on the screen while the recording played. Each paragraph was immediately followed by a series of four sentences containing the nonce verb, which the participants judged. For each sentence, the participant first read the sentence out loud (again to ensure correct pronunciation), and then judged it on a 1-7 scale.

Half of the 32 paragraphs were “test” paragraphs and half were “filler” paragraphs. For half of the test paragraphs, the recording had a pronunciation of the nonce verb with a long vowel in the second syllable, and for the other half, the recording had a short vowel pronunciation. (There was only one pronunciation of the nonce verb available for the filler paragraphs, of course.) No participant heard any given nonce verb more than once, so each participant heard only one pronunciation of each verb.

### 3.7.2 Results and discussion: Acceptability

The pronunciations were coded according to whether or not they were identical to the pronunciation given, and if not, whether or not they at least preserved the prosodic structure modelled in the recorded passage. Only responses based on pronunciations that preserved the correct prosodic structure were included in the analysis.

As in Experiment 1, the acceptability ratings were converted to  $z$ -scores to take into account differences between subjects in the use of the rating scale. Both PARTICIPANT and ITEM were treated as random effects in a mixed-effects linear regression model of the rating  $z$ -score, using the `lmer` command in R. The significance values are again based on MCMC sampling, with 10,000 simulations.

The results are shown in Figure 3.3. As the graph suggests, there was a main effect of CONSTRUCTION ( $B = 0.71$ ,  $p < .001$ ), but no interaction between CONSTRUCTION and PROSODIC WEIGHT on acceptability ( $B = -0.05$ ,  $p = .76$ ). There was also no main effect of PROSODIC WEIGHT ( $B = -0.08$ ,  $p = .12$ ).

Whereas Gropen et al. (1989) found a contrast between monosyllabic verbs and polysyllabic verbs, there was no contrast between 1-foot and 2-foot verbs here. There are several possible explanations for this difference between experiments. The most obvious explanation is that prosodic weight is not sufficient to classify verbs as alternating or non-alternating; either the number of syllables or the number of morphemes or the overall perceived Latinateness of the verbs *calimode*, *dorfinize*, *orgulate*, and

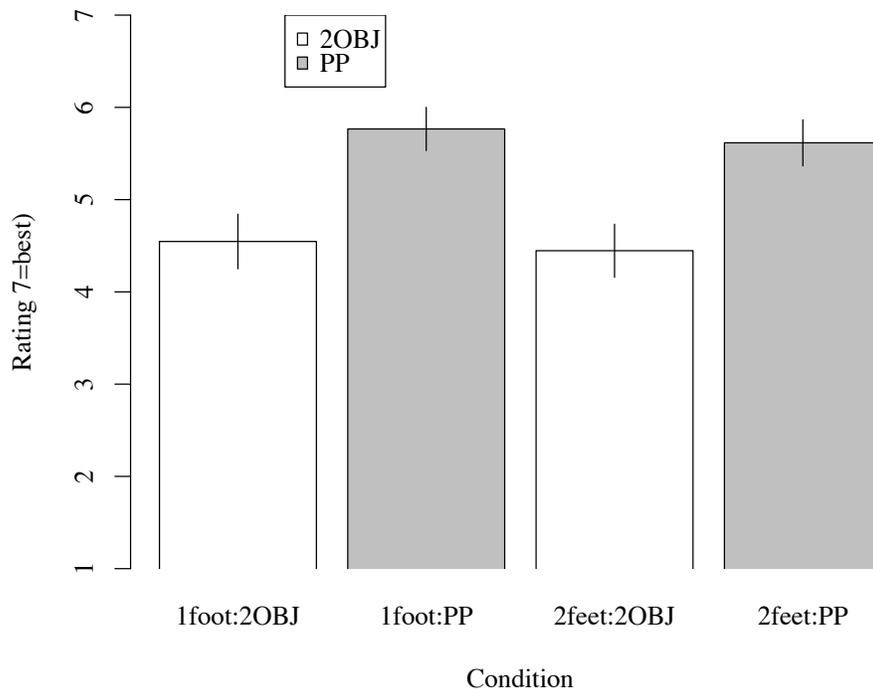


Figure 3.3: Experiment 2: Mean acceptability ratings by construction and word shape

*repetrine* contributed to their lack of ability to license the double object construction.

Another possible explanation is that our participants are different from Gropen et al.'s. While both samples were drawn primarily from college populations, the two populations differ geographically. Moreover, it is almost 20 years since Gropen et al.'s study. A third possible explanation is that in the present study, but not in Gropen et al.'s, participants developed a conscious awareness of the double object vs. prepositional object manipulation, and chose to assign all of the double object sentences the same rating. This masked any underlying sensitivity to prosodic weight that exists subconsciously.

There is some support for the third of these, the conscious strategy explanation. First, whereas Gropen et al. had 9 filler constructions, I used only 4. More anecdotally, in the debriefing session following the experiment, participants fairly often displayed

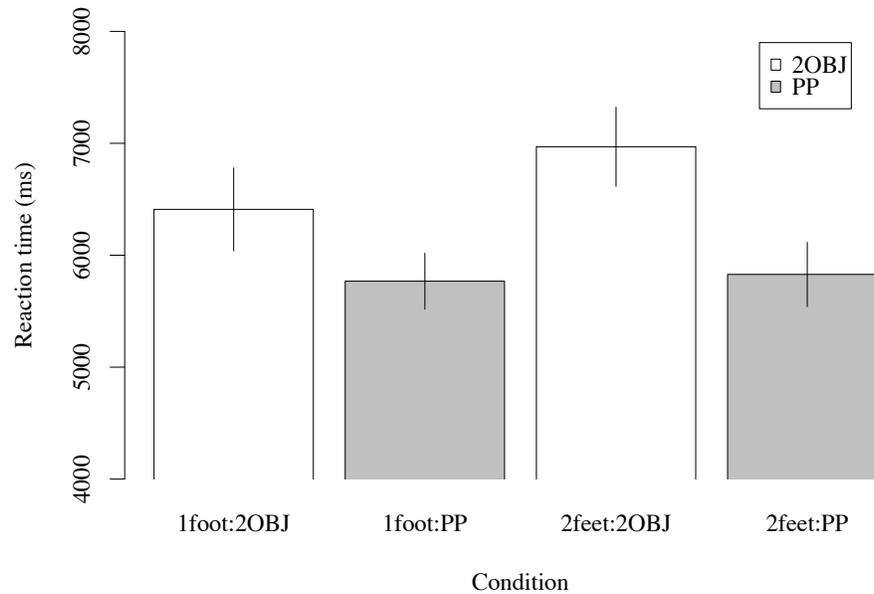


Figure 3.4: Experiment 2: Response times by construction and word shape

awareness of the manipulation between the two alternants of the dative alternation. Finally, the response time results, discussed in the following section, support the idea that there may have been a genuine effect of prosodic weight that failed to appear in the acceptability judgments.

### 3.7.3 Results and discussion: Response times

Response time provides an additional measure of how participants perceived the stimuli. This measure includes the time it took participants both to read a sentence aloud and to make a decision as to how to rate it.

With respect to response times, there *was* a significant interaction between CONSTRUCTION and PROSODIC WEIGHT ( $B = -502.8$ ,  $p = .04$ ) such that 2-foot verbs took longer for participants to read and make a decision about than 1-foot verbs in the double object construction. This data is shown in Figure 3.4.

There are quite a few ways to interpret these response times. Longer response times could signal either comprehension difficulty or difficulty of evaluation, because they represent the time participants took to complete both tasks. Since evaluation was taking place concurrently with comprehension, it is not possible to isolate the periods during which each task was taking place and measure them separately. However, there is a strong relationship between response time and acceptability rating, as shown in Figure 3.5: Restricting attention to the filler sentences (of which there were  $2 \times 16 + 4 \times 16 = 96$ ), which all of the participants judged, the average response time for sentences that were given extreme ratings is lower than the average response time for sentences that were given intermediate ratings. In other words, when the judgment was extreme, participants were quick to make a judgment, and when the judgment was intermediate, participants took longer. A slower response time, therefore, may be taken to indicate uncertainty. On the upper half of the rating scale (4-7), a slower response time could therefore indicate a less extreme, hence lower, acceptability level. Since the ratings given to the dative sentences were all in the upper half of the rating scale (4-7), the response time result can be taken to indicate that the 2-foot verbs in the double object construction were in fact less acceptable than 1-foot verbs, as the metrical hypothesis would predict.

### 3.7.4 Summary: Experiment 2

The results of Experiment 2 were mixed. The main result was negative: there was no significant interaction between CONSTRUCTION and PROSODIC WEIGHT on RATING  $z$ -score, contrary to the prediction of the prosodic weight hypothesis. This suggests that the contrast between 1-syllable and 3-syllable nonce words that Gropen et al. (1989) found was not due to prosodic weight. However, there could be other explanations for the lack of an effect of prosodic weight.

Prosodic weight *did* interact significantly with construction as a predictor of the

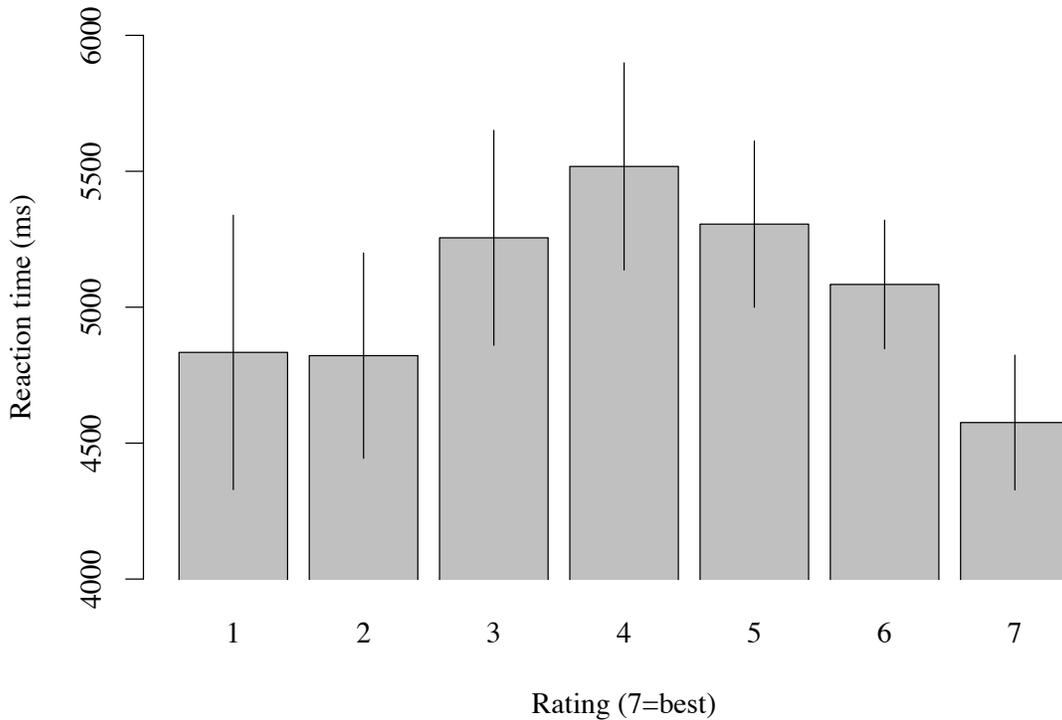


Figure 3.5: Experiment 2: Response times by acceptability judgment, fillers only

time that participants took to respond; participants judged 2-foot nonce verbs significantly more slowly than 1-foot verbs in the double object construction. Prosodic weight therefore does have some impact, independent of all other factors. This result is consistent with the idea that a conscious strategy interfered with participants' ability to discriminate between verbs based on their form in their acceptability judgments. However, it is still unclear whether prosodic weight was a driving factor behind Gropen et al.'s finding.

Another way to synthesize the results of this experiment with those of Gropen et al. (1989) is to view prosodic weight as one among multiple cues that conspired to produce a contrast between 1-syllable and 3-syllable verbs in the Gropen et al. experiment. It is strong enough to produce a perceptible effect in response times, but not strong enough to drive a contrast in acceptability. This idea is consistent with the

view that Grimshaw (2005) espouses, when she claims that prosodic weight is a cue that allows native English speakers to classify verbs into one of their two lexicons, the G-lexicon and the L-lexicon. If this view is correct, then prosodic weight may have conspired with other factors to produce the effect that Gropen et al. observed.

Several open questions remain: Is prosodic weight capable of driving contrasts in acceptability between ditransitive and prepositional dative uses of nonce verbs, under the right experimental conditions? Even if such an effect could be found, it may be that apparent etymology or morphological complexity is the driving factor. The next experiment aimed to tease these possible explanations apart.

### 3.8 Experiment 3: Etymology in nonce verbs

The previous experiment did not unambiguously support Grimshaw's prosodic weight hypothesis, but was consistent with her more general claim, that prosodic weight allows speakers to classify words of English into two lexicons, the G-lexicon and the L-lexicon. Experiment 3 evaluates this claim. In particular, my goal was to find out whether apparent etymological origin governs the productivity of the double object construction.

The etymology hypothesis predicts that words that appear to have native (Germanic) origin should be more acceptable as ditransitives than words that appear to have Latinate origin, even if they have the same number of syllables, the same stress pattern, and the same number of morphemes. A nonce word such as *forhoove*, which has two syllables, stress on the second syllable, two morphemes, and apparently native origin, should therefore be more acceptable as a ditransitive verb than a nonce word such as *tranject*, which has all of the same features except that it has ostensibly Latinate origin.

A secondary goal of this experiment is to replicate Gropen et al.'s finding that

monosyllabic nonce verbs like *moop* are more acceptable than trisyllabic ones like *calimode*, to ensure that variations on Gropen et al.'s methodology are not eliminating the effect.

By including the conditions used by Gropen et al., I was able to evaluate the predictions of other hypotheses as well. If prosodic weight *per se* was the driving factor, then there should be no contrast between nonce verbs like *forhoove* and ones like *tranject*, but both of these should contrast with monosyllabic verbs like *moop*. The morphological complexity hypothesis predicts that as long as a verb is morphologically complex, it should be unacceptable as a ditransitive, so morphologically complex verbs like *forhoove* and *tranject* should be less acceptable as ditransitive verbs relative to morphologically simple verbs like *moop*. Thus, both of these hypotheses predict that nonce verbs like *forhoove* and *tranject* should pattern with verbs like *calimode*, against verbs like *moop*.

### 3.8.1 Methods

**Participants.** Forty adult native English speakers participated in this experiment. Participants were all members of the Stanford community, and primarily undergraduates who participated in the experiment for course credit. Those who did not participate for course credit were paid \$14. None of the participants in this study participated in Experiment 1 or 2.

**Paragraphs.** In this nonce word judgment task, the materials consisted of 32 paragraphs, and all of them were “test” paragraphs; there were no filler paragraphs, unlike in the previous experiment. Sixteen of the paragraphs described communication events (in which some piece of information or message is conveyed), and 16 others described transfer of possession events (in which the agent no longer possesses the theme after the action takes place).

Example paragraphs describing movement/transfer events are as follows (illustrated with *dorfinize*):

- (20) Sue, who had wanted the deed to the house for twenty years, was very excited when her lawyer called with the good news. Her lawyer told her that Bob, the current owner, was almost ready to **dorfinize**, the formal (and only legal) process by which she could obtain the house. Sue hoped that Bob would **dorfinize** the house to her rather than his daughter.
- (21) John and Ben, the star players for their team, were eager to face their rival. Ben knew that it would be very important for him to **dorfinize**. And sure enough, it was the deciding moment of the game when John summoned all of his strength and was able to **dorfinize** the disc to Ben.

Here are example paragraphs describing communication events.

- (22) Brian desperately needed to speak to his girlfriend Katie, and he was grounded from the phone and the internet. The only way he could possibly get in touch with her would be to **dorfinize**, using a combination of radio signals and digital technology. After hours of intense engineering, he was able to **dorfinize** his message to Katie.
- (23) Pierre, a top-notch waiter at a five star restaurant, was always worried about how to bring the check. No matter how he did it, he always felt rude. After thinking about it long and hard, he realized that the best strategy would be to **dorfinize**. If he could simply **dorfinize** the check to the guests, then nobody would ever be offended.

The full list of paragraphs is given in the appendix, §3.10.3.

**Verbs.** For each of the 32 paragraphs, there was one nonce word (although the assignment of verbs to paragraphs varied across four versions of the experiment, as described below). The 32 nonce words in the current study are listed in Table 3.4. There are four WORD SHAPE conditions:

- Condition 1: Monosyllabic
- Condition 2G: Disyllabic with Germanic (native) morphology
- Condition 2L: Disyllabic with Latinate morphology
- Condition 3: Trisyllabic

(The monosyllabic words were more Germanic-sounding and the trisyllabic words were Latinate-sounding, so the “1” condition can be thought of as “1G”, and the “3” condition can be thought of as “3L”.) Each category contained eight words. The two-syllable words contained a prefix of Germanic or Latinate origin, respectively, followed by a stem that either had such an origin or could plausibly be seen to have it. The three-syllable words all had recognizable Latinate suffixes, and plausibly Latinate stems. Each group of eight words was divided as evenly as possible into two groups of four words for the purposes of balancing the assignment of words to paragraphs.

There were four versions of the experiment, each with a different assignment of words to paragraphs. The assignments were counterbalanced such that each word appeared twice in a communication paragraph and twice in a transfer-of-possession paragraph. Furthermore, each paragraph appeared with one word from each WORD SHAPE condition (1, 2G, 2L, 3). For example, one paragraph appeared with the trisyllabic nonce word *secutize*, the disyllabic Latinate word *subfect*, the disyllabic Germanic word *erskall*, and the monosyllabic word *dorf*, across the four versions of the

1-SYLLABLE (GERMANIC)	2-SYLLABLE (GERMANIC)	2-SYLLABLE (LATINATE)	3-SYLLABLE (LATINATE)
stott	gestosh	submote	orgulate
tonk	erskall	obtend	secutize
goam	forhoove	sevolve	volutize
moop	besloff	expute	sedify
pell	forqueath	tranject	pugnavate
dorf	gelaut	subfect	crocinize
norp	erblick	affute	flumenate
blint	begroat	procuse	sulcify

Table 3.4: Experiment 3: Nonce verbs

experiment. Because each participant only saw one version of the experiment, each participant only witnessed one assignment of words to paragraphs.

**Sentences.** In order to make it more difficult for participants to develop a conscious strategy, the double object and prepositional dative constructions appeared in different *CLAUSE TYPES* (imperative, declarative, yes-or-no question, or subject *wh* question). The clause type of the double object sentence and the clause type of the prepositional dative sentence were not fully crossed, but each argument structure pattern (double object or prepositional dative) appeared with each clause type an equal number of times. In total, there were four *CLAUSE TYPE* conditions associated with each paragraph in each version of the experiment. In the *DECL-IMP* condition, the double object dative was in a declarative clause, and the prepositional dative in imperative clause:

- (24) a. Ron was happy to **dorf** Dave the statistics.  
 b. **Dorf** the statistics to Dave!

The *IMP-DECL* condition had the reverse:

- (25) a. **Dorf** Dave the statistics!

- b. Ron was happy to **dorf** the statistics to Dave.

In the WHSUBJ-YN condition, the double object dative occurred in a subject *wh* question, and the prepositional dative in yes-or-no question:

- (26) a. Who **dorfed** Dave the statistics?  
 b. Did Ron **dorf** the statistics to Dave?

The YN-WHSUBJ condition again had the reverse:

- (27) a. Did Ron **dorf** Dave the statistics?  
 b. Who **dorfed** the statistics to Dave?

In all conditions, the recipient was always a proper noun, and the theme was always a lexical noun phrase, as shown. In general, the factors that Bresnan et al. (2007) found to influence the dative alternation were held constant across items.

In addition to the two test sentences, there were eight filler sentences with distinct argument structure patterns, illustrated in declarative clauses below (the particle chosen for the particle constructions was the most appropriate one for the meaning of the verb given the paragraph):

- (28) a. The statistics will be **dorfed** to Dave. [Theme-subject Passive (TP)]  
 b. Dave was **dorfed** the statistics by Ron. [Recipient-subject Passive (RP)]  
 c. Ron will **dorf** soon. [Intransitive (IN)]  
 d. Ron **dorfed** the statistics perfectly. [Monotransitive (MT)]  
 e. The statistics will **dorf** well. [Middle (MID)]  
 f. Ron **dorfed** the statistics for Dave. [Benefactive (BEN)]

- g. Ron finally **dorfed** over the statistics. [Monotransitive + Particle (MTPRT)]
- h. Ron refused to **dorf** Dave out the statistics [Double object + Particle (DOPRT)]

The reason for including more filler sentences per paragraph was to make the design more similar to Gropen et al.'s, and to reduce participants' opportunities for forming conscious strategies.

The fillers also varied in clause type (declarative, imperative, yes-or-no question, or subject *wh* question). Clause types were assigned to argument structure patterns in such a way as to ensure that the four clause types were evenly represented across the eight fillers (two sentences of each clause type), and each argument structure pattern occurred an equal number of times with each clause type. For a given clause type condition of a given paragraph, the assignment of clause types to argument structures for the fillers remained constant across all four versions of the experiment. For example, the set of filler sentences in the DECL-IMP condition for one paragraph are as follows:

- (29) a. The statistics will dorf without any trouble. [MID, DECL]  
 b. Ron finally dorfed over the statistics. [PRT, DECL]  
 c. The statistics should be dorfed to Dave by Ron. [TP, IMP]  
 d. Ron should really dorf. [IN, IMP]  
 e. Who will dorf the statistics for Dave? [BEN, WHSUBJ]  
 f. Who will dorf Dave over the statistics? [DOPRT, WHSUBJ]  
 g. Was Dave dorfed the statistics? [RP, YN]  
 h. Has Ron dorfed the statistics yet? [MT, YN]

(When a true imperative was impossible, as in the case of passives, or awkwardly short, as in the case of intransitives, a declarative headed by *should* appeared instead.) Again, the rationale for this clause type manipulation was to give participants an alternative factor to posit as a factor of interest for the study and increase the complexity of the manipulations.

**Procedure.** This experiment had three phases:

1. A nonce word sentence judgment task
2. A memory test, which the participants were informed about before they completed the nonce word judgment task
3. A questionnaire on the etymology of the nonce words, given after the completion of 1 and 2

These will be described in turn.

At the beginning of the session, participants were informed that the session would consist of three phases, and heard the instructions for the sentence judgment phase verbally. They were also informed that there would be a memory test at the end. The instructions for the sentence judgment task included the following:

In this experiment, you'll be reading some short passages. Each passage will describe the meaning of a new word.

After you read the passage, you will see a series of sentences containing the new word. Your job is to judge how well the word is used in the sentence.

To respond, you will be given a scale from 1-7, where 1 means the word is used very BADLY, and 7 means the word is used very WELL.

On each trial of the sentence judgment task, the participant read the paragraph containing the word, and for each of the ten sentences following the paragraph, judged

the sentence on a 1-7 scale. The test and filler sentences following each paragraph appeared in a different random order for each participant. The paragraphs themselves were also randomly ordered.

A memory test followed the sentence judgment task. The memory test contained six sentences that had been presented and six sentences that had not been, modified slightly from sentences that had been presented. The main purpose of the memory test was to encourage participants to pay attention during the sentence judgment task.

After completing the memory test, the participants saw each of the nonce words again and were asked, for each word, what its most likely etymology is, choosing between French, Latin, Old English, and Greek. The purpose of this portion of the procedure was to ascertain whether or not participants could explicitly identify contrasts in apparent etymology, and whether or not this explicit knowledge affected their judgments of the syntactic properties of the nonce words.

### 3.8.2 Results and discussion: Constructed etymology

The data were analyzed using mixed-effects linear regression models of the RATING (converted into a  $z$ -score, as explained above) with crossed random effects for PARTICIPANT, PARAGRAPH, and WORD, created using the `lmer` command in `lme4` package from the R statistical library (Baayen 2008).<sup>12</sup> As in Experiments 1 and 2 (see page 77), the significance values are based on Markov chain Monte Carlo sampling of the posterior distribution of the model parameter in question with 10,000 simulations, given by the `pvals.fnc` command from the R `languageR` library.

The results for WORD SHAPE are shown in Figure 3.6. The vertical axis shows the  $z$ -score of the participants' ratings. The ratings are subdivided by CONSTRUCTION (double object or prepositional dative) and WORD SHAPE condition on the horizontal

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<sup>12</sup>Including both PARAGRAPH and WORD as random effects amounts to treating both as “item” variables.

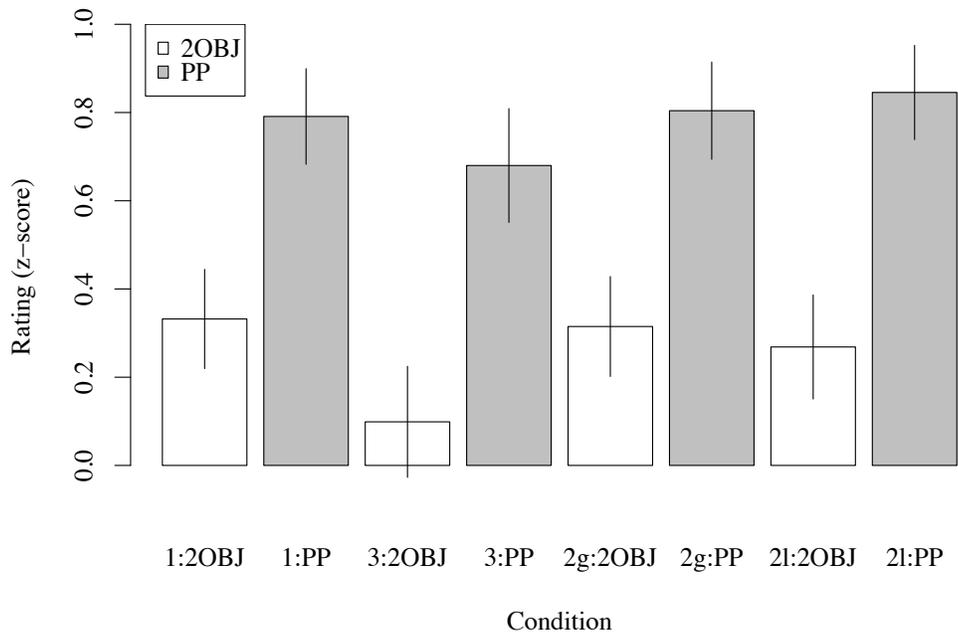


Figure 3.6: Experiment 3: Mean acceptability rating  $z$ -score by construction and word shape

axis.

The first four bars in the graph in Figure 3.6 represent a replication of the Gropen et al. (1989) result; there is a significant interaction between CONSTRUCTION and WORD SHAPE, focussing only on the monosyllabic and trisyllabic conditions. This interaction was evaluated using a logistic regression model of rating  $z$ -score, limited to the dataset consisting of judgments for the 1-syllable and 3-syllable nonce words, with WORD SHAPE, CONSTRUCTION and their interaction as fixed factors, and WORD, PARAGRAPH, and PARTICIPANT as random effects. CONSTRUCTION was recoded as ‘0’ for the double object construction and ‘1’ for the prepositional dative construction, and WORD SHAPE was recoded as ‘0’ for the monosyllabic condition and ‘1’ for the trisyllabic condition. Within this dataset, there was a significant positive interaction between WORD SHAPE and CONSTRUCTION ( $B = 0.236$ ,  $p < .02$ ), along with main

effects of WORD SHAPE ( $B = -0.281$ ,  $p < .01$ ) and CONSTRUCTION ( $B = 0.376$ ,  $p < .01$ ). The main effect of WORD SHAPE favors one-syllable words; three-syllable words received lower acceptability ratings overall than the one-syllable words. The main effect of CONSTRUCTION favors prepositional datives over double object datives overall. (This is not surprising given that prepositional datives were used in the paragraphs.) The interaction between WORD SHAPE and CONSTRUCTION is such that ditransitive uses of trisyllabic words received significantly lower ratings than ditransitive uses of monosyllabic words, relative to prepositional datives. This interaction is the result of interest, because it suggests selective productivity of the double object construction based on WORD SHAPE.

The rightmost four bars in the graph in Figure 3.6 concern the two disyllabic conditions that were added to Gropen et al.'s design, 2L and 2G. Visually, it appears that they pattern like the monosyllabic condition, leaving the trisyllabic verbs on their own, contrary to the predictions of any of the current hypotheses. Looking pairwise at interactions between WORD SHAPE and CONSTRUCTION by limiting the dataset to judgments for two WORD SHAPE conditions at a time, it is the case that the monosyllabic-trisyllabic contrast interacts significantly with CONSTRUCTION (as reported above; this replicates Gropen et al.'s finding), and there were no significant interactions between CONSTRUCTION and either of the monosyllabic-disyllabic contrasts. However, the disyllabic conditions are not equivalent to the monosyllabic condition: the disyllabic-trisyllabic contrasts also fail to interact significantly with CONSTRUCTION, unlike the monosyllabic-trisyllabic contrast. Hence, the disyllabic conditions appear to be intermediate between the monosyllabic and trisyllabic conditions, not significantly different from either, even though the monosyllabic and trisyllabic conditions are significantly different from each other. The contrast between the two disyllabic conditions (2G and 2L) also did not interact significantly with CONSTRUCTION.

These results do not support any of the predictions discussed above. The prosodic weight hypothesis predicts a significant contrast between the mono- and multi-syllabic conditions, as does the morphological complexity hypothesis, since the multi-syllabic conditions happen also to be bimorphemic. The two-lexicon hypothesis predicts a significant contrast between the Latinate and Germanic conditions.

Since the prosodic weight hypothesis corresponds to the most concrete and measurable property of these words, it is the most easily refuted hypothesis. These results are clearly inconsistent with that hypothesis, as the disyllabic words undeniably contain more than one metrical foot.

The other hypotheses, however, are salvageable. In §3.8.3, I will explore the possibility that what matters is not the language from which the word was intended to derive, but the language from which the word is perceived as deriving (“perceived” rather than “actual” etymology). Likewise, it is possible that although the words in the disyllabic conditions were constructed as morphologically complex, they are not always perceived as morphologically complex, or perceived as complex to varying degrees. This potential way of accounting for the intermediate stats of the disyllabic conditions between the mono- and trisyllabic conditions is explored in §3.8.4. Following that, the formality hypothesis will be further explored, in §3.8.5.

### 3.8.3 Results and discussion: Perceived etymology

As just discussed, the two-lexicon hypothesis appears at first glance not to be supported by the results shown in Figure 3.6. The prediction of this hypothesis was that there should be a contrast between 2L words and 2G words in their acceptability as ditransitives, but such a contrast was not found. A potential explanation for the absence of the predicted effect might lie in the fact that participants’ perceptions of the properties of these words may not match the properties that they were designed to have. Under this view, it is the etymology that words are *perceived* as having that

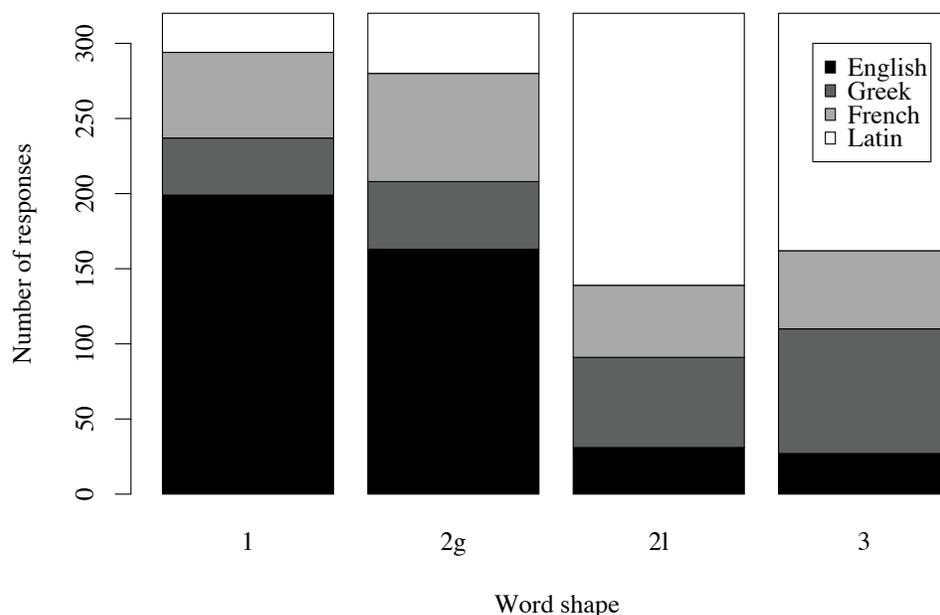


Figure 3.7: Etymology questionnaire: Frequency of response type by word shape

matters.

In Figure 3.7, the frequencies of responses in the etymology section for each of the word shapes are shown (*English* is short for *Old English*, and *Greek* is short for *Ancient Greek*). In keeping with how the words were designed, there were fewer *Latin* and more *Old English* responses in the 1 and 2G conditions than in the 2L and 3 conditions, but there is a fair amount of variability in all conditions.

Several ways of using this variability to predict contrasts in acceptability between double object and prepositional dative structures will be considered in what follows. First, summary statistics at the word level will be considered, followed by summary statistics at the participant level, followed by a fine-grained analysis linking individual participants' responses on the etymology questionnaire with their responses on the acceptability judgment task.

### 3.8.3.1 Word-level: Perceived Latinateness

One way of exploiting the variability shown in Figure 3.7 is to summarize, for each word, the percent of participants that perceived it as deriving from Latin or Old English, and to use these statistics as predictors of the contrast in acceptability between the double object and prepositional dative constructions. Taking a closer look at perceived etymology of individual words is a potential strategy for salvaging the two-lexicon hypothesis. Words that are *perceived* as deriving from Latin (or Old English) may be less (or more) acceptable as ditransitives, relative to prepositional datives.

The proportions of “Latin” and “Old English” responses in the etymology questionnaire are shown in Figure 3.8. Each point on that graph represents an individual word. The symbols represent the word’s WORD SHAPE category, as indicated in the legend. The proportion of participants who judged a given word as deriving from Old English is shown on the vertical axis, and the proportion of participants who judged the word as deriving from Latin is shown on the horizontal axis. (“French” and “Greek” responses are not represented on the graph.) The graph shows a clear demarcation between the words that were intended to be perceived as native (1, 2G) and those that were intended to be perceived as Latinate (2L, 3), and total overlap between the two “native” classes, and between the two “Latinate” classes. Participants essentially got the intended etymology “right,” and equally so in all classes.

Since participants found 2L-words equally Latinate as 3-words, and found 2G-words equally Latinate as 1-words, perceived Latinateness cannot be the (only) explanation for the contrast between 1-words and 3-words. If it were, then there should have been a significant contrast between 2L and 2G words.

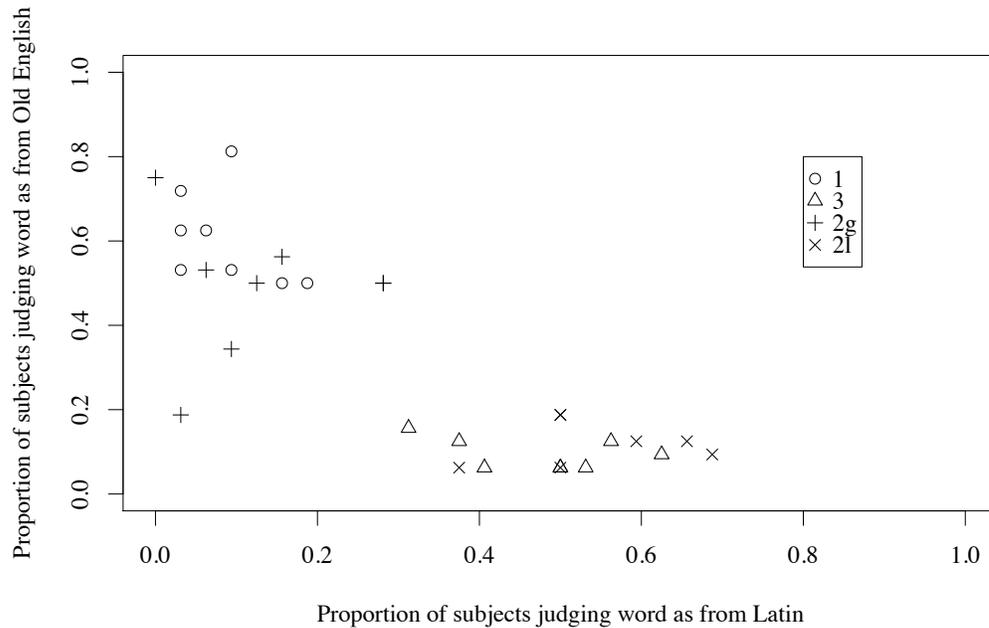


Figure 3.8: Etymology questionnaire: Proportion of “Latin” and “Old English” responses by word

### 3.8.3.2 Participant-level: Etymology score

Some participants were more “accurate” in their responses on the etymology questionnaire than others. Did those participants show more sensitivity to etymological contrasts than those with less command of etymology? To examine this possibility, participants were characterized by how “well” they did on the etymology questionnaire, i.e., how often their responses conformed to the intended etymology of the nonce verbs (ETYMOLOGY SCORE). *Latin*, *French*, and *Greek* were counted as “correct” for the 2L and 3 conditions, and *Old English* counted as correct for the 1 and 2G conditions. All other answers counted as incorrect. The prediction of the two-lexicon hypothesis is that participants who scored well on the etymology section would show a larger difference between the 2G and 2L conditions.

This prediction was tested with a mixed-effects linear regression model with fixed

effects for WORD SHAPE, CONSTRUCTION, and ETYMOLOGY SCORE, along with all interactions between these factors, and the usual random effects. There was a significant interaction between ETYMOLOGY SCORE and CONSTRUCTION on the acceptability rating  $z$ -score, as shown in Figure 3.9. Each data point on the graph corresponds to an individual participant. The horizontal dimension represents the etymology score; the further to the right the point is, the higher the participant's score on the etymology questionnaire. The vertical dimension represents the average difference in acceptability between double object and prepositional datives for that participant; the lower the point is on the graph, the less acceptable double object datives are compared to prepositional datives. This was one of the most robust findings of the experiment, but it is not of particular interest here, since it does not relate to the issue of how formal properties of words govern the productivity of the double object construction. (Since this effect is so strong, it was included in all of the regression models. Including this factor in the models described above does not qualitatively affect the results.)

Despite this strong interaction between ETYMOLOGY SCORE and CONSTRUCTION, there was no support for the idea that people who were good at etymology would show greater sensitivity to WORD SHAPE in their judgments of the ditransitive construction. If the driving force behind native speakers' intuitions that verbs like *donate* and *explain* are unacceptable as ditransitive verbs lies in their implicit understanding of etymology, one would have expected speakers with a strong sense of etymology to have strong intuitions about the grammaticality of nonce verbs based on their apparent etymology. However, there was no three-way interaction between ETYMOLOGY SCORE, CONSTRUCTION, and WORD SHAPE. ETYMOLOGY SCORE does not appear to modulate the interaction between WORD SHAPE and CONSTRUCTION.

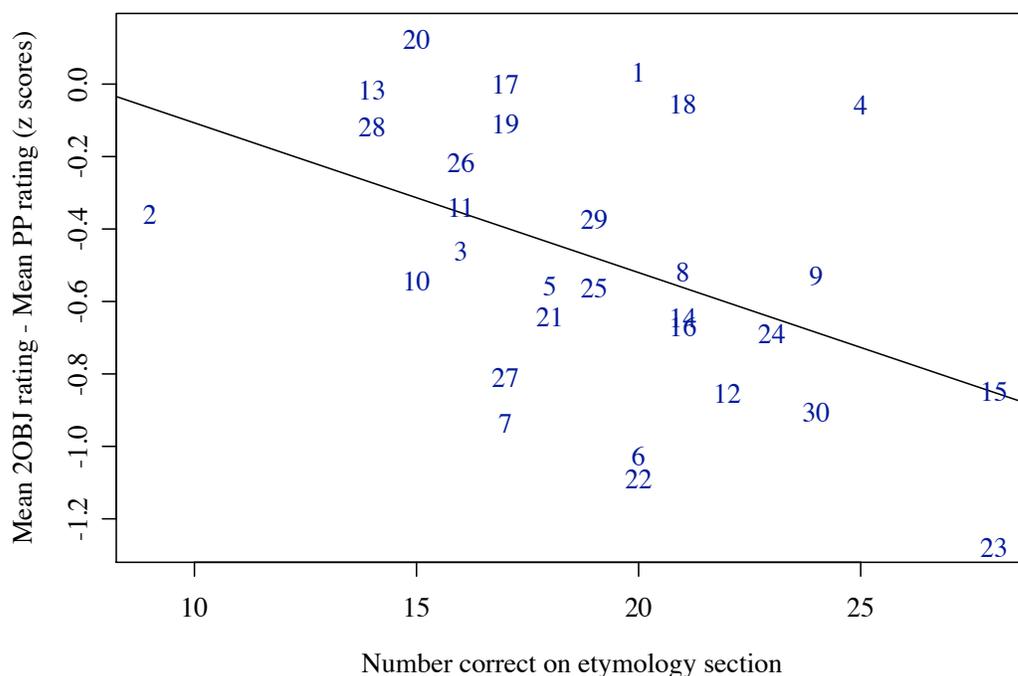


Figure 3.9: Experiment 3: Effect of etymology score on mean acceptability rating  $z$ -score by subject

### 3.8.3.3 Perceived Latinateness

There is yet hope for the two-lexicon hypothesis, because there is a more fine-grained way of measuring perceived etymology. Instead of word-level or participant-level statistics, it is possible to identify, for each word, what etymological origin the participant assigned to it, and use this information (PERCEIVED ETYMOLOGY) as a predictor of the participant's responses for that word. (For example, if participant  $s$  assigned *Old English* to *forhoove*, then *Old English* would be the value of PERCEIVED ETYMOLOGY corresponding to all of  $s$ 's judgments on sentences containing the word *forhoove*.)

To evaluate the effect of PERCEIVED ETYMOLOGY, a mixed-effects linear regression model of rating  $z$ -score (for participant  $s$ , and a sentence containing word  $w$ ) was

constructed with fixed effects for PERCEIVED ETYMOLOGY (of word  $w$  by participant  $s$ ) and CONSTRUCTION. As above, CONSTRUCTION was recoded as ‘0’ for the double object construction and ‘1’ for the prepositional dative construction. Dummy coding was also used to evaluate the effects of each level of PERCEIVED ETYMOLOGY (*Old English, French, Greek, Latin*); here *Old English* was the reference category.<sup>13</sup> The interaction between ETYMOLOGY SCORE and CONSTRUCTION, was included in the model in order to control for this effect.

In this model, PERCEIVED ETYMOLOGY: LATIN emerges as a significant main effect ( $B = -0.18, p < .01$ ). This means that overall, sentences containing words perceived as deriving from Latin received lower ratings than those containing words perceived as deriving from Old English. In addition to this main effect, PERCEIVED ETYMOLOGY: LATIN yields a significant positive interaction with CONSTRUCTION: PP ( $B = 0.226, p < .01$ ). This means that participants tended to give lower ratings to ditransitive uses of verbs that they perceived as coming from Latin.

The question of interest, however, is whether or not this effect survives once NUMBER OF SYLLABLES is controlled for. There is a significant correlation between NUMBER OF SYLLABLES and PERCEIVED ETYMOLOGY: LATIN, measured on a per word basis as the percentage of participants who judged the word as deriving from Latin (Pearson’s product-moment correlation  $r = 0.62, t(30) = 4.3, p < .01$ ). This association means both that NUMBER OF SYLLABLES is a confounding factor, and that it would be problematic to include both NUMBER OF SYLLABLES and PERCEIVED ETYMOLOGY in a regression model.

One way to evaluate the independent contributions of collinear independent variables is to use residual variance from one model as a dependent variable in another. Let

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<sup>13</sup>This means that each level of PERCEIVED ETYMOLOGY other than *Old English* was represented as a ‘dummy’ variable in the regression model, with the levels 0 and 1. The ‘dummy’ variable corresponding to, for example, *French* has the value 1 if the response is *French*, and 0 otherwise.

Factor	$\hat{B}$	$p$
(Intercept)	0.679	0.004**
ETYMOLOGY SCORE	-0.009	0.287
CONSTRUCTION=PP	-0.446	0.028*
NUMBER OF SYLLABLES	-0.139	0.005**
ETYMOLOGY SCORE $\times$ CONSTRUCTION=PP	0.030	<0.001***
CONSTRUCTION=PP $\times$ NUMBER OF SYLLABLES	0.118	0.008**

Table 3.5: Experiment 3: Fixed effects in the basic linear regression model of rating  $z$ -score

the “basic” model be a mixed-effects linear regression model that includes CONSTRUCTION, ETYMOLOGY SCORE, and their interaction, along with NUMBER OF SYLLABLES as fixed factors, and PARTICIPANT, WORD, and PARAGRAPH as random factors. The estimated coefficients of the fixed effects in this “basic” model ( $\hat{B}$ ) are given in Table 3.5 along with significance values. The columns of the table show the mean estimate of the model coefficient obtained by Markov chain Monte Carlo sampling, the  $p$ -value obtained through MCMC sampling, and the significance level. (‘\*’ indicates significance at the .05 level; ‘\*\*’ at the .01 level; ‘\*\*\*’ at the .001 level.)

The difference between the model prediction and the actual response for each observation was obtained using the `resid` function in the R `stats` library. These differences functioned as the dependent variable in a linear regression model with dummy-coded variables for PERCEIVED ETYMOLOGY, CONSTRUCTION, and their interactions as predictors.

PERCEIVED ETYMOLOGY does not predict a significant amount of the residual variance from the basic model, nor does it give rise to a significant interaction with CONSTRUCTION ( $p = 0.19$ ). None of the predictors in the model of residual differences described in the preceding paragraph emerged as significant. Thus, controlling for NUMBER OF SYLLABLES, the effect of PERCEIVED ETYMOLOGY falls away.

#### 3.8.3.4 Summary: Perceived etymology

Four ways of measuring the impact of perceived etymology on acceptability as a ditransitive verb have been considered, but none of these measures succeeded in predicting acceptability of the ditransitive construction, independent of number of syllables. Three measures were based on judgments of etymological origin, and these closely mirrored the intended etymology, as shown in Figure 3.8. The contrast that Gropen et al. (1989) found between monosyllabic Germanic nonce verbs and trisyllabic Latinate nonce verbs therefore cannot be explained solely by the contrast between these verbs in apparent etymological origin.

#### 3.8.4 Follow-up study: Morphological complexity

The previous section evaluated the hypothesis that apparent etymology plays a role in governing the productivity of the double object construction. The initial results based on WORD SHAPE condition did not support the hypothesis, and other ways of construing and evaluating the hypothesis also failed to find support. None of these possibilities succeeded; apparent etymology was not a significant factor, controlling for number of syllables.

The WORD SHAPE results also suggests that morphological complexity did not have a significant impact on the acceptability of a nonce word as a ditransitive verb; the words in the disyllabic conditions were designed as morphologically complex, so they should have patterned with the trisyllabic verbs. However, the fact that they were designed to be morphologically complex (and indeed contained two morphemes) does not imply that they were necessarily *perceived* as morphologically complex.

To assess the perception of morphological complexity, I carried out an online survey in which participants assessed whether the nonce words were *simple* or *complex*. If perceived morphological complexity drives the contrast in acceptability between

*moop*-type verbs and *dorfinize*-type verbs as ditransitives, then morphological complexity ratings should emerge as significant predictors of the acceptability ratings found in the sentence judgment task.

### 3.8.4.1 Methods

**Participants.** The participants in Experiment 3 were recruited to participate by email. Sixteen participants completed the survey.

**Materials.** There were no paragraphs or sentences in this experiment; words were presented out of context. The words were identical to those in Experiment 3.

**Procedure.** The instructions were taken from Hay (2003), modified slightly thus:

In this survey, we will be interested in the structure of made-up words. You will see a number of words, and will be asked to decide whether they are more likely to be simple or complex words.

In English, for example, the word “writer” can be broken down into two units: “write,” and “er”. “er” is a unit which occurs at the end of many English words. In “writer,” “er” has been added to the word “write” to make a new, more complex word “writer.” We will call a word which has been made out of smaller units in this way, a complex word.

“Reddish” is another example of a complex word in English. It can be broken down into “red” and “ish”.

Words which are not complex are called simple words. Here are some examples of simple words in English: *yellow*, *sing*, *table*. It is impossible to break down the word “table” into smaller units. “Table” is a simple word.

In this survey you will read some made-up words. We are interested in whether you think each word is more likely to be a simple word or a complex word.

For each word, first indicate whether you think it is more likely to be a simple word, or a complex word. Then rate from 1 to 4 how certain you are of your answer. If you feel very certain of your answer, you should choose 4. If you feel very uncertain of your answer, you should choose 1. Remember that there are no right or wrong answers; we are only interested in your intuitions.

Following Hay's (2003) design, subjects were asked to make a binary choice about the morphological complexity of the word ("complex" or "simple") and rate their confidence on a 1-4 scale as well.

#### 3.8.4.2 Results and discussion

Although all of the words in both of the 2-syllable conditions were designed to be morphologically complex, and equal in complexity to the words in the 3-syllable condition, the words in these three conditions were not equivalent in perceived morphological complexity. Figure 3.10 shows the average complexity ratings in each of the four WORD SHAPE conditions.

These ratings make it possible to carry out a more nuanced investigation of the role of morphological complexity in determining the acceptability of nonce words in the ditransitive construction. This can be done by treating the proportion of participants who rate a given word as complex (MORPHOLOGICAL COMPLEXITY) as a factor and measuring its interaction with CONSTRUCTION in a mixed-effects linear regression model of rating  $z$ -score with MORPHOLOGICAL COMPLEXITY, CONSTRUCTION, and their interaction, along with ETYMOLOGY SCORE and its interaction with CONSTRUCTION. In this model, a significant interaction between morphological complexity and construction does emerge, such that the more morphologically complex a word is, the less acceptable it is as a ditransitive, relative to the prepositional dative construction.

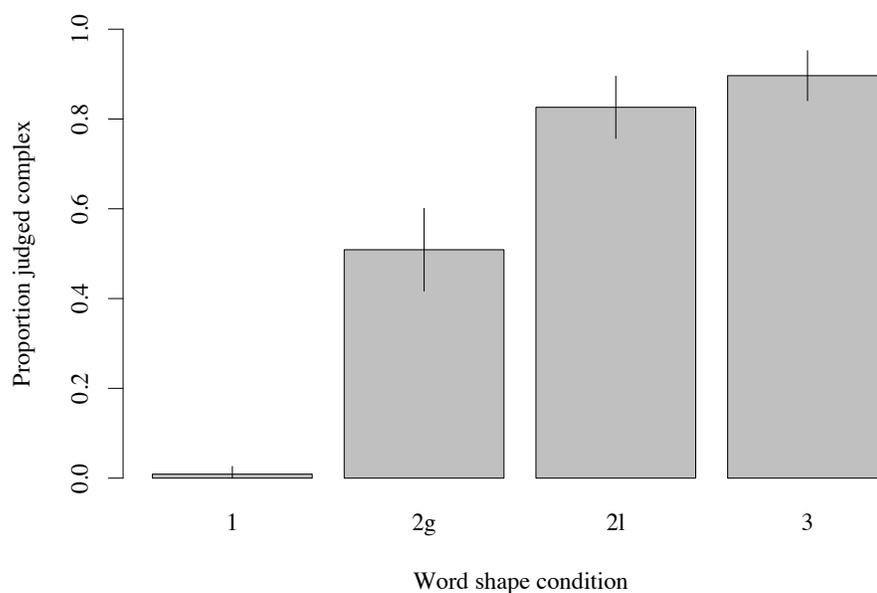


Figure 3.10: Experiment 3: Mean morphological complexity rating by word shape

This effect is illustrated in Figure 3.11, where acceptability of the ditransitive construction, relative to the prepositional dative construction, is shown on the vertical axis, and morphological complexity rating is shown on the horizontal axis. Acceptability of the ditransitive construction relative to the prepositional dative construction is measured for each word as the average rating  $z$ -score for the word as a ditransitive, subtracting the average rating  $z$ -score for the word as a prepositional dative. The distance below zero at which a word appears on the graph corresponds to how much worse the ditransitive construction is than the prepositional dative construction. The fact that the words tend to lie below zero in the vertical dimension means that the ditransitive construction tends to be worse than the prepositional dative construction.

This interaction does not survive once NUMBER OF SYLLABLES is controlled for, using the residual-based technique described above. Like PERCEIVED LATINATENESS, MORPHOLOGICAL COMPLEXITY is highly correlated with number of syllables (Pearson's product-moment correlation  $r = 0.8$ ,  $t(30) = 7.36$ ,  $p < .001$ ). This collinearity

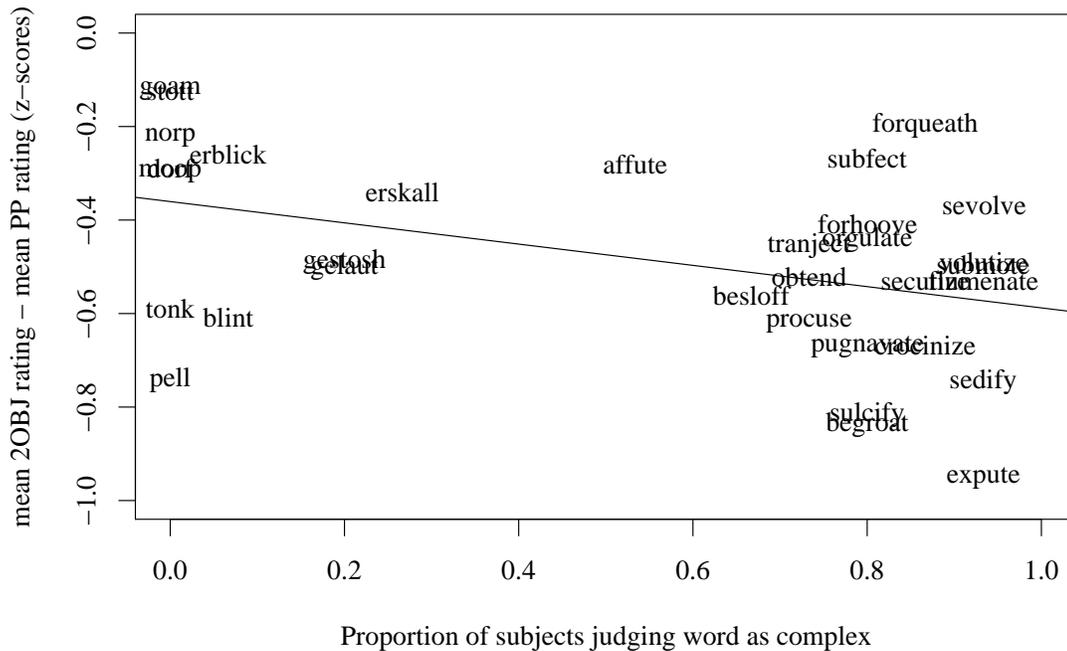


Figure 3.11: Experiment 3: Effect of morphological complexity on acceptability of ditransitive construction, relative to prepositional dative, by word

makes it problematic to include both as factors in the same regression model, but this problem can be overcome by treating the residuals of the basic model (given in Table 3.5) as the dependent variable in a new model that treats complexity as predictor of the residual data. Morphological complexity is not a significant predictor of the residual variance. This result remains once the certainty ratings are taken into account as well.

Unlike PERCEIVED ETYMOLOGY, it is not clear that MORPHOLOGICAL COMPLEXITY *should* remain significant once NUMBER OF SYLLABLES is controlled under the morphological complexity hypothesis, since the materials were not designed to include

words that varied in morphological complexity while remaining constant in number of syllables. A future study with this manipulation would be necessary in order to determine whether or not morphological complexity has an independent influence on the acceptability of nonce verbs as ditransitives.

### 3.8.5 Follow-up study: Formality

Another way in which the trisyllabic verbs differ from the monosyllabic verbs is that the trisyllabic verbs appear to be more formal. Being derived from Latin and being morphologically complex could contribute to the perceived formality of a word. Perhaps there is not really any constraint against the use of Latin-derived or morphologically complex verbs *per se*; instead, these factors may provide cues to the more general property of formality. As discussed in §3.4.4, stylistic discord (Silva and Zwicky 1975) provides a viable candidate for a more general explanation, because Latinate vocabulary is associated with a more formal register than native vocabulary (e.g. DeForest and Johnson (2001), Corson (1984)), and the prepositional dative construction is also relatively formal, compared to the double object construction (Bresnan et al. 2007). If this explanation is correct, then the apparent effect of perceived Latinate-ness could be an epiphenomenon of formality.

Additional support for the plausibility of the formality hypothesis is that the effect of morphophonological form was not as strong as the effect of using inappropriate semantics for the ditransitive construction. Violations of the morphophonological constraint were rated close to 0, in the middle of the rating scale, which ranged from -3 to 3. The mean ratings for verbs with nonpossessive semantics were much lower (-2.3), near the minimum (-3). This suggests that the morphophonological constraint is a weaker constraint than the semantic constraint involving transfer of possession. This is what would be expected if the morphophonological constraint was stylistic, assuming that a stylistic violation would be expected to have a relatively weak impact,

compared to a grammatical violation.

In order to assess the formality hypothesis, formality ratings were collected for each of the nonce words used in the sentence judgment task, and these ratings were used as predictors of acceptability in the double object construction.

### 3.8.5.1 Methods

**Participants.** 43 adult native English speakers, recruited via email, participated in the study.

**Materials.** The words in this experiment were identical to those of the sentence judgment task.

**Procedure.** The participants read the following instructions:

In this survey, we will be interested your impressions about made-up words.

You will see a number of words, and will be asked to decide how *formal* or *casual* you think they are, based on how they sound.

In English, for example, the word “stuff,” as in “There is some *stuff* missing” is very casual. In an official document, you would never see the word “stuff”; you would only use the word “stuff” in casual situations. The word “items” is much more formal – an official document might say “There are some *items* missing.”

In the following pairs of words, the word on the right is the more formal word:

whole – entire  
 leave – exit  
 help – assist  
 mistake – error  
 let – enable (to)  
 ask – inquire

tell – notify (of)  
go (to) – attend

In this survey you will read some made-up words. We are interested in how formal you think the words are, just based on how they sound.

Please think of the made-up words as *verbs*. For example, if the word is *flune*, imagine it as the verb *to flune*. You can imagine any meaning you like for the verb.

You will have a scale from -3 (very casual) to +3 (very formal). Use 0 to mean “neutral.”

After reading the instructions, the participants simply rated each nonce word on a scale from -3 to 3, 3 being the most formal and -3 being the least formal.

### 3.8.5.2 Results and discussion

Like the complexity ratings, the formality ratings for each word were averaged across participants to produce an estimate of the formality level of each word (FORMALITY). Monosyllabic words tended to receive the lowest formality ratings; (30) lists the words in increasing order of associated formality ranking:

(30) *tonk* < *dorf* < *moop* < *norp* < *goam* < *blint* < *gestosh* < *pell* < *stott* < *erblick* < *besloff* < *gelaut* < *begroat* < *erskall* < *obtend* < *crocinize* < *subject* < *volutize* < *sevolve* < *sulcify* < *affute* < *submote* < *forhoove* < *secutize* < *sedify* < *pugnivate* < *flumenate* < *expute* < *tranject* < *orgulate* < *procuse* < *forqueath*

Using the formality ratings as predictors in a mixed-effects linear regression model of acceptability rating *z*-score in the sentence judgment task, we find that the interaction of FORMALITY with CONSTRUCTION is not significant, whether or not NUMBER OF SYLLABLES is controlled for using the residuals technique described above. The formality hypothesis is therefore not supported.

### 3.8.6 Summary: Experiment 3

This experiment has provided additional support for the existence of a “morphophonological constraint” on ditransitivity by replicating Gropen et al.’s (1989) finding that nonce words like *moop* are more acceptable as ditransitives than nonce words like *calimode*. Since this experiment contained more items and controlled the way that the paragraph contexts were set up more carefully, we can be more confident in the existence of such a constraint. This is a key point for the central thesis of this dissertation: Since the form of a nonce word affects its acceptability as a ditransitive verb, there are form-based criteria governing the productivity of the double object construction. Verbs that are subject to these limitations, such as *donate* and *explain*, are therefore not arbitrary exceptions.

The experiments in this chapter tested a number of hypotheses regarding the precise nature of the morphophonological constraint, and the results of these experiments make it possible to reject some of these hypotheses: the prosodic weight hypothesis, the two-lexicon hypothesis, and the formality hypothesis. The morphological complexity hypothesis remains consistent with the results obtained.

The prosodic weight hypothesis predicted that there should be a contrast between monosyllabic verbs (the ‘1’ condition) and multisyllabic verbs (the 2G, 2L, and 3 conditions), since all of the multisyllabic verbs happened to contain more than one metrical foot in this experiment. This prediction was not borne out. Because it is quite straightforward to measure prosodic weight in metrical feet, it is clear that the predictions of the prosodic weight hypothesis were not met.

The hypothesis that apparent etymology governs the productivity of the double object construction predicted a contrast between the 2G and 2L conditions, which did not emerge. Several subjective measures of apparent etymology were considered as well, and none of them supported the role of apparent etymology as a factor above and beyond the length of the word in syllables.

The morphological complexity hypothesis, like the prosodic weight hypothesis, predicted a contrast between the monosyllabic and multi-syllabic verbs, since the multi-syllabic verbs were all designed to appear morphologically complex. Again, this prediction was not borne out. However, it is possible that this objective measure of morphological complexity did not provide an adequate test of the morphological complexity hypothesis. It may still be possible to salvage the hypothesis by measuring morphological complexity subjectively. Subjective morphological complexity ratings for each of the nonce words were obtained in a follow-up study to Experiment 3. Measured as a subjective factor, MORPHOLOGICAL COMPLEXITY did interact significantly with CONSTRUCTION. It did not survive as an independent factor beyond NUMBER OF SYLLABLES, but as the experimental materials contained very little variability in morphological complexity among words with the same number of syllables, this finding does not refute the morphological complexity hypothesis. It is therefore consistent with the results obtained here.

Finally, this study also addressed whether the apparent formality of a word is a driving force behind the contrasts observed by Gropen et al., and replicated here. I collected formality ratings for the nonce words in a follow-up study, but these ratings did not have any significant impact on the acceptability of nonce words used as ditransitives.

In summary, the data fail to confirm the predictions of three of the four hypotheses about the nature of the morphophonological constraint: the prosodic weight hypothesis, the two-lexicon (or “apparent etymology”) hypothesis, and the formality hypothesis. The only hypothesis that remains consistent with the data is the morphological complexity hypothesis, although it was not positively supported.

## 3.9 Conclusion

Although the experimental data do not make it possible to identify the precise nature of the morphophonological constraint, they do support the crucial point for this dissertation, which is that it is real. That the form of a nonce word affects its acceptability as a ditransitive allows us to conclude that there is a general restriction on ditransitives, a restriction that words like *donate* and *explain* are subject to. As long as learners have grasped this general restriction, there is no need for them to memorize *donate* and *explain* as arbitrary exceptions. Other putative exceptions listed in the literature can be explained on semantic grounds. I therefore conclude that there are no good examples of arbitrary exceptions in this domain.

The nature of the morphophonological constraint was the focus of Experiments 1–3. Experiment 1 supported the view that for a particular sample of two-syllable English verbs, verbs that are prosodically heavy (containing more than one metrical foot) are less acceptable as ditransitives than those that are prosodically light. Prosodic weight, however, is confounded with morphological complexity in English, so Experiments 2 and 3 used nonce words. Experiment 2 tested a prediction of Grimshaw and Prince’s (1986) prosodic weight hypothesis (ditransitives may not consist of more than one metrical foot). This prediction was not supported by acceptability judgments, although it was supported by response times. These results suggest that prosodic weight is just one of several cues that contribute to the classification of verbs as members of either the G[ermanic]-lexicon or the L[atin]-lexicon (Grimshaw 2005). Experiment 3 explored this hypothesis and disconfirmed it. Experiment 3 also found no evidence for the prosodic weight hypothesis. The formality hypothesis was also not supported. The hypothesis that ditransitive verbs must be morphologically simple in order to be ditransitive (Storm 1977; Harley 2006) remains a possibility.

Regardless of exactly how the morphophonological constraint should be formulated, it does not appear to be a hard-and-fast constraint, or a constraint governing the *grammaticality* of verbs as ditransitives. Violations of the morphophonological constraint give rise to effects of smaller magnitudes than violations of semantic constraints on ditransitivity, as Gropen et al.'s (1989) data show. Furthermore, it is not the case that every word that violates this constraint is worse as a ditransitive than every word that does not; there is a great deal of overlap. It appears that violation of the morphophonological constraint has a real but small and gradient impact on acceptability. This is in line with Bresnan and Nikitina's (2003) claim that semantic constraints on manner-related motion verbs such as *drag* and *push* are not hard constraints, but soft constraints that can be overridden.

It follows that words like *donate* and *explain* are not really "exceptions" in the grammatical sense; they do not give rise to violations of any grammatical principle when used in the double object construction. The solution to Baker's Paradox in this domain is not what can properly be called a "criteria-governed productivity" solution, although it does deny the existence of arbitrary exceptions in this domain. A criteria-governed productivity solution to Baker's Paradox explains apparent exceptions to a productive pattern on the basis of general constraints limiting the productivity of the pattern. To say that the productivity of a pattern is limited in some way is to imply that the grammar does not generate the set of forms corresponding to the limitations. In other words, under a criteria-governed productivity solution, the general constraints serve to render the exceptions ungrammatical. The relevant general constraint here, however, merely serves to render certain things that are grammatical (use of *donate* as a ditransitive, for example) relatively less acceptable.

## 3.10 Appendix: Experimental materials

### 3.10.1 Paragraphs for Experiment 2

The following is a list of the paragraphs that were used in Experiment 2.

1. Sue, who had wanted the deed to the house for twenty years, was very excited when her lawyer called with the good news. Her lawyer told her that Bob, the current owner, was almost ready to **feffame**, the formal (and only legal) process by which she could obtain the house. She hoped that Bob would **feffame** the house to her rather than his daughter.
2. John, the star player for his team, was eager to face their rival. He knew that it would be very important for him to **dassude**. And sure enough, it was the deciding moment of the game when John summoned all of his strength and was able to **dassude** the disc to his teammate, Ben.
3. Ted, a native of the North, was quite unfamiliar with the customs of the South, where his wife Kate was from. For instance, he had no idea that he was supposed to **zeepike** when he proposed. Luckily, the mother of the bride set him straight and graciously explained how to **zeepike** the ring to Kate.
4. Amy was in desperate need of certain supplies that were only available from a firm that took months to process orders. After speaking with a customer service representative, however, Amy learned that certain special circumstances, they might be able to **koofove**. If she demonstrated that she met the requirements, the firm would **koofove** the goods to her.
5. Patrick and Bob were working hard on their new communication software based on the ability to **laundibe**, which would allow users to perform introductions over the internet. Just the thought of being able to **laundibe** his roommate to his co-worker made Patrick certain that they would be making millions in no time.
6. After 5 years of intense training, Mary had finally learned to **sharnoke**, and now she could apparently move objects just by thinking. This came in surprisingly handy at her housewarming party; just by concentrating extremely hard, Mary could **sharnoke** refreshments to her guests from the kitchen.
7. Ron, who had promised Dave that he would provide him with some data for his research, was feeling some regret. It had been a full month since he had last tried to **zannele**, and he was worried that the information might not go

- through. He was very relieved after he was able to **zannele** the crucial statistics to Dave.
8. Ned, a young but upcoming inventor, needed to spring his latest idea on the world. He had invented a very exciting machine that was able to **pauthete**. He thought he'd begin with his ex-girlfriend, Cindy, by causing flowers to appear in her hand with it. Wisely, Ned's friend informed him that it would not be a good idea to **pauthete** the flowers to Cindy.
  9. Gail, a recent graduate of Magic Academy, was eager to try out her newly-acquired skills on Frank. She was especially proud of her ability to **shapame**, which allowed her to perform practically instantaneous movement. Everyone was very impressed when Gail showed that she could **shapame** her pencil to Frank.
  10. George, the famous biochemist, was disgusted by Carl's negligence in dealing with hazardous materials. He explained to Carl that he should always remember to **darpu**de when sharing samples with other labs, so that the toxins are safely contained. George decided to **darpu**de a sample to Carl, in order to remind Carl what a superior method this was.
  11. Nancy could not contain her excitement for the show. All her life she had wanted to see an acrobat **plutike**, an amazing form of baton-throwing done without using the hands. At the climax of the show, when she saw an acrobat **plutike** a flaming baton to her colleague, Nancy was almost in tears.
  12. Brian desperately needed to speak to his girlfriend Katie, and he was grounded from the phone and the internet. This would not stop him though: using a combination of radio signals and digital technology he rigged up a device that would allow him to **traggove**. After hours of intense engineering, he was able to **traggove** his message to Katie.
  13. Penelope and her partner Alex had always wanted to learn to **driggibe**. As performing artists, they were convinced that this would take their work to the next level and make them famous. When Penelope tried to **driggibe** a long, flowing scarf to Alex, however, they realized they had a lot of work ahead of them.
  14. Pierre, a top-notch waiter at a five star restaurant, was always worried about how to bring the check. No matter how he did it, he always felt rude. After thinking about it long and hard, he realized that the best strategy would be to **hezzoke**. If he could simply **hezzoke** the check to the guests, then nobody would ever be offended.

15. William's hearing was starting to decline, and it was really starting to bother him and everyone around him. His wife Clara decided to invest in learning to **slegele**. That way, whenever William failed to hear something, she could simply **slegele** the words to him.
16. Joe was a very talented musician, and was always interested in learning new ways to create sound. On his trip to India, he met a woman who taught him how to **veenete**. After just an hour of instruction, Joe was able to **veenete** one of his own compositions to her. She was very impressed.

### 3.10.2 Filler paragraphs for Experiment 2

The following is a list of the filler paragraphs for Experiment 2.

1. Gregory was suffering from a terrible disease that prevented him from being able to speak. The only way he could communicate was to **sheefnoll**, a very laborious task that required a lot of concentration. His friends tried not to ask him too many questions, because they didn't want to make him **sheefnoll** the answer to them.
2. Andrew, a rising star in the business consulting world, wanted to do something to make himself stand out even more. He realized that the perfect way to quickly and efficiently communicate decisions throughout the company would be to **plickore**. Once the management began to **plickore** its decisions to the company, Andrew got a huge promotion.
3. Under the new rules, everyone was required to **nardoy** daily. It was part of a general movement towards greater accountability – this new policy would allow employers to keep closer track of the hours spent on various projects by the employees. Now, before going home each day, every employee had to **nardoy** their hours to their boss.
4. Jordan would never forget his trip to the small village where the women were all taught to **solfnop**. This was an elaborate type of calligraphy that involved certain intricate patterns. Jordan was deeply honored when his host was so kind as to **solfnop** a good-bye card to him.
5. In order to be a member of the resistance group known as the Society for Justice, one had to be able to **mazzem**. This was an extraordinarily discreet type of body language that would allow members to recognize other members in the presence of enemies. The ability to **mazzem** one's membership status to another member was crucial to the success of the movement.

6. Ben, the CEO of Innovative Software, Ltd., was very upset to learn that his demo had somehow failed to reach a very important potential client. He realized that it would be necessary to **piddet** it; this would ensure that it reached every single checkpoint intact. It was extremely expensive for Ben to **piddet** the demo to the client, but worthwhile in the end.
7. Janice was fed up with her boss Nick. He was always making her **mevvipe**, and it was a terribly odious cleaning task, especially when it involved the refrigerator. Finally one day she told Nick that she would rather quit than **mevvipe** that refrigerator for him again. Nick was very understanding.
8. Blair, a graduate student in organic chemistry, was obsessed with getting molecules to **puvwot**. She knew that if she could **puvwot** nitrogen to a protein, she would practically have a Ph.D. in her hand. Indeed, she was able to graduate just a month after she finally did it.
9. Bridget, a line cook at Le Gout restaurant, was looking forward to learning how to **slemeep** at culinary school. She had seen it on cooking shows on TV, but was convinced there were secrets to it that they weren't telling her. She knew that if she could **slemeep** a lobster for the head chef just right, she might be promoted to sous-chef.
10. Sam, an avid gardener, was keen on learning how to **banauk**. This technique would ensure that exactly the right amount of water was distributed to each plant at exactly the right time. After Sam had managed to do his own garden, his neighbor Gabby asked if he would **banauk** her garden for her.
11. The international community was appalled when China developed the ability to **wedack**. With this technology, China would be able to launch a nuclear probe that could land on the moon. If China were to **wedack** a probe to the moon, then it would be sending a clearly hostile signal to the rest of the world.
12. Laurie was the only girl in her whole class who knew how to **neriss**. While other girls tried to show off with round-offs and backbends, Laurie would put them all to shame as she began to **neriss** herself across the soccer field. But her skill, unfortunately, backfired: she was generally regarded as a show-off.
13. Lisa, the mother of two young boys, badly needed a babysitter, immediately. She knew Brad would be willing to, but he wasn't able to come over since his car had broken down. In a flash of insight she realized that she could **dashiff** to get the boys safely to his place. She told Brad she would **dashiff** the boys to him right away.

14. Kirk, the commander of the emergency response unit, insisted that his men **striboke** as a way of leaving the battlefield; this was the safest and most efficient manner of exiting. Whenever it was time to retreat, he would always **striboke** his troops out of the combat zone.
15. Ted was always on top of the latest products, and always eager to show them off to his neighbor Marsha. When he got a new **pirkife**, he offered to do Marsha's kitchen ceiling with it. Marsha was so impressed that she asked Ted to **pirkife** the ceiling in her dining room too.
16. Sergio, the top technician for I.N.C. Incorporated, was overwhelmed with all of the machines had to fix. He decided he would have to start to use **apofe**, the new job-tracking software the company was using. Whenever a new job came in that he couldn't take, he would just **apofe** the job to his assistant.

### 3.10.3 Paragraphs for Experiment 3

The following is a list of the paragraphs that were used in Experiment 3. The first 16 paragraphs describe movement/transfer events.

1. Sue, who had wanted the deed to the house for twenty years, was very excited when her lawyer called with the good news. Her lawyer told her that Bob, the current owner, was almost ready to **dorfinize**, the formal (and only legal) process by which she could obtain the house. Sue hoped that Bob would **dorfinize** the house to her rather than his daughter.
2. John and Ben, the star players for their team, were eager to face their rival. Ben knew that it would be very important for him to **dorfinize**. And sure enough, it was the deciding moment of the game when John summoned all of his strength and was able to **dorfinize** the disc to Ben.
3. Ted, a native of the North, was quite unfamiliar with the customs of the South, where his wife Kate was from. For instance, he had no idea that he was supposed to **dorfinize** when he proposed. Luckily, the mother of the bride set him straight and graciously explained how to **dorfinize** the ring to Kate.
4. Patrick and Bob were working hard on their new communication software that enabled users to **dorfinize**, a great new way to share files over the internet. Just the thought of being able to **dorfinize** his photos to Bob made Patrick certain that they would be making millions in no time.

5. After 5 years of intense training, Mary had finally learned to **dorfinize**, and now she could apparently move objects just by thinking. This came in surprisingly handy at her housewarming party; just by concentrating extremely hard, Mary could **dorfinize** refreshments to her guests from the kitchen.
6. Ned, a young but upcoming inventor, needed to spring his latest idea on the world. He had invented a very exciting machine that was able to **dorfinize**. He thought he'd begin with his ex-girlfriend, Cindy, by causing flowers to appear in her hand with it. Wisely, Ned's friend informed him that it would not be a good idea to **dorfinize** the flowers to Cindy.
7. Gail, a recent graduate of Magic Academy, was eager to try out her newly acquired skills on Frank. She was especially proud of her ability to **dorfinize**, which meant she could perform practically instantaneous movement. Everyone was very impressed when Gail showed that she could **dorfinize** her pencil to Frank.
8. Nancy could not contain her excitement for the show. All her life she had wanted to see an acrobat **dorfinize**, an amazing form of baton-throwing done without using the hands. At the climax of the show, when she saw Cleopatra **dorfinize** a flaming baton to Napoleon, Nancy was almost in tears.
9. George, the famous biochemist, was disgusted by Carl's negligence in dealing with hazardous materials. He explained to Carl that he should always remember to **dorfinize** when sharing samples with their partner lab, so that the toxins are safely contained. George decided to **dorfinize** a sample to Carl, in order to remind Carl what a superior method this was.
10. Hector, a firefighter, dashed up to the burning third-floor apartment to save Mrs. Wilson's cat. Unfortunately, there was no way the cat could make it down the flaming staircase alive, but the window would allow Hector to **dorfinize**. To everyone's relief, Hector successfully **dorfinized** the cat to Mrs. Wilson.
11. Penelope and her partner Alex had always wanted to learn to **dorfinize**. As performing artists, they were convinced that this would take their work to the next level and make them famous. When Penelope tried to **dorfinize** a long, flowing scarf to Alex, however, they realized they had a lot of work ahead of them.
12. Steve, the CEO of Innovative Software, Ltd., was very upset to learn that his demo had somehow failed to reach a very important potential client, Kim. He realized that it would be necessary to **dorfinize** it; this would ensure that it

reached every single checkpoint intact. It was extremely expensive for Ben to **dorfinize** the demo to Kim, but worthwhile in the end.

13. Sergio, the top technician for I.N.C. Incorporated, was overwhelmed with all of the machines he had to fix. He told his assistant Mike that he would have to start to **dorfinize**, using the new job-tracking software the company was using. Whenever a new job came in that he couldn't take, he would just **dorfinize** the job to Mike.
14. Natasha loved to paint, but she'd had one too many masterpieces ruined when she tried to send them to the local gallery. Her friend told her about a new delivery method in which the post office would **dorfinize** in order to protect the package. Ever since Natasha started to **dorfinize** her paintings to the gallery, she never saw one damaged again.
15. Tricia, a lawyer, was interested in doing some pro bono work. She began perusing a charity database and soon hit upon a case worthy enough for her to **dorfinize**. The client, Chris, was grateful to have Tricia **dorfinize** her services to him.
16. Ron, who had promised Dave that he would provide him with some data for his research, was feeling some regret. It had been a full month since he had last tried to **dorfinize**, and he was worried that the information might not go through. He was very relieved after he was able to **dorfinize** the crucial statistics to Dave.

The paragraphs describing communication events are as follows:

1. Brian desperately needed to speak to his girlfriend Katie, and he was grounded from the phone and the internet. The only way he could possibly get in touch with her would be to **dorfinize**, using a combination of radio signals and digital technology. After hours of intense engineering, he was able to **dorfinize** his message to Katie.
2. Pierre, a top-notch waiter at a five star restaurant, was always worried about how to bring the check. No matter how he did it, he always felt rude. After thinking about it long and hard, he realized that the best strategy would be to **dorfinize**. If he could simply **dorfinize** the check to the guests, then nobody would ever be offended.
3. William's hearing was starting to decline, and it was really starting to bother him and everyone around him. His wife Clara decided to invest in learning to **dorfinize**. That way, whenever William failed to hear something, she could simply **dorfinize** the words to him.

4. Joe was a very talented musician, and was always interested in learning new ways to create sound. On his trip to India, he met a woman named Ritu who taught him how to **dorfinize**. After just an hour of instruction, Joe was able to **dorfinize** one of his own compositions to her. She was very impressed.
5. Gregory was suffering from a terrible disease that prevented him from being able to speak. The only way he could communicate was to **dorfinize**, a very laborious task that required a lot of concentration. His best friend Sam needed to ask Gregory a question, but he wasn't sure if he should make Gregory **dorfinize** the answer to him.
6. Andrew, a rising star in the business consulting world, wanted to do something to make himself stand out even more. He realized that the perfect way to quickly and efficiently communicate decisions throughout the company would be to **dorfinize**. Once the management began to **dorfinize** its decisions to the company, Andrew got a huge promotion.
7. Under the new rules, everyone was required to **dorfinize** daily. It was part of a general movement towards greater accountability – this new policy would allow employers to keep closer track of the hours spent on various projects by the employees. Now, before going home each day, every employee had to **dorfinize** their hours to the boss.
8. Jordan would never forget his trip to the small village where the women were all taught to **dorfinize**. This was an elaborate type of calligraphy that involved certain intricate patterns. Jordan was deeply honored when his host Lu was so kind as to **dorfinize** a good-bye card to him.
9. In order to be a member of the resistance group known as the Society for Justice, one had to be able to **dorfinize**. This was an extraordinarily discreet type of body language that would allow members to recognize other members in the presence of enemies. Although he was only a beginner, Benjamin managed to **dorfinize** his status to his comrade Richard at a crucial moment.
10. Charlie wasn't doing well in school, so his teacher Ms. Houseman called his father in for a conference. He told her that Charlie had a very unique learning style, and that he needed her to **dorfinize**, in order to be able to grasp the concepts. Once Ms. Houseman began to **dorfinize** the material to Charlie, his grades began to pick up.
11. Emily, an aspiring singer, had trouble getting a record contract because she was told her sound was not distinctive. That all changed when she taught her voice

to **dorfinize**. Emily found that whenever she **dorfinized** the lyrics to her fans, she was met with wild applause.

12. At Wittgenstein University, it was the custom to **dorfinize** as a way of advertising for performances and other kinds of student events. Marie, a freshman at Wittgenstein, wanted to do things right and really get the word out about her dance performance, so she **dorfinized** the event to everyone she talked to, even the professors.
13. Centuries ago, there were religious groups in India who would **dorfinize** whenever they wanted to make a request to the gods. This constituted a beautiful dancing ritual that enacted their desire. One of their most famous legends is of a farmer named Raj who would often **dorfinize** a rainstorm to the rain goddess Rita. She apparently loved him because she always made it happen.
14. Senator Franklin's campaign was worried about his recent poll numbers, which showed his opponent, Representative Richards, with a 10-point advantage. Knowing that drastic action was necessary, he decided it was time to **dorfinize**. Once Franklin **dorfinized** a dirty rumor about Representative Richards to the newspaper, the race turned in his favor.
15. First Lieutenant Clark had been left in control of the ship while Admiral Wilson was undergoing surgery. In case of severe emergency, she was to **dorfinize**. When electricity was lost and the modern controls stopped working, she felt she had to **dorfinize** the problem to the admiral.

# Chapter 4

## “Odd Prepositions”

### 4.1 Introduction

Baker’s Paradox has been discussed primarily with respect to verbal diathesis alternations (in the literature, and so far in this dissertation), but there are instantiations of it in other domains of grammar as well. Although they are not discussed quite in these terms, Culicover’s (1999) book *Syntactic Nuts* contains instances of Baker’s Paradox outside the domain of verbal diathesis alternations, concerning the behavior of prepositions.

Not all of Culicover’s “syntactic nuts” are instances of Baker’s Paradox, i.e., potential arbitrary exceptions. Recall that an arbitrary exception is a word that fails to undergo a productive “rule” (broadly speaking) despite meeting the criteria for undergoing it. A “syntactic nut,” on the other hand, is a slightly different concept, implicitly defined by Culicover as any lexical item that has a set of syntactic properties that is not identical to that of any other lexical item. Some of Culicover’s “syntactic nuts” involve the display of an apparently unique positive ability (for example, the adverb *rather* licenses sentential complements in the context of *would*); this is idiosyncratic, but not a negative exception.

Culicover’s analysis of certain putatively “odd” prepositions, however, contains arbitrariness claims in the sense related to Baker’s Paradox. Although he does not explicitly cast his argument in these terms, there are several prepositions that he argues constitute arbitrary exceptions to productive generalizations, which are as follows.

(i) Prepositions precede, and do not follow, their argument:

- (1) a. John performed in the coffeeshop.  
 b. \*John performed the coffeeshop in.

(ii) Prepositions undergo *pied-piping* in long-distance dependency constructions (Ross 1968), preceding their argument, of course:

- (2) a. In which coffeeshop did John perform?  
 b. \*Which coffeeshop in did John perform?

(iii) Prepositions can be *stranded* in long-distance dependency constructions:

- (3) Which coffeeshop did John perform in?

A “normal” preposition like *in* adheres to these principles, but the “odd” prepositions *notwithstanding*, *ago*, *since*, *during*, *out*, and *off* each differ from this picture in their own apparently nutty way. Culicover summarizes their properties as in Table 4.1 which shows the whole range of patterns: Some prepositions must strand, some must pied-pipe, and some do neither. In his summary of this table, Culicover (1999:82) writes, “A number of possible patterns are realized, with no apparent generalization emerging among the exceptions” (p. 82). The claim that such chaos exists can be translated into a set of arbitrariness claims: The inability of *notwithstanding* to strand is an arbitrary exception to the generalization that prepositions can strand, the inability of *off* to pied-pipe is an arbitrary exception to the generalization that

Preposition	Precede	Piedpipe (prec.)	Follow	Piedpipe (follow)	Strand
<i>to</i> (normal)	yes	yes	no	n/a	yes
<i>notwithstanding</i>	yes	yes	yes	no	no
<i>ago</i>	no	n/a	yes	yes	no
<i>since</i>	yes	with <i>when</i>	no	n/a	no
<i>during</i>	yes	yes	no	n/a	??
<i>out</i>	yes	no	no	n/a	no
<i>off</i>	yes	no	no	no	no

Table 4.1: Behavior of odd prepositions according to Culicover (1999:82)

prepositions can pied-pipe, etc. Combined with the productivity of preposition ordering, pied-piping, and stranding (the “productivity” premise), along with the notion that the child does not make use of negative evidence to acquire such restrictions (the “no negative evidence” premise), these arbitrariness claims constitute instances of Baker’s Paradox.

Although Culicover does not cast his arguments in terms of Baker’s Paradox, his goals concern the same learnability problem. On the basis of the apparent chaos shown in Table 4.1, Culicover argues for “the conservative [learning] strategy of ‘setting’ the ‘features’ [STRAND] and [PIEDPIPE] independently [for each word], on the basis of positive experience.” The learner he describes is *attentive*, paying attention to what prepositions have (for example) pied-piped, and *conservative*, not allowing a preposition to pied-pipe unless the preposition has been witnessed in a pied-piping construction. (By this logic, [PRECEDE NP] and [FOLLOW NP] must also be features that are set individually for each word on the basis of positive experience.)

Throughout the book, Culicover (1999) uses the existence of lexical idiosyncrasies to argue for a “Conservative Attentive Learner.” As discussed in Chapter 1, conservatism does not follow from the existence of lexical idiosyncrasies; negative evidence is another possible means by which they could arise.<sup>1</sup> However, it does follow from

<sup>1</sup>The inference from idiosyncrasy to conservatism echoes Baker’s (1979) argument for strict lexical conservatism on the basis of the existence of apparently arbitrary exceptions.

arbitrariness that the learner must be attentive to the use of particular words in particular constructions. The notion that the learner is attentive in this way constitutes a significant claim about learning, so it is worthwhile to establish its empirical foundations carefully.

The goal of this chapter is to critically evaluate Culicover’s claim that the behavior of prepositions is unpredictable and chaotic, and rife with arbitrary exceptions. I argue that a corrected version of the picture that he presents follows from deeper principles, and that prepositions do not differ arbitrarily in their ability to precede or follow their argument, strand, or pied-pipe.

## 4.2 Straightening out the data

Prior to developing an explanation for the behavior of the prepositions in question, I will aim to establish firmly how they behave. I argue in this section that the grammaticality status of pied-piping, stranding, and ordering with the prepositions in question is not in fact as represented in Table 4.1. I offer a revised picture of the data to be accounted for, which serves as the foundation for my argument that prepositions do not differ arbitrarily in their ability to undergo pied-piping or stranding.

### 4.2.1 Typographical error regarding *off*

In Table 4.1, the value “n/a” (“not applicable”) is often present in the “Piedpipe (follow)” column because prepositions would not be expected to pied-pipe following the argument if it does not do so in canonical sentences. If a preposition never follows its argument, then there is no reason to expect that it should follow its argument when pied-piped, so the value in the “Piedpipe (follow)” column should be “n/a” whenever the “Follow” column is “no,” as it is for *since*, *during*, and *out*. The “no” in the “Piedpipe (follow)” column for *off* should therefore read “n/a”. I believe this is a

typographical error. (This change renders the last two rows identical, so neither *out* nor *off* is a “syntactic nut” in Culicover’s sense, because neither has a unique set of properties.)

### 4.2.2 Pied-piping with *since*

Culicover argues that *since* cannot be pied-piped, except when its argument is *when*, citing the contrast between these two examples:

- (4) \*Since which party hasn’t John called?
- (5) Since when have you been able to speak French?(!)

The awkwardness of (4) can be attributed to factors other than pied-piping with *since*, however, as evidenced by the fact that there are contexts that can ameliorate pied-piping with *since*.

One factor in the unacceptability of (4) is the use of the contracted form, *hasn’t*. The following example, assumed to be grammatical and analyzed by Grimshaw (2005:41), uses the uncontracted form *has not*, and sounds much better:

- (6) Since which party has he not seen her?

Contraction is an informal, casual construction, while pied-piping is a formal construction. As Silva and Zwicky (1975) show, contraction (or lack thereof) has stylistic properties that can conflict with the stylistic properties of other aspects of an utterance. For example, non-contraction of an auxiliary, which is formal, conflicts with the very casual use of subject deletion in (7):

- (7) \*Have not seen George around for a long time.

Silva and Zwicky assign a numerical value between  $-10$  (most casual) and  $+10$  (most formal) to a set of linguistic elements, and measure “discord” as the difference between

these values. For example, non-contraction of the auxiliary is assigned +4, and subject deletion is assigned -9, yielding a very large discord value of 13 for example (7).

Under Silva and Zwicky's analysis, contraction is actually neutral (with a value of 0), and non-contraction has a value of +4 (somewhat formal). Pied-piping has a value +7 (quite formal). The discord between contraction and pied-piping we see in (4) is not quite as great as the discord in (7); it is only  $7 - 0 = 7$ . But non-contraction as in (6) reduces the stylistic discord value of (4) from  $7 - 0 = 7$  to  $7 - 4 = 3$ , clearly an improvement. Under these assumptions, stylistic discord is one of the factors underlying the unacceptability of example (4).

There is independent support for the claim that pied-piping is formal in register. Corpus evidence provides one source: The frequency of pied-piping, relative to stranding, is higher in formal registers in corpora (Hoffmann 2005). In light of a cross-linguistic tendency for pied-piping to be obligatory where stranding is impossible, Heck (2004) even suggests that preposition pied-piping involves a separate grammar from stranding in English; people who have learned to pied-pipe switch back and forth between two grammars, one which disallows it and one which requires it. Indeed, pied-piping has a very different status from stranding in the course of acquisition; the children who participated in the acquisition study of McDaniel et al. (1998) tended not to produce or accept pied-piping, even though they were capable of forming and accepting relative clauses with stranded prepositions. McDaniel et al. (1998:332) conclude that "pied-piping is a prescriptive rule which is learned during schooling," and is not part of the basic grammatical system of English. Whether or not pied-piping reflects a separate grammar from stranding, their evidence suggests that it is of a different status, and more formal in particular.

Examples of pied-piped *since* are admittedly somewhat awkward in many contexts, but this can be understood on the basis of pragmatic factors. Often, a *since*

question is an overly complicated and roundabout way of asking for a piece of information: it asks for the starting point as a way of deriving the duration – why not just ask for the duration, using *how long*? In contexts where the duration is not really the question, pied-piped *since* becomes more acceptable. For example, consider the following example from a Weber State University application for Resident Classification, from the Utah System of Higher Education:

(8) Since what date have you lived *continuously* in Utah? (Month/Day/Year)

In (8), a *how long* question (*How long have you lived (continuously) in Utah?*) would not suffice, because the answer is to be in the form of a date. Another type of context in which it is sensible to ask for a starting point is in television game shows. Game shows ask participants to supply answers in a prescribed format. In such contexts, pied-piped *since* is acceptable:

(9) Since what year have all popes been cardinals?

(10) Since what war has Sweden remained a neutral country?

*Since* is appropriate here because the answer to these questions must be in a certain form, specifying a particular point of time or event that marks the beginning of a period.

In short, I conclude that *since*'s entry for “Piedpipe (prec.)” should be “yes” rather than just “with *when*.” This removes one of the potential arbitrary exceptions to be accounted for.

### 4.2.3 Stranding with *out*

Culicover claims that stranded *out* is ungrammatical without *of*, thus (Culicover's judgments):

(11) This is the door that you go out of.

(12) \*This is the door that you go out.

Members of the audience at the 2007 Berkeley Linguistics Society meeting, where this material was presented, not only found (12) acceptable, but even preferred (12) to (11). I assume that stranding with *out* is acceptable.

#### 4.2.4 Stranding with *off*

Culicover's example of stranding with *off* is:

(13) This is the chair that Robin fell off \*(of).

In a more felicitous pragmatic context, stranded *off* becomes acceptable; consider the following example:<sup>2</sup>

(14) One tiny detail of his passing that seems particularly tragic to me: they found his bicycle and helmet on the bridge he jumped off.

Identifying the particular chair that someone has fallen off (of) is a less likely scenario than identifying the bridge that someone has jumped off (of), unfortunately.<sup>3</sup>

#### 4.2.5 The new picture

These corrections leave us with the picture in Table 4.2. Deviations from the normal pattern are shown in bold; corrections are shown with strike-throughs.

With the deviations from the normal pattern highlighted, it can be seen that the cases of deviation from the normal pattern are less numerous than cases in which the normal pattern is followed. Already, this picture is less chaotic than the one in Table 4.1.

<sup>2</sup>[adam.rosi-kessel.org/weblog/2004/03](http://adam.rosi-kessel.org/weblog/2004/03)

<sup>3</sup>This may be a source of dialectal variation; Eve Clark (p.c.) informs me that (13) is acceptable without *of* in her British dialect.

Preposition	Precede	Piedpipe (prec.)	Follow	Piedpipe (follow)	Strand
<i>to</i> (normal)	yes	yes	no	n/a	yes
<i>notwithstanding</i>	yes	yes	<b>yes</b>	<b>no</b>	<b>no</b>
<i>ago</i>	<b>no</b>	<b>n/a</b>	<b>yes</b>	<b>yes</b>	<b>no</b>
<i>since</i>	yes	<del>with</del> <i>when</i> yes	no	n/a	<b>no</b>
<i>during</i>	yes	yes	no	n/a	??
<i>out</i>	yes	<b>no</b>	no	n/a	no yes
<i>off</i>	yes	<b>no</b>	no	no n/a	no yes

Table 4.2: Behavior of odd prepositions (revised)

### 4.3 Explaining the new picture

In this section, I will argue that, indeed, with a small number of independently-motivated principles, we can derive the picture in Table 4.2.

#### 4.3.1 *since* and *during*

What makes *since* and *during* odd prepositions is their difficulty with stranding, as shown in (15) and (16).<sup>4</sup>

(15) \*What war has Sweden been a neutral country since?

(16) \*What class did you fall asleep during?

An indication that this may reflect a general constraint comes from the fact that temporal prepositions have difficulty stranding in general:

(17) \*What war did Sweden become a neutral country after?

(18) \*What party did you talk to him before?

(19) \*What time did you talk to him until?

<sup>4</sup>Example (16) is admittedly not as unacceptable as (15); a possible explanation for this contrast will be given later in this section.

One might imagine that the relative unacceptability of stranding with these temporal prepositions is due to the fact that they are adjuncts. It has been claimed that extraction from within an adjunct is ungrammatical (Huang 1982; Chomsky 1986). However, extraction from within an adjunct cannot be ruled out across the board, because there are clearly acceptable cases of this. For example, Hornstein and Weinberg (1981) cite example (20), which contains extraction out of an adjunct prepositional phrase headed by *about*:

(20) Who did you speak to Harry about?

Hornstein and Weinberg (1981) offer the alternative generalization that “only [prepositional phrases] which are immediately dominated by VP [as opposed to S] can strand.” This includes some prepositional phrases that are adjuncts, but not those dominated by S. For example, (21) is ambiguous between one interpretation in which *on the boat* is dominated by VP and one where it is dominated by S (Hornstein and Weinberg 1981, ex. 13):

(21) John decided on the boat.

According to one interpretation, John decides to buy the boat. According to another one, he made a decision while on the boat (i.e., the boat is the location of the decision). The former interpretation corresponds to a syntactic analysis on which *on the boat* is dominated by VP; the latter interpretation corresponds to the one on which it is dominated by S.

Hornstein and Weinberg (1981) propose to account for preposition stranding in English through a transformational rule of “reanalysis,” which converts a complex sequence including the verb and the preposition into a single transitive verb. Under Hornstein and Weinberg’s (1981) reanalysis rule, a verb *V* and a set of contiguous elements to its right in the domain of VP is “reanalyzed” as a complex *V*. The resulting complex *V* is similar to a transitive verb, with the ability to license the trace.

Hornstein and Weinberg’s (1981) analysis falls into a class of theories positing a process of reanalysis, all of which also posit some kind of “possible word” constraint on the sequence undergoing reanalysis. According to Hornstein and Weinberg, the resulting sequence must be a “semantic unit.” Hornstein and Weinberg’s (1981) solution builds on van Riemsdijk’s (1978) analysis in which a V-PP sequence can be reanalyzed as a V'-NP sequence, where V' contains the V and the head of the PP; van Riemsdijk (1978:221) suggests that reanalysis is limited to sequences that are “possible words.” Stowell (1982:255) posits a restriction on his reanalysis rule that the resulting sequence be “defined as a *word* by the rules of the word-formation component,” that is, “the complex words that [reanalysis rules] ‘create’ must be weakly equivalent in structure to words that might be produced independently by the word-formation rules of the language in question.”

Theories based on the idea of the “possible word” all posit a limit on the semantic complexity of the material intervening between the filler and the gap. Another way of limiting the semantic complexity, without appealing to syntactic reanalysis, is offered by Truswell (2008:25):

(22) **Single Event Condition**

An instance of *wh*-movement is acceptable only if the minimal constituent containing the head and the foot of the chain describes a single event.

The terms *wh*-movement and *chain* connote the type of theory in which questions and relative clauses and other *long-distance dependencies* are formed by movement of the *wh*- item, which leaves a trace in its place (Chomsky 1981, 1986). This is not a necessary assumption (e.g. Gazdar 1981, Pollard and Sag 1994, Sag and Fodor 1994, Levine and Hukari 2006); a more theory-neutral way of casting this principle would be in terms of the *filler* and the *gap* in a *long-distance dependency*. Moreover, it is not clear whether the effect predicted by the Single Event Condition is due to

grammatical constraints or processing factors (or a combination of these). What is important for present purposes is that the generalization in (23) holds:<sup>5,6</sup>

(23) **Single Event Condition (theory-neutral version)**

In a long-distance dependency construction, the path between the filler and the gap must span only a single event.

What constitutes a single event? This is a deep question with a venerable history. As discussed in Chapter 2, in order for a set of events to be grouped as subevents of a larger event, the subevents must be related by causation (Davidson 1969, Croft 1991, i.a.). Truswell (2007) proposes that event individuation is related to agentivity, intentionality, and planning, which can affect whether or not the subevents stand in *contingent* relations (of which causation is an example). Drawing on insights also expressed by Wolff (2003), Truswell (2007:27) puts it thus: “The link between agentivity and the individuation of events stems from the observation that larger single events tend to consist of subevents related by goal-driven and planning-related notions. Such notions require the presence of a rational agent capable of forming goals and acting in such a way as to attempt to reach them.” This formulation allows Truswell to account for patterns of extraction from bare present participial adjuncts (e.g. *What did John arrive/\*work whistling?*) and extraction from *in order to* phrases (e.g. *What did you come round in order to work on?*) The idea that agentivity affects event individuation receives experimental support from Wolff (2003): Native English

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<sup>5</sup>It is not clear whether the condition is sensitive to linear order or hierarchical relations or some combination of the two. A potential problem for a characterization based on hierarchical relations is that it would seem to incorrectly rule out right-adjoined modifiers that introduce events, as in *What was John [talking about \_] when he called you after he got back from his travels?* But in support of the hierarchically-based characterization, intervening relative clauses do not seem to degrade extraction: *[What did [the guy that [Mike met yesterday]] bring to eat]?* (Robert Truswell, p.c.).

<sup>6</sup>To be more precise, the Single Event Condition should be stated in terms of “eventualities” rather than events (Bach 1986), to take into account cases in which the matrix clause is stative rather than eventive.

speaking participants were found to be more likely to describe an event using a lexical rather than periphrastic causative when the causer of the event was depicted as sentient.

Although the Single Event Condition was designed to account for the conditions under which extraction from bare present participial adjuncts is possible, it also applies to preposition stranding. Although Truswell’s focus is not on preposition stranding, he points out that *notwithstanding* and *despite* stand out from the set of prepositions by virtue of the fact that, far from introducing a causally related event, they describe a *hindrance* to the matrix event (Truswell 2007:164). The unacceptability of extraction from the complement of these prepositions is predicted by the Single Event Condition, since the semantic relation between the two events is precisely the opposite of what is required to make them into a single event.

The Single Event Condition extends to the inability of other temporal prepositions to strand, like *after*, *before*, *since*, and *until*. Because these temporal prepositions introduce a new event, the filler-gap dependency spans more than a single event. For example, the preposition *since* introduces an additional event into the sentence (World War II, in the following example):

(24) Sweden has been a neutral country since World War II.

When an event-introducing preposition like *since* is stranded in a long-distance dependency construction, as in (15), repeated here as (25), the *wh*- phrase is extracted across the event introduced by the preposition:

(25) \*What war has Sweden been a neutral country since?

The unacceptability of (25) is thus captured by the Single Event Condition.

As Truswell (2007) discusses, the preposition *during* can describe an event that is more tightly integrated with the matrix clause. He argues that *during* allows

extraction when the event it introduces is construed as causally related to the matrix event; hence a contrast between (26) and (27):<sup>7</sup>

(26) \*Which meal did you read a book during?

(27) %Which play did John fall asleep during?

In (26), the matrix event (reading) and the event described by the prepositional phrase (eating) are not causally related. On the other hand, it is possible to construe the play and the sleeping as causally related in (27). In this way, the Single Event Condition accounts for the slight contrast between *since* and *during* in their ability to strand.

The Single Event Condition also accounts for the fact that not all temporal prepositions are incapable of stranding – some temporal prepositions do strand, such as *on*:

(28) What day did he leave on?

In this case, the *on* phrase specifies the time of the matrix event, rather than introducing a separate event. Hence, the extraction path crosses only one event. The acceptability of (28) is therefore consistent with the Single Event Condition.

The Single Event Condition does not affect pied-piping in the same way that it affects stranding. This can be made evident using the distinction between the relation between the filler and the gap on one hand, and the relation between the *wh*- element and the filler on the other. (See Pollard and Sag 1994 regarding this distinction.) In pied-piping constructions, the filler is distinct from the *wh*- element; for example, in *To whom did you speak?*, the filler is *to whom*, and the *wh*- element is just *whom*. Assuming that a preposition such as *since* introduces a new event, (23) will rule out stranding the preposition, but not pied-piping it, because the extraction

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<sup>7</sup>The percent sign in (27) indicates that there is variation between speakers on this judgment.

path will cross two events in the case of stranding, but only one event in the case of pied-piping.

In summary, the Single Event Condition predicts the behavior of *since*, *during*, and other temporal prepositions with respect to stranding, without being overly restrictive. It does not rule out stranding with the temporal preposition *on*, and does not rule out pied-piping.

### 4.3.2 *ago*

*Ago* is like other temporal prepositions in that it does not strand, but *ago* is quite unlike other prepositions in general. All of *ago*'s properties are abnormal for a preposition. It follows the noun phrase, and does not precede it:

- (29) a. John received a very generous offer a few minutes ago.  
 b. \*John received a very generous offer ago a few minutes.

It pied-pipes, but only following the noun phrase (as one would expect based on its behavior in canonical sentences):

- (30) a. How long ago did John receive the offer?  
 b. \*Ago how long did John receive the offer?

It also does not strand:

- (31) \*How long did John receive the offer ago?

One possible analysis of these facts is that *ago* is a postposition. In that case, its inability to strand would remain to be explained, and its ordering properties would be individually stipulated.

I propose to analyze *ago* as an intransitive preposition rather than a postposition. I propose to analyze the preceding noun phrase (e.g. *how long*) as a specifier, performing

the same function as measure phrases such as *three years* and *two blocks* in phrases like *three years in the past* or *two blocks past the light*. This analysis is proposed by Jackendoff (1973:355, ex. 44a) for phrases such as in (32).

$$(32) \left\{ \begin{array}{l} \text{Right} \\ \text{Far} \\ \text{Six miles} \\ \text{A long way} \\ \text{Halfway} \end{array} \right\} \text{ down the road, Frodo saw an approaching band of grzches.}$$

The category of “intransitive preposition” has a great deal of independent support. Klima (1965) argues for the analysis of words such as *home*, *downstairs*, and *afterward* as intransitive prepositions. Emonds (1972) argues that the particles in verb-particle constructions such as *look out* are also intransitive prepositions. Jackendoff (1983:350) treats *home*, *here*, and *there* as intransitive prepositions. These arguments are based partially on similarities with prepositions that do take complements: intransitive prepositions can modify verb phrases, appear as the complement of *put*, occur in locative inversion constructions, and can be modified by *right*, etc. Furthermore, they can be distinguished from adverbs on the basis that they can post-modify nouns, they cannot modify adjectives or other adverbs, they can function as the complements of prepositions, and they can take prepositional phrases as complements (see Lee 1999:134). The category of intransitive preposition is not small; the *Cambridge Grammar of the English Language* lists 40 prepositions that alternate between taking a complement and taking no complement, and approximately 40 others that function solely as intransitive prepositions, including *abroad*, *north*, and *downstairs*.

The intransitive-preposition-with-specifier analysis is in line with that of Fillmore (2002), which relates the syntax of time expressions to a simple but explicit semantic ontology. Expressions like *a few minutes ago* are “Vector Constructions” which locate

a Target (e.g. the time of the event) at a Distance (e.g. ‘a few months’) in a Direction (e.g. ‘before’) with respect to some Landmark (e.g. ‘now’). The Distance element in a Vector Construction is expressed as a specifier. Unlike *before* and *after*, the preposition *ago* requires its Distance element to be expressed.

The analysis according to which the noun phrase is a specifier, rather than a complement, accounts for the facts as follows. *Ago* follows its argument because its argument is realized as its specifier, and specifiers precede their heads in English. The same principle accounts for ordering in pied-piping constructions. *Ago* cannot be stranded for the same reason that stranding of *book* is impossible in (33):

(33) \*Whose did you read book? [cf. *Whose book did you read?*]

This example illustrates the generalization that specifiers do not strand their heads in long distance dependencies in English, assuming that a possessor is a specifier. The constraint may be formulated in a variety of ways – as the *Left Branch Condition* (Ross 1968), the *Trace Principle* (Pollard and Sag 1994:173), or otherwise, but the generalization remains the same. It would not be necessary to see and remember having seen *ago* in the pied-piping construction in order to conclude that pied-piping is grammatical; learners need only learn the principle that is at work in (33).

### 4.3.3 *notwithstanding*

Unlike a normal preposition, *notwithstanding* can precede its complement, as in (34a), or follow it, as in (34b):

- (34) a. Notwithstanding your generous offer, we are going to demolish the building.
- b. Your generous offer notwithstanding, we are going to demolish the building.

Yet (unlike the other cases discussed so far) its behavior in pied-piping constructions does not mirror its behavior in declarative sentences; when it pied-pipes, it can only precede the argument:

(35) That was a very generous offer, notwithstanding which we are going to demolish the building.

(36) \*That was a very generous offer, which notwithstanding we are going to demolish the building.

It also does not strand:

(37) \*That was a very generous offer, which we are going to demolish the building notwithstanding.

If *notwithstanding* is a “syntactic nut” in Culicover’s sense, then there should be no way to assign to it a syntactic category, or set of syntactic categories, in a manner that derives all of these properties. There may be no single syntactic category one can assign to *notwithstanding* that could account for all of its behavior, but its behavior can be accounted for if we assume that there are two forms of *notwithstanding* with different syntactic categories. I propose that when *notwithstanding* appears before its argument, the argument functions as its object, and *notwithstanding* is a preposition. This is *notwithstanding<sub>P</sub>*. When *notwithstanding* appears after the argument, *notwithstanding* is a present participle, and the argument functions as its subject. This is *notwithstanding<sub>V</sub>*.

The participial *notwithstanding* (*notwithstanding<sub>V</sub>*) is restricted to *absolute constructions*, which are illustrated in the following examples:

(38) No other business arising, the meeting was adjourned.

(39) The horse loped across the yard, her foal trailing behind her.

(40) His hands gripping the door, he let out a volley of curses.

These constructions involve a sentence-level modifier that itself contains a subject (e.g. *no other business*) and a participial predicate (e.g. *arising*). Together, the phrase including the subject and the predicate applies to the sentence it modifies (as opposed to the subject of the sentence it modifies, as in, for example: *Limping, John left*). Because the argument of *notwithstanding*<sub>V</sub> is its subject, *notwithstanding* can follow its argument.

This analysis accounts for the pied-piping behavior of *notwithstanding* as follows. As a preposition, *notwithstanding*<sub>P</sub> precedes its argument, of course, and can pied-pipe, maintaining canonical order. As a subject-taking participle, *notwithstanding*<sub>V</sub> follows its argument and is correctly not expected to be able to pied-pipe, because pied-piping of absolute modifier phrases is impossible in general:

(41) \*Here is the foal, which trailing behind her, the horse loped across the yard.

(42) \*These are the hands, which gripping the door, he let out a volley of curses.

Why is pied-piping of absolute modifier phrases, as in (41) and (42), unacceptable? The unacceptability of these examples cannot be chalked up to the size of the pied-piped constituent, nor to the fact that it is headed by a verbal element, because it is possible to pied-pipe large VPs (Nanni and Stillings 1978; Pollard and Sag 1994):

(43) The elegant parties, [to be admitted to one of which] was a privilege, had usually been held at Delmonico's.

The reason that absolute modifiers resist pied-piping could be, however, that they are clausal. In general, clauses (conceived of as phrases that contain a subject) seem to resist pied-piping (Pollard and Sag 1994):

(44) \*The elegant parties, [for us to be admitted to one of which] was a privilege, had usually been held at Delmonico's.

Absolute modifiers, which also contain a subject and a predicate, are also clausal, and may not be able to pied-pipe for that reason.

The *notwithstanding<sub>P</sub>*/*notwithstanding<sub>V</sub>* analysis thus captures the pied-piping facts, but the stranding behavior of *notwithstanding* requires further explanation. Under the assumption that *notwithstanding* can function as a preposition, it should be able to strand, in the absence of an independent factor ruling this behavior out. There are two possible independent explanations for its inability to strand, which may work in concert.

One possible explanation comes from the fact that *notwithstanding* is extremely formal. As discussed in §4.2.2, stranding is informal (at least compared to pied-piping). As Silva and Zwicky (1975) show, stylistic discord can arise when a formal lexical item occurs in an informal construction. In the following example, the formal lexical item such as *eschew* conflicts with the casual syntactic process of topicalization:

(45) ?Men who eschew controversy we are not in need of.

In Silva and Zwicky's system (described above in §4.2.2), a formal lexical item like *eschew* has a formality rating of +7, and topicalization has a formality rating of -5, yielding a stylistic discord value of 12 for (45). In a similar way, the extreme formality of *notwithstanding* may conflict with the relative informality of preposition stranding.

Another viable explanation of the inability of *notwithstanding* to strand comes from the Single Event Condition, given in (23). As mentioned above, Truswell (2008) suggests that extraction from the complement of *notwithstanding* is ruled out because its object is not causally related to the main clause, but is, in fact, a hindrance to that event. Because the two events are not causally related, the unacceptability of stranding with *notwithstanding* is predicted by the Single Event Condition.

To summarize, the behavior of *notwithstanding* can be understood by assuming that there are two forms of *notwithstanding* with different parts of speech (a subject-taking participle and a preposition), that it occurs only in absolute constructions, and that it is a formal word. Beyond this, nothing about *notwithstanding* needs to be said *per se* in order to account for its syntactic properties.

#### 4.3.4 *out* and *off*

In its use as a preposition with a direct nominal complement, *out* fails to pied-pipe:

(46) \*This is the door out which he went.

This property is shared by *off*:<sup>8</sup>

(47) \*This is the bridge off which he jumped.

I argue that these two observations fall under a larger generalization.

To avoid confusion, note that *out* (unlike *in*, surprisingly) only takes direct nominal complements when its complement describes an aperture:

(48) a. He went out the door/\*room.

b. He went in the door/room.

*Out* must be followed by *of* when its complement describes an enclosure such as a room (*in* disallows *of*):

(49) a. John went out \*(of) the room.

b. John went in (\*of) the room.

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<sup>8</sup>I agree with Culicover’s judgment that (47) is awkward, if not unacceptable, but other speakers find it acceptable. To the extent that it is acceptable, *off* behaves like a normal preposition and does not give rise to an exception to be accounted for.

The reason for this contrast between *in* and *out* is not important for our purposes.

(With *of*, *out* pied-pipes:

(50) This is the room out of which he went.

It is only the prepositional use of *out* with nominal, aperture-denoting complements that is unable to pied-pipe.)

Like *out*, *in* is restricted in its ability to pied-pipe. With complements denoting enclosures such as rooms, *in* is ambiguous between a static location reading and a dynamic reading on which the enclosure is the goal of the motion (on the latter reading, *in* is equivalent to *into*):

(51) John ran in the room.

In pied-piping constructions, the dynamic reading disappears.

(52) This is the room in which he ran.

The reading of *in* as *into* is not available in (52).<sup>9</sup> With complements denoting apertures such as doors, *in* is unambiguous:

(53) John ran in the door.

In (53), the door is not interpreted as a location for the entire running event, but rather an aperture through which John passes at some point during the running event. This can be considered a second kind of dynamic reading in addition to the *into* reading. Following Jackendoff (1983:165), I will use the term *route* to describe the meaning of prepositional phrases whose object is to be interpreted as located along the path of the motion being described, such as an aperture. When *in* is pied-piped with an aperture-denoting complement, this dynamic reading disappears again:

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<sup>9</sup>Replacing *ran* with *went* seems to ameliorate this sentence. This may be due to the fact that *went* signals goal-directed motion.

(54) \*This is the door in which he ran.

In this case, because only a dynamic reading would be available, the sentence is unacceptable. Thus, in general, dynamic readings are unavailable for *in* when it is pied-piped.

It is not the case that prepositions describing movement do not pied-pipe as a rule, since pied-piping is possible on dynamic readings with *through*, *across*, *to*, *towards*, and *from*:

(55) This is the door through which he went/ran.

(cf. He ran through the door.)

(56) This is the bridge across which they travelled.

(cf. He travelled across the bridge.)

(57) This is the city to which he moved.

(cf. He moved to the city.)

(58) This is the monument towards which he was walking.

(cf. He was walking towards the monument.)

(59) This a prison from which he cannot escape.

(cf. We escaped from the prison.)

However, *off*, *out*, and *in* are not alone in their inability to pied-pipe; *up* and *down* are also awkward in pied-piping contexts such as the following:

(60) ?These are the stairs up which he ran.

(cf. He ran up the stairs.)

(61) ?This is the chute down which he fell.

(cf. He fell down the chute.)

Furthermore, on a dynamic reading (with *the table* as the goal of motion), *on* does not pied-pipe:

- (62) \*This is the table on which he jumped.  
 (cf. He jumped on the table)

I suggest that these facts are all related.

The unacceptability of pied-piping with dynamic (or “directional”) *in* and *on* is also pointed out by Thomas (2004), in the context of a series of *adjacency effects*. Thomas’s pied-piping examples are as follows:

- (63) a. John fell in/into the pool. [T.’s 15a]  
 b. The pool ?\*in/into which John fell (is extremely deep). [T.’s 15b]

The inability of directional *in* and *on* to pied-pipe is an “adjacency effect” in the sense that it reflects a requirement that directional *in* and *on* be adjacent to the verb that licenses it. The other such effects she identifies are as follows:

(i) Modifiers intervening between motion verbs and the preposition. These worsen directional *in* much more than *into*:

- (64) a. John ran ?in/into the house. [T.’s 12a]  
 b. John ran at top speed \*in/into the house. [T.’s 12b]

(ii) Conjunction with another directional prepositional phrase. This reduces acceptability of sentences with directional *in* phrases:

- (65) a. He came ?in/into the living room. [T.’s 13a]  
 b. He came through the hall and \*in/into the living room. [T.’s 13b]

(iii) Prepositional phrase fronting. *Onto* phrases can be fronted much more easily than directional *on* phrases:

- (66) a. Mike jumped on/onto a moving train. [T.’s 14a]  
 b. ?On/onto a moving train jumped Mike. [T.’s 14b]

In addition to their failure to pied-pipe, *out* and *off* also show at least one adjacency effect. They are both unable to undergo prepositional phrase fronting (without help from *through* or *of*, respectively):

(67) Out \*(through) the door ran John.

(68) Off \*(of) the cliff jumped John.

Admittedly, *out* and *off* do not show all of the adjacency effects that *in* and *on* show:

- (69) a. John ran at top speed out (through) the door.  
 b. John jumped with a backflip off ?(of) the bridge.
- (70) a. John went in the door and out (through) the window.  
 b. John went through the curtain and off (of) the stage.

Thus, *out* and *off* are similar to directional *in* and *on* in that they resist separation from the verb they modify, but are more permissive than directional *in* and *on*, allowing intervening modifiers (69) and conjunction (70). The separations from the verb that *out* and *off* tolerate can be seen as less “severe” than fronting, because they do not dramatically alter the configurational relationship between the verb and the prepositional phrase; the prepositional phrase is still within the verb phrase in these cases. The fact that *out* and *off* do show adjacency effects is the point of interest here.

How can these adjacency effects be explained? According to Thomas (2004), *in* and *on* are basically atelic, and basically atelic prepositions require adjacency of the prepositional phrase to the governing verb in order to receive a telic interpretation.

Hence, these prepositions must be adjacent to the verb in order to acquire the telic, directional reading (as *into* or *onto*).

Further evidence for the treatment of *in* as primarily a static location marker (atelic) comes from Nikitina (2008). In a corpus study of *in* vs. *into*, comparing static (e.g. *I am in the house*) vs. dynamic (e.g. *I went in the house*) uses of *in*, Nikitina (2008) finds that *in* tends to be used for expressing goals more often when the directional meaning can be inferred from other elements in the sentence, such as the verb. This suggests that the interpretation of the argument of *in* as a goal of motion arises as a pragmatic inference rather than being specifically lexically encoded by *in*; the default interpretation for *in* is as a marker of static location, rather than goal of motion. Only the complex form *into* explicitly marks the argument as a goal. Since *in* does not lexically encode a directional meaning, it does not suffice as a marker of the goal of motion.

I propose a related explanation for the inability of *in*, *out*, *down*, and *up* to pied-pipe. In particular, I claim that they do not adequately mark the role of their object, something which syntactic displacement requires. This requirement can be stated as follows:

(71) **Marking Generalization**

When a prepositional phrase is syntactically displaced from the verb phrase it modifies, the role of the prepositional object must be explicitly marked.<sup>10</sup>

As I will discuss below, the contrasts in the ability to pied-pipe described above follow from this generalization.

An assumption behind the principle in (71) is that prepositions do not always explicitly mark their objects as bearing the roles that they bear. Jackendoff (1983) provides a framework for describing the types of interpretations involved. As he

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<sup>10</sup>In the discussion that follows, I assume that the preposition is what must mark the role of the object, but a verb may be capable of explicitly marking the role as well.

shows, prepositional phrases that normally denote places can denote paths of motion when “path functions” are applied to their meaning. This is the source of ambiguity in the following sentence (Jackendoff’s example 9.11):

(72) The mouse ran under the table.

On the place reading, the running event takes place entirely under the table; on the path reading, the prepositional phrase denotes the goal of the running movement. Jackendoff analyzes this effect as deriving from the application of the path function ‘TO’ to the meaning of *under the table*, which denotes a place.<sup>11</sup> A path interpretation can be explicitly specified by preceding *under* with, for example, *from*:

(73) The mouse ran from under the table

According to Jackendoff’s analysis, *from* denotes a path function (‘FROM’). On the path reading of (72), there is also a path function (‘TO’), but it is implicit. Because *under* takes on path readings through context rather than explicitly indicating them, *under* does not explicitly mark its argument as a goal.

How do these ideas help explain the observations given above? Let us begin with goals.<sup>12</sup> According to the Marking Principle in (71), a prepositional phrase with a goal argument must be headed by a preposition that marks its argument as a goal in a displacement construction such as pied-piping. The prepositions *to*, *towards* and *on* can all occur with goal-denoting objects, but only *to* and *towards* explicitly mark the object as a goal; *on* expresses only location. The object of *on* can take on the interpretation of being a goal through context, even though this interpretation is not explicitly indicated. Hence, the Marking Generalization predicts that *to* and *towards*

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<sup>11</sup>In fact, Jackendoff is careful not to assert that the place reading is basic. All he does to suggest that is to represent the denotation of *under* on the place reading as ‘UNDER’ (in all capital letters), and on the path reading, ‘TO(UNDER...)’. This representational choice suggests that the place reading is basic, but does not strictly imply that.

<sup>12</sup>For the purpose of discussion, I assume that it is the noun phrase, rather than the prepositional phrase as a whole, that serves as a “goal.”

should be able to pied-pipe with goal-denoting objects, as in (57) and (58) but *on* should not be able to, as in (62).

Turning to sources, the Marking Generalization implies that a prepositional phrase introducing the source of motion must be headed by a preposition that marks its object as a source, in a displacement construction. *From* and *off* occur in general with arguments interpreted as the source of motion, but only *from* is an explicit source marker; I assume that *off* is like *on* in marking only place because they are opposites. A prepositional phrase like *off the chair* is therefore correctly predicted not to be able to pied-pipe, as in (47).

Finally, let us consider prepositional phrases denoting routes, such as *in the door*. In such phrases, the prepositional object is interpreted as being located along a route, rather than as a goal (as in *go in the room*) or a static location (as in *be in the room*). Let us refer to the role played by the object noun phrase in a route-denoting prepositional phrase as a *passageway*. Just as the complex preposition *into* is the explicit goal marker corresponding to *in*, the combination *in through* (as in *in through the door*) explicitly marks the prepositional object as a passageway. The object of *in* can only take on a passageway interpretation through context, for example when the argument describes an aperture such as a door or a window. According to the Marking Generalization, a displaced prepositional phrase with an object interpreted as a passageway must be headed by a preposition that marks the object as such. This rules out piedpiping *in* with passageway objects as in (54), and also applies to pied-piping with *out*, as in (46) assuming that *out* is literally a static location marker like *in*, being its opposite. This means that the Marking Generalization also rules out pied-piping of prepositional phrases headed by *out* with passageway objects, such as *out the door*.

Other facts about prepositions with passageway objects can be accounted for using the Marking Generalization as well. I suggest that *down* and *up* are similar

to *in* and *out* in that they appear with passageway objects but are not passageway markers; rather, they explicitly mark only orientation. Evidence for this comes from the fact that they can be used outside of motion contexts, as in for example, *I’m facing down/up*. Under this assumption, the Marking Generalization accounts for the inability of *down* and *up* to pied-pipe as well. In contrast, *through* can be argued to be a passageway marker on the grounds that it specifies the nature of the passageway. *Through* implies that the passageway partially or fully surrounds the entity moving through it, in the vertical dimension. Although one can move *through* a field, saying so suggests that the grass is relatively tall; one would not speak of moving through a field of astroturf. Hence, the Marking Generalization correctly includes pied-piping of prepositional phrases headed by *through* with passageway objects. *Across* specifies an orientation (of perception or movement) that is perpendicular to the central axis of an object that functions as a passageway. Because the passageway is a crucial part of the meaning of *across*, this preposition can also be considered a passageway marker. Therefore, the Marking Generalization also predicts that prepositional phrases headed by *across* with passageway objects should be able to pied-pipe.

I conclude that the inability of *off* and *out* to pied-pipe are not idiosyncratic facts about these two prepositions, but fall under a larger generalization, namely the Marking Generalization in (71). It may be possible to derive this generalization from deeper principles, but the conclusion stands that these are not arbitrary exceptions.

#### 4.4 Summary and conclusion

In her review of *Syntactic Nuts*, Fodor (2001:381) argues that “the route we have to take toward a true theory of the periphery” is to evaluate conjectures which “relate the stipulations to the general ecology of natural language grammars.” When apparent idiosyncrasies are placed against the background of the general ecology of natural

language grammars, the need for stipulations sometimes even disappears. In this chapter, I have argued that the chaotic picture that Culicover presents actually has an underlying orderliness. The revised set of behaviors to account for, given in Table 4.2, fall under several deeper generalizations:

- Stylistic discord can lead to unacceptability, and pied-piping is formal and stranding is informal.
- The “Left Branch Condition” or equivalent.
- Specifiers precede their heads, and heads precede their complements.
- Clauses do not pied-pipe.
- The Single Event Condition given in (23).
- The Marking Generalization given in (71).

Some of these generalizations correspond to theoretical principles; some are merely descriptive generalizations. Developing a theory capable of deriving these generalizations as consequences would be ideal, but the existence of these generalizations suffices to prove the main point under consideration in this chapter. They show that it is not necessary to learn individual restrictions on individual prepositions regarding ordering properties or their ability to strand or piedpipe.

Along with basic principles and descriptive generalizations, I have made use of some lexical stipulations: *ago* is intransitive and requires a specifier, *notwithstanding* is limited to absolute constructions, and prepositions have differing inherent levels of formality. The existence of this type of lexical idiosyncrasy, however, does not contradict the basic thesis that this chapter is devoted to supporting: that there are no prepositions that arbitrarily fail to strand or pied-pipe.

I conclude that it is not necessary to stipulate restrictions on the ability of individual prepositions to strand or pied-pipe in order to have a descriptively adequate account of their behavior. This assessment of the linguistic situation means that learners need not be attentive to the use of particular prepositions in stranding or pied-piping constructions, for example, by setting the features [STRAND] and [PIED-PIPE] individually on the basis of positive experience. It is more likely that the learner seeks out larger generalizations.

# Chapter 5

## Adjectives

The final case study of arbitrariness that I will address involves adjectives. Baker's Paradox has two instantiations in this domain, corresponding respectively to two productive patterns: The use of adjectives as *prenominal* or *attributive* modifiers, as in (1a), and their *predicative* use, as in (1b):<sup>1</sup>

- (1) a. John is a happy man.  
b. John is happy.

Adjectives used *preminally* precede the noun they modify, as the term suggests.<sup>2</sup> The prenominal adjective construction is productive, as evidenced by the fact that English allows new words to be used in this position when they enter the language. For example, the adjective *Chomskyan* could immediately be used preminally after it was invented. The productivity of prenominal adjective constructions corresponds

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<sup>1</sup>There is another adnominal use in which the adjective follows the noun, as in *the only room available*. This use is subject to different factors than the prenominal use, and will not be the focus of this chapter. See Bolinger (1967), Abney (1987), Larson (1998), i.a.

<sup>2</sup>There are two kinds of prenominal modification: restrictive and non-restrictive. The non-restrictive use would be the primary reading of *my wonderful wife*, where it is assumed that the speaker has only one wife and is not using *wonderful* to restrict the set of referents matching the description. If the speaker wished to distinguish his wonderful wife from his less-than-wonderful wife (or wives), he might use *my wonderful wife* restrictively. In general I will ignore non-restrictive uses.

to the “productivity” premise of one instantiation of Baker’s Paradox.

*Predicative* uses appear as the complement of a copula verb such as *be* or *seem* and are interpreted as being predicated of the subject of that verb. This construction is also productive; *Chomskyan* could also be used predicatively when it was invented. The productivity of the post-copular adjective construction corresponds to the “productivity” premise of another instantiation of Baker’s Paradox in the adjectival domain.

The existence of arbitrary exceptions in both of these domains is defended by Goldberg (2006), who claims that there are certain adjectives whose ability to function in one or the other of these ways is arbitrarily limited. Her examples are *mere*, which cannot be used predicatively, and *aghast*, which cannot be used prenominaly.

- (2) a. She’s a mere imitation.  
 b. \*Don’t worry, she’s only mere.
- (3) a. \*There were several aghast members of the audience.  
 b. Several members of the audience were aghast.

She concludes: “Clearly we must learn the distributional properties of these words and constructions individually. Their distribution does not follow from general facts about adjectives” (Goldberg 2006:50). The claim that “their distribution does not follow from general facts about adjectives” can be cast in the terms of Baker’s Paradox as a claim that these adjectives satisfy the criteria governing the productivity of the patterns in question. If indeed, despite satisfying the criteria, these adjectives simply cannot behave in these ways, then they are the type of arbitrary exception that gives rise to Baker’s Paradox.

Together with the “productivity” and “prbitrariness” premises, the instantiations of Baker’s Paradox in these adjectival domain would include a “no negative evidence”

component, supposing that learners do not make use of negative evidence to learn restrictions on the use of prenominal or predicative uses of adjectives such as those represented by *mere* and *aghast*. Goldberg’s conclusion based on the presumed arbitrariness of such restrictions is that the “distributional properties of these words and constructions must be learned individually,” which suggests either strict lexical conservatism (not extending words beyond the syntactic frames in which they are witnessed) or word-specific negative evidence (using implicit or explicit information that concerns the use of specific words in specific constructions). Since strict lexical conservatism contradicts productivity, Goldberg’s proposal about learning must be interpreted as advocating a specific type of negative evidence (indeed, this is what she later proposes). Arbitrariness, therefore, forces one into a particular view of learning according to Goldberg: that it involves word-specific negative evidence. Because of its potential consequences for learning, the empirical validity of the premise of arbitrariness should be carefully evaluated.

The purpose of this chapter is to argue that the distribution of words such as *mere* and *aghast* does in fact follow from general principles, i.e., that the criteria governing the productivity of prenominal and predicative constructions correctly excludes these words. Furthermore, I investigate a range of other adjectives whose behavior with respect to prenominal and predicative uses is restricted, and show that they fall into classes with predictable syntactic behavior. This removes the empirical argument for the existence of arbitrary negative exceptions in the adjectival domain.

## 5.1 Predicativity

This section addresses adjectives that cannot be used predicatively, like *mere*, as in (2). *Mere* is not alone in its inability to function predicatively, but falls into a very large class of adjectives that are limited to the prenominal position. In this

section, I argue that the crucial characteristic linking these adjectives together (or in some cases, particular senses) is that they do not denote what Beesley (1982) called *semantic predicates*. Denoting a semantic predicate, furthermore, is a general prerequisite for functioning syntactically as a predicative adjective. Any adjective that fails to meet this criterion is not an arbitrary exception, as its behavior indeed follows from a “general fact about adjectives.”

### 5.1.1 The Predicativity Principle

A *semantic predicate* is a semantic type in the sense of Montague grammar (e.g. Montague 1974). In particular, it is a function from the set of individuals to the set of truth values; for example, the predicate **red** applies to individual entities and returns TRUE if the entity is red, and FALSE otherwise. For example, if  $x$  is a red object,  $\mathbf{red}(x) = \text{TRUE}$ . If individual entities are type  $e$ , and truth values are type  $t$ , a semantic predicate is of type  $\langle e, t \rangle$ , because it applies to individuals and returns truth values.

*Absolute* adjectives, following Beesley’s (1982) terminology, like *red*, *fluorescent*, and *deciduous* are the prototypical examples of semantic predicates. Absolute adjectives give rise to *intersective* interpretations (Montague 1974). For example, a *red barn* is a member of the intersection between the set of red things and the set of barns. Set intersection is closely related to logical conjunction. For example, in a phrase like *red barn*, both of the predicates **red** and **barn** apply to the referent of the noun phrase, and combine via logical conjunction to produce a property of the following form:

$$(4) \quad \lambda x . [ \mathbf{red}(x) \ \& \ \mathbf{barn}(x) ]$$

The set of objects satisfying this property is the intersection of the set of red things and the set of barns.

*Gradable* (or *degree*, or *measure*) adjectives like *big* and *tall* can be argued not to have an intersective interpretation on the grounds that a *tall midget*, for example, would not generally be considered to be *tall*. The nominal property is entailed, on the other hand; a tall midget is still a midget. Such adjectives are called *subsective* by Montague (1974). Taking adjectives like this into account, Montague (1974) argues that all prenominal adjectives denote functions from the set of properties to the set of properties, rather than being semantic predicates and combining with the noun they modify via logical conjunction. For example, in *tall midget*, the adjective *tall* applies to the property denoted by *midget*, and returns the property denoted by *tall midget*. Since properties are of semantic type  $\langle e, t \rangle$ , and adjectives are functions from properties to properties, such adjectives are of type  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$  according to Montague (1974). The predicate denoted by *tall* would then apply to the property denoted by *midget* directly, and yield a property that applies to the referent of the noun phrase. This can be represented thus:

$$(5) \quad \lambda x . [[\mathbf{tall}(\mathbf{midget})](x)]$$

In contrast to Montague (1974), Siegel (1976) argues that gradable adjectives should be analyzed in the same way as absolute adjectives in some cases, as functions from individual entities to truth values. According to Siegel, the comparison class (e.g., the set of midgets) can be specified in one of two ways: either by the common noun that the adjective modifies prenominally, or by context, when the adjective appears in predicative constructions. For example, in *He is tall*, the comparison class may be the set of midgets or people, etc., depending on context; in *He is a tall midget*, the comparison class is necessarily the set of midgets. For Siegel, when the comparison class is determined by context, the gradable adjective has type  $\langle e, t \rangle$ , and when it is determined by the common noun, the adjective is of type  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ .<sup>3</sup>

<sup>3</sup>Siegel (1976) uses the notation CN/CN, rather than  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ , where CN stands for “common noun.”

Beesley (1982) moves further away from Montague's (1974) analysis of gradable adjectives, arguing that the comparison class is *always* determined by context, based on the possibility of non-restrictive modification by relative adjectives such as *short* in dialogues such as (6):

(6) Q: Which of the men over there is Quang?

A: Quang is the short Vietnamese.

In (6), the comparison class is not the set of Vietnamese people, but the set of men. This is evidence that the comparison class is not always determined by the modified common noun, but by context. The idea of a contextually-bound comparison class is an idea also discussed by McConnell-Ginet (1973), Klein (1980), Bartsch (1972), Keenan and Faltz (1985), and Kennedy (1999), among others. Following Siegel (1976) in assuming that a degree adjective is of type  $\langle e, t \rangle$  when the comparison class is given by context, the fact that the comparison class is contextually given implies that degree adjectives are always of type  $\langle e, t \rangle$ , which is to say that they are always semantically predicative.<sup>4</sup>

*Evaluative adjectives* such as *good* also have an interpretation relative to the noun they modify: As Aristotle pointed out, a *good thief* is not usually a *good man*; the property described by *good* depends on the functional criteria that happen to be relevant. For this reason, evaluative adjectives, like degree adjectives, are not intersective modifiers. Another test for intersectivity is Siegel's (1976) *substitution test*: Suppose that the set of dancers is coextensive with the set of singers, so every dancer is a singer and every singer is a dancer. Even under such circumstances, *Olga is a beautiful dancer* does not entail *Olga is a beautiful singer*; this shows that *beautiful* is a

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<sup>4</sup>Another common analysis of gradable adjectives is that they are functions from individuals to degrees – *measure functions* – which take an entity and return a degree on the scale associated with the adjective (Cresswell 1977, von Stechow 1984, i.a.; see also Kennedy 1999, Kennedy and McNally 2005). Gradable adjectives can still broadly be considered “predicative” under this analysis, however. Although gradable adjectives do not have  $\langle e, t \rangle$ -type semantics themselves under this analysis, they do yield such predicates through a silent, default process that absorbs the degree argument.

non-intersective modifier in this case.

Evaluative adjectives differ from degree adjectives, however, in that their interpretation depends not only on the comparison class, but also on the criteria or standard according to which the evaluation is made. Siegel (1976) argues that the evaluation criteria are determined by context only when the adjective is used in predicative position, and necessarily by the common noun when the adjective is used in attributive position, citing the contrast in interpretation between (7a) and (7b):

- (7) a. That is a good lutist.  
       b. That lutist is good.

In both (7a) and (7b), *good* can be used to mean either *good as a lutist* or *absolutely good*, i.e., *good as a person*. The attributive and predicative uses seem to differ with respect to a third potential reading, however: In the context of a chess game between a lutist and, say, an oboist, *good* in (7b) can be used to mean *good at chess*, but this reading seems not to be available in (7a). This leads Siegel (1976) to conclude that preminally, evaluative adjectives are necessarily functions from properties to properties ( $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$ ), but that predicatively, they denote either functions from properties to properties or functions from individual entities to truth values (semantic predicates;  $\langle e, t \rangle$ ). This conclusion is significant because it would mean that not all syntactically predicative adjectives are semantically predicative.

Beesley (1982) challenges Siegel's analysis, arguing that evaluative adjectives can in fact be analyzed as semantically predicative.<sup>5,6</sup> Firstly, he offers a context in which a sentence like (7a) can be used to mean *good at chess*:

Consider the hypothetical case of a chess school which specialises in teaching musicians. When asked how lutists, as opposed to oboists, take

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<sup>5</sup>I am changing the terminology a bit here. Beesley argues for the treatment of evaluative adjectives as "absolute" adjectives, but I find this categorization confusing and slightly inconsistent, because evaluative adjectives are actually relative in meaning.

<sup>6</sup>See Kamp (1975) for a similar claim.

to chess, an instructor might say, ‘We get some good lutists and some bad lutists’. In this context, the goodness will be relative not to lute playing but to chess playing. (Beesley 1982:221)

He moreover offers a range of syntactic tests showing that evaluative adjectives pattern with degree adjectives and absolute adjectives, against adjectives like *mere*, which are truly semantically non-predicative. For example, absolute (8a), relative (8b), and evaluative adjectives (8c) license *one* anaphora, while semantically non-predicative adjectives like *utter* do not, as shown in (8d) (Beesley 1982:223, exx. 91–94):

- (8) a. That’s a red box, and that’s a blue one.  
 b. That’s a tall man, and that’s a short one.  
 c. That’s a good boxer, and that’s a bad one.  
 d. \*That’s an utter fool, and that’s a fat one.

Beesley also offers his own diagnostic using sentence-level adverbs. Adjectives describing semantic predicates would be predicted to be incompatible with sentence-level adverbs, because sentence-level adverbs describe the status of propositions, not predicates. As Beesley shows, this prediction is borne out: Absolute adjectives like *red* allow sentence-level adverbs like *obviously*, but non-semantically-predicative adjectives like *mere* do not (Beesley 1982:226–227, exx. 111 and 113):

(9) The obviously red barn collapsed.

(10) \*The obviously mere barn collapsed.

In support of the analysis of both degree and evaluative adjectives as semantically predicative, sentence-level adverbs such as *obviously* are compatible with both types (Beesley 1982:129, exx. 129 and 134):

(11) The obviously tall ballerina was rejected.

(12) John is an obviously bad monk.

As Beesley points out, a “relative” meaning for (12), in which John is bad as a monk, rather than in general, or as a person, is “even preferred” (p. 229). The results of this diagnostic support the idea that degree adjectives and evaluative adjectives, despite being relative to some contextually-given comparison class or criterion, are semantically predicative.

Taken together, the evidence reviewed in the preceding paragraphs supports the generalization in (13).

(13) **Predicativity Principle**

An adjective can be syntactically predicative if and only if it is semantically predicative.

In (13), what is meant by *semantically predicative* is not only that the adjective denotes a predicate, but furthermore, that it denotes a predicate that applies to the referent of the noun phrase it modifies when it is used prenominally. This means that it must be of type  $\langle e, t \rangle$ , and furthermore, that the individual to which it applies is the referent of the NP.<sup>7</sup>

As a corollary to (13), any adjective that is not semantically predicative should not function syntactically predicatively. In other words, this is a criterion governing the productivity of this construction. As far as I am aware, this generalization accounts for all of the restrictions on the predicative use of adjectives that have been brought up in the literature. These are discussed in the following subsection.

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<sup>7</sup>If  $\langle e, t \rangle$ -type modifiers should be considered “intersective” by definition, then the Predicativity Principle amounts to saying that predicative adjectives must be intersective. A distinction between intersectivity and predicativity could be maintained, however, such that degree adjectives and evaluative adjectives could be seen as  $\langle e, t \rangle$ -type, but non-intersective. I prefer to leave the possibility of this distinction open, retaining the generalization in (13) rather than stating it in terms of intersectivity.

### 5.1.2 Applying the Predicativity Principle

Quite a few examples of non-predicative adjectives have been brought up in the context of critiques of the transformational analysis of prenominal adjectives. According to this analysis, a structure like (14a) is derived from a structure like (14b) (Chomsky 1957; Smith 1961):

- (14) a. the tall man  
       b. the man who is tall

Arguments against the transformational analysis of prenominal adjectives, by scholars including Bolinger (1967), Jackendoff (1972), Levi (1973, 1978), and Winter (1965), point to cases in which an adjective-noun combination (e.g. *tall man*) cannot be paraphrased by the same noun modified with a relative clause containing the adjective in predicative position following the copula (e.g. *man who is tall*).

Although the literature contains quite a long list of examples like these, the list can be organized into a set of semantic categories, all of which fall under the general heading of non-semantically predicative adjectives. Many of the adjectives in the non-predicative category can be classified as “adverbial,” because they can be paraphrased with an adverb. These include adjectives of veridicality (as in *true king*, *real friend*), the so-called “modal” class of adjectives (as in *alleged criminal*), along with other adjectives of modality (*old school*, *erstwhile friend*), adjectives expressing a degree of veridicality (*perfect ass*, *pure nitwit*), adjectives evaluating the predicate they modify (*mere kid*, *common soldier*), adjectives of selection (*the very man*, *the same reason*), and event-manner adjectives (*hard worker*, *beautiful dancer*). Alongside adverbial adjectives, there are adjectives of psychological experience (as in *sorry sight*) and so-called “nominal adjectives” (as in *criminal lawyer*). I will address each of these classes in turn.

**Modal adjectives.** The *adverbial* class of non-predicative adjectives contains those that can be paraphrased by an adverb. For example, a *true poet* is *truly a poet*. Many of these have to do with veridicality in some way, such as the following examples from Bolinger (1967:18ff):

- (15) a. a true poet; ?The poet is true  
 b. the true king; \*The king is true  
 c. a real friend; \*The friend is real  
 d. an actual fact; \*The fact is actual  
 e. a sure winner; \*The winner is sure  
 f. an honest quart; \*The quart is honest  
 g. the lawful heir; \*The heir is lawful  
 h. the rightful owner; \*The owner is rightful

*Veritable*, mentioned by Siegel (1976), can be added to this list: *a veritable palace*; \**A palace that is veritable*. Adjectives in this category do not describe semantic predicates that apply to the referent of the noun phrase, but rather have a *modal* meaning, in the sense that their meaning applies to propositions. For example, in *it is a veritable palace*, *veritable* characterizes the proposition *it is a palace* as true. The semantic type of these adjectives is not  $\langle e, t \rangle$ , applying to an individual; rather, they apply to a proposition.

Adjectives like *alleged criminal* exemplify what are standardly known as “modal adjectives” (Kamp 1975). These adjectives, when combined with a noun, give rise to a term that is not a subset of the denotation of the noun; they are non-intersective, and furthermore, non-subsective. For example, an *alleged criminal* is not necessarily a *criminal* (Vendler 1968). These adjectives, like *true*, *real*, *actual*, etc., predicate over propositions rather than individuals; for example, in *he is an alleged criminal*,

*alleged* characterizes the proposition *he is a criminal* as something that has been alleged. Thus, adjectives like *alleged* can be seen as a larger class of adjectives related to modality in a broader sense, none of which are of semantic type  $\langle e, t \rangle$ .

A potential counterexample to the generalization that modal adjectives cannot be predicative is that *fake*, an apparent example of a modal adjective, can be syntactically predicative:

(16) This gun is fake.

According to Beesley's (1982) test for semantic predicativity (illustrated in (8)), however, *fake* is in fact semantically predicative:

(17) an obviously fake gun

It could also be argued that a fake gun is in fact a type of gun, i.e., that it is at least a substantive modifier. These considerations support the idea that *fake* is not a genuine modal adjective, and in particular, that it is semantically predicative. Hence, it satisfies the criteria for being syntactically predicative, and is not an arbitrary exception.

Other syntactically non-predicative adjectives in the adverbial class have to do with other kinds of modality (these examples are from Bolinger 1967):

- (18) a. my old school; \*The school is old  
 b. our late President; \*The president is late  
 c. my erstwhile/quondam/whilom/former/budding friend; \*My friend is erstwhile/quondam/whilom/former/coming/budding  
 d. a putative/possible/probable/likely example; \*The example is putative/possible/probable/likely  
 e. the future king; \*The king is future

In all of these cases, the predication denoted by the noun phrase holds in a world or time that is remote from the time of reference. For example, the referent of *my old school* is the speaker's school at a time before the time of reference. This type of adjective is similar to the modal type described above, predicating over a proposition rather than being of type  $\langle e, t \rangle$ . Since these are modal, rather than semantically predicative, their inability to function syntactically as predicative adjectives falls under the Predicativity Principle in (13).

Another class of adverbial non-predicative adjectives expresses degree of veridicality. Like other modal adjectives, the following adjectives apply to propositions, and express the degree to which a predication is being asserted (again, the examples are from Bolinger 1967):

- (19) a. a perfect ass; \*The ass is perfect  
 b. a pure nitwit; \*The nitwit is pure  
 c. an unadulterated jackass; \*The jackass is unadulterated  
 d. an unmitigated liar; \*The liar is unmitigated  
 e. a total stranger; \*The stranger is total  
 f. a sheer fraud; \*The fraud is sheer  
 g. a regular champion; \*The champion is regular  
 h. a plain fool; \*The fool is plain  
 i. an utter incompetent; \*The incompetent is utter  
 j. straight whiskey; \*The whiskey is straight

Although predications are not normally thought of as holding to various degrees (i.e., either they hold or do not), speakers can modulate the degree to which they are committed to making an assertion, or the strength with which they make it.<sup>8</sup>

<sup>8</sup>This idea may be formalizable in terms of Kamp and Partee's (1995) idea of *supervaluations*.

Assertions can be strengthened or mitigated through the use of this type of adjective. These adjectives therefore apply to propositions rather than individuals; they are not semantically predicative. The unacceptability of their syntactically predicative uses therefore falls under the Predicativity Principle.

**Predicate-evaluating adjectives.** *Mere* falls into another class of adjectives that do not function predicatively in syntax, along with *common*:

- (20) a. a mere kid; \*The kid is mere  
 b. a common soldier; \*The soldier is common

Evidence for the non-semantic-predicativity of this type comes from (10), repeated here, which shows that *mere* fails the sentence adverb test for semantic predicativity, as does *common*:

- (21) \*The obviously mere barn collapsed.  
 (22) \*The obviously common soldier collapsed.

Rather than applying to the individual denoted by the referent of the noun phrase, an adjective like *mere* characterizes the predicate denoted by the common noun. For example, in *mere kid*, *mere* characterizes the property of being a kid as being low in status or importance. Since adjectives like *mere* do not apply to individuals, but rather, properties, they are also not of type  $\langle e, t \rangle$ . Their inability to function predicatively in the syntax, therefore, follows from the Predicativity Principle.

**Adjectives of selection.** Another set of adverbial-type syntactically non-predicative adjectives has to do with picking something out from a list (examples from Bolinger 1967):

- (23) a. the very man; \*The man is very

- b. the particular spot; \*The spot is particular
- c. the precise reason; \*The reason is precise
- d. the same/selfsame/identical/exact/specific reason; \*The reason is same/selfsame/identical/exact/specific
- e. their main faults; \*Their faults are main
- f. our prime suspect; \*The suspect is prime
- g. the first citizen; \*The citizen was first
- h. the principal/chief/topmost cause; \*The cause was principal/chief/topmost
- i. the sole survivors; \*The survivors were sole
- j. the right (wrong) book; \*The book is right (wrong)

Siegel (1976) provides the following examples of non-predicative adjectives, which can be placed in this list: *chief, top, initial, ultimate*. By the sentence-adverb test, such adjectives are not semantically predicative:

(24) \*the obviously very man

(25) \*the obviously particular spot

These adjectives uniquely specify a particular entity, rather than classifying it. One interpretation of this feature of their meaning is that they are functions from properties to individuals, rather than functions from individuals to truth values. Under this interpretation, their inability to function predicatively in the syntax, again, follows from the Predicativity Principle.

**Event-manner adjectives.** Another class of adverbial-type adjective uses describes the manner of the action described by the nominal, as in the well-known *beautiful dancer* example, and examples such as the following, from Bolinger (1967):

- (26) a. a hard worker; \*The worker is hard  
 b. a clean fighter; \*The fighters are clean

These examples are analyzed by Larson (1998) as functions from individuals to truth values, which apply to an event variable contained within the meaning of the noun rather than the referent of the noun itself. These adjectives are not semantically predicative of the referent of the noun, so their behavior also follows from the Predicativity Principle.

**Psychological experience adjectives.** Yet another class of non-predicative adjectives that Bolinger (1967) points to contains adjectives describing the psychological experience of an experiencer of the event denoted by the noun:

- (27) a. a sorry sight; ?The sight is sorry  
 b. a happy coincidence; ?The coincidence is happy  
 c. a brave sight; ?The sight was brave  
 d. a proud moment; ?The moment was proud

For example, with a *sorry sight*, it is not the sight itself that is sorry, but some experiencer of the sight. Again, these adjectives are not semantically predicative of the referent.

**Nominal adjectives.** Some of the cases listed by Bolinger (1967) are analyzed by Levi (1973, 1978) as “nominal adjectives,” because they function semantically in the same way that nominal modifiers in noun-noun compounds function. Examples of this type include the following:

- (28) a. a criminal lawyer; ?The lawyer is criminal  
 b. a rural policeman; ?The policeman is rural

- c. a medical man; \*The man is medical
- d. a subterranean explorer; \*The explorer is subterranean
- e. an electrical worker; \*The worker is electrical
- f. nervous system; \*The system is nervous
- g. alimentary canal; \*The canal is alimentary
- h. adhesive tape; \*The tape is adhesive
- i. industrial machinery; \*The machinery is industrial
- j. maritime law; \*The law is maritime

These adjective-noun combinations are similar to noun-noun compounds: A *criminal lawyer* is a lawyer who deals with issues of crime, and this is the same relation that holds in the noun compound *tax lawyer*: a tax lawyer is a lawyer who deals with tax issues. As another illustration, the *nervous system* is another way of saying the *nerve system*; the relation between *nervous* and *system* is just what it would be if *nervous* were a nominal modifier of *system* rather than an adjectival one (cf. *a nervous mother*). Further evidence for the analysis of such adjective uses as nominal comes from the fact that these adjectives exhibit several properties of nouns, including the inability to receive degree modification, the ability to conjoin only with other nominal adjectives, countability, and bearing case roles (Levi 1978). The modifier noun in a noun-noun compound is not a semantic predicate applying to the referent of the noun phrase, as evidenced by Beesley's (1982) sentence-adverb test:

(29) \*the obviously tax lawyer

This property is shared by nominal adjectives:

(30) \*the obviously criminal lawyer

The inability of nominal adjectives to function predicatively in the syntax follows from the Predicativity Principle as well.

In summary, the Predicativity Principle (13) accounts for a wide range of restrictions on the ability of adjectives to function syntactically as predicative adjectives. The behavior of *mere* is not at all idiosyncratic, but is governed by a broad generalization. It is not necessary to learn *mere* as an arbitrary exception; rather, what must be acquired is the notion that only semantically predicative adjectives can be syntactically predicative.

## 5.2 Prenominality

The previous section dealt with adjectives that are unable to function syntactically as predicative adjectives. In this section, I address adjectives that are unable to function prenominally, such as *aghast* (e.g. *\*the aghast man*). Whereas a single principle seems to account for all of the observed restrictions on the ability of an adjective to function predicatively, there appear to be multiple principles at work in the domain of adjectives that fail to function prenominally.

### 5.2.1 *a-* adjectives

#### 5.2.1.1 Morphological generalization

Goldberg's (2006) example of an adjective with an idiosyncratic inability to function prenominally is *aghast*. *Aghast* falls into a class of words beginning with *a-*, including *alive*, *asleep*, *awake*, *afraid*, *alone*, *akimbo*, *asunder*, *agape*, *agog*, *afloat* (see also Marchand 1966:92, Salkoff 1983, and Jacobsson 1996 for dozens of other examples). I argue that the morphological make-up of these adjectives is implicated in their inability to function prenominally.

All of these *a-* adjectives begin with an initial, unstressed schwa vowel, so it could be hypothesized that their phonological shape is responsible for their syntactic behavior. There are some adjectives with an initial, unstressed schwa vowel that can be used prenominal, however: *an astute remark*, *an aloof air*, *an adroit politician* (Quirk et al. 1985:409). The correct generalization does not seem to be phonological (but see §5.2.1.4 for further discussion of this issue).

It could also be hypothesized that the inability of *a-* adjectives to be used prenominal is etymological. In particular, their behavior could be imagined to be a consequence of their “prepositional unit origin,” as suggested by Long (1961:286).<sup>9</sup> The prefix *a-* is related to *on*, so adjectives like *alive* derive from prepositional phrases. Since prepositional phrases cannot function prenominal, (e.g. *\*the on the boat man*), this property of *a-* adjectives could be seen as a historical relic of their original status as prepositional phrases. Although this historical observation may form part of the story, it suffers from several limitations as an explanation for the syntactic behavior of *a-* adjectives. First, it is not the case that every single adjective with a prepositional origin is unusable prenominal: Although *a-* derives from *on* in *afloat*, *alive*, and *asleep*, it also derives from *on* in *aloof*, which is usable prenominal. Moreover, several of the predicative-only adjectives beginning with *a-* do not have this origin. *Afraid*, *aghast*, and *awake* derive from participles and *alone* derives from *all+one*.

Although the etymological origin of the *a-* adjectives as entire prepositional phrases cannot be used as an explanation for their behavior, the etymological origin of the *a-* prefix itself provides a viable explanation, because the following generalization holds: *All adjectives containing a- followed by a recognizable stem are blocked from prenominal position.* In other words, perhaps adjectives like *afraid*, which do not contain *a-* historically, nonetheless contain it synchronically (perhaps due to diachronic

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<sup>9</sup>In a similar claim, Bolinger (1967) attributes the behavior of *a-* adjectives to their “adverbial origin” (p. 12).

Word	Prenominal?	Remainder	Morphological status
<i>abed</i>	No	<i>bed</i>	Free
<i>afraid</i>	No	<i>fraid</i>	No, but cf. <i>feared</i>
<i>aghast</i>	No	<i>ghast</i>	Bound, cf. <i>ghastly</i>
<i>alive</i>	No	<i>live</i>	Free
<i>alone</i>	No	<i>lone</i>	Free
<i>asleep</i>	No	<i>sleep</i>	Free
<i>awake</i>	No	<i>wake</i>	Free
<i>adroit</i>	Yes	<i>droit</i>	No
<i>aloof</i>	Yes	<i>loof</i>	No
<i>astute</i>	Yes	<i>stute</i>	No

Table 5.1: Properties of selected *a*- adjective stems

reanalysis). Table 5.1 provides a sampling of *a*- adjectives, and illustrates that in the adjectives beginning with *a*- that do not function prenominally, *a*- attaches to a recognizable morpheme. In every case where the adjective is not usable prenominally (where there is a “No” in the “Prenominal?” column), the remainder of the adjective, when *a*- is deleted from the initial part of the adjective, is a free morpheme (*live*, *lone*, etc.), except for two cases: *\*fraid* and *\*ghast*. In these cases, however, the remainder can still be identified as a morpheme: *\*ghast* is a bound stem, also found in the semantically related word *ghastly*; *\*fraid* may be cognitively related to *feared*, so *afraid* is seen as a variant of *afeared* that has arisen through sound change. The non-attributive *a*- adjectives (*adroit*, *aloof*, *astute*) do not contain any stem that can be recognized as meaningful: *\*droit*, *\*loof*, and *\*stute* are meaningless and do not occur elsewhere.

If this generalization constrains productivity, then new adjectives that are coined with the *a*- prefix should not be usable prenominally. This prediction is borne out: The *a*- prefix is productive (Salkoff 1983, Jakobsson 1996; *pace* Kuiper 1987), and when new adjectives using this prefix are coined, they are unacceptable as attributives. For example, Salkoff (1983:299) cites *abud* as an example “not to be found in any

dictionary,” as in:

(31) The tree is *abud* (with green shoots).

Like other *a*- adjectives, *abud* cannot be used prenominally:

(32) \*An *abud* tree is a beautiful thing to see.

Another example Salkoff gives is *afizz*:

(33) The water is *afizz* (with bubbles).

It behaves similarly to other *a*- adjectives as well:

(34) \**Afizz* water was everywhere.

This is an important point, because it means that there are constraints on the productivity of the use of adjectives as prenominal modifiers that rule out cases like *aghast*. The constraints on *a*- adjectives do not need to be learned individually for each adjective; their behavior follows from a general limit on productivity.

### 5.2.1.2 Phrasality

The previous sub-subsection (§5.2.1.1) established the most important point for the purposes of this dissertation: that *aghast* is not an arbitrary exception, but an adjective whose inability to function prenominally falls under a larger generalization. It remains an interesting question, however, whether and how this generalization falls out from even larger generalizations.

It has been suggested (Sadler and Arnold 1994; Larson and Marušič 2004) that the behavior of *a*- adjectives is related to the fact that adjectives do not license complements in prenominal position, as illustrated in (35):

(35) a. a student keen on jazz

- b. \*a keen on jazz student

Adjective phrases like *keen on jazz* are similar to *a-* adjectives in the respect that they are head-initial: *keen on jazz* is headed by *keen* (syntactically) and *aghast* is headed by *a-* (morphologically). Whether head-complement constructions are ruled out directly via Williams's (1982) Head Final Filter or via more general principles about adjective syntax such as Sadler and Arnold's (1994) proposal that prenominal adjectives are non-phrasal ( $X^0$  projections), these two cases could be seen as analogous and subject to the same principle.

Such an explanation would rely on the idea that words, like syntactic phrases, have heads (Williams 1981; Selkirk 1982). A reasonable understanding of what it means to be the head of a morphologically complex word is based on feature projection: The morpheme whose features match the features of the adjective-plus-noun combination is the head (Selkirk 1982). For example, the compound *parts supplier* is singular despite the plurality of the first noun (*parts*). The second noun (*supplier*) determines the plurality of the compound as a whole; if it were pluralized, then the compound would be plural (Williams 1981). The syntactic category of a morphologically complex word is another feature projected by the morphological head.

In English, it is generally the right-hand member of a morphologically complex word that determines the category of the word, and hence, is the head. This generalization is stated in Williams's (1981:248) *Right Hand Head Rule*, which implies that suffixes can "alter" the syntactic category of a word, but prefixes cannot. For example, the prefix *pre-* attaches to adjectives (*premature*, *premodern*, *prenatal*), nouns (*precondition*, *prehistory*, *preschool*) and verbs (*preheat*, *prepay*, *prerecord*, *prewash*), and the resulting word always matches the syntactic category of the stem. In contrast, suffixes regularly alter the syntactic category of the word. Adding *-ly*, for example, to an adjective such as *mature* creates an adverb: *maturely*. If *a-* adjectives are, as suggested above, headed by the prefix *a-*, then they are counterexamples to the Right

Hand Head rule.

Other potential counterexamples to the Right Hand Head rule, namely *be-*, *de-*, and *en-*, are discussed by Olsen (1993). These prefixes create verbs from adjectival stems (*becalm*, *debase*, *embitter*), nominal stems (*bedevil*, *debone*, *embed*), and verbal stems (*bedazzle*, *decompress*, *endazzle*). Using a wide range of attested forms, Olsen (1993) demonstrates that these prefixes do not, in fact, counterexemplify the Right Hand Head rule. She argues that *be-*, *de-*, and *en-* attach only to verbal stems. When they appear to attach to adjectival and nominal stems, she argues, the stem is actually a verb formed by zero-derivation (deriving the verb without adding an overt morpheme). Strong evidence for this analysis comes from the fact that the prefixes *be-*, *de-*, and *en-* do not attach to non-verbal stems whose verbal forms are created through overt suffixation. The verbal form of *light*, for example, is *lighten*, and the *en-* form is, correspondingly, *enlighten*, rather than \**enlight*; the verbal form of *live* is *liven*, and the *en-* form is *enliven*, rather than \**enlive*.

The *a-* prefix, like *be-*, *de-*, and *en-*, creates adjectives from stems of a variety of syntactic categories, as Kuiper (1987:55) observes:

1. noun stems: *astern*, *ashore*, *afield*, *aboard*
2. verb stems: *adrift*, *aglow*, *asleep*, *aflutter*, *awake*, *afloat*
3. adjective stems: *alone*, *alike*, *alive*

Since *a-* determines the category of the word as a whole, rather than the stem to which it attaches, *a-* appears to be the morphological head of the word. However, Olsen's zero-derivation analysis does not carry over to *a-* adjectives. Unlike prefixes like *em-*, *a-* prefixation is possible with adjectives whose verbal form contains an overt suffix: *alive* (cf. *liven*); *alight* (cf. *lighten*). This shows that the stem in *a-* adjectives does not undergo a zero-derivation process creating a verb stem prior to affixation by

*a-*. There is no other plausible zero-derivation process that could feed *a-* prefixation. This class of adjectives appears to be a genuine counterexample to the Right Hand Head rule.

One possible way of utilizing the head-initial nature of *a-* adjectives to explain their inability to function prenominally is to extend Williams's (1982) *Head Final Filter*,<sup>10</sup> which requires that the head of a prenominal modifier aligns with the right edge of the modifier. This principle rules out examples like (35), in which the complement of an adjective occurs following the adjective in a prenominal modifier. If the Head Final Filter were extended "below" the level of the word, as it were, then words that are not morphologically head-final, such as *a-* adjectives, would be ruled out as prenominal modifiers. This version of the Head Final Filter would require that the morphological head of a prenominal modifier must be final.

One immediately puzzling piece of evidence under this proposal is that there do appear to be morphologically complex, non-head-final prenominal modifiers. The following examples suggest that the Head Final Filter is "inactive in the lexicon" (Escribano 2004:5):

- (36) a. a higher-than-average (basic) salary  
 b. a tongue-in-cheek (snide) remark

In the examples in (36), the final element (*average* or *cheek*) is not the the head, yet the examples are acceptable. (The intervening adjectives *basic* and *snide* show that the examples are genuine adjective-noun constructions, rather than compounds.) Such examples do not pose a serious threat to the idea of extending the Head Final Filter to account for the behavior of *a-* adjectives, however, because it can be argued that complex modifiers like *higher-than-average* are not derived through a morphological

<sup>10</sup>Not to be confused with Williams's (1981) Right Hand Head rule despite their interestingly confusable names.

process of affixation, but rather a process converting syntactic phrases into lexical items.

A more pernicious problem with the approach under consideration is that the Head Final Filter does not appear to be the best way of explaining the restriction against complement-taking prenominal modifiers shown in (35). As Abeillé and Godard (2000) point out, there are several problems with an account of the contrast in (35) based on the Head Final Filter. One major problem is that it falsely rules out post-adjectival uses of *enough*, as in:

(37) a big enough shirt

Since *big* is the head of the phrase *big enough*, the prenominal modifier in *a big enough shirt* is not head-final. The Head Final Filter also fails to account for the apparently related fact that both conjuncts in a conjoined prenominal modifier are subject to the same constraint, as Abeillé and Godard point out:

(38) \*a proud of his son and happy man

The Head Final Filter is an overly superficial way of capturing the contrast in (35).

Another way of capturing the restriction against complement-taking prenominal modifiers is to posit that prenominal modifiers are not phrasal projections, in the  $X'$ -theoretic sense (Stowell 1981). According to Sadler and Arnold's (1994) analysis of phenomena like (35), prenominal adjective modifiers are "weakly lexical" constructions, i.e., "constructions whose root is a zero level projection, and which contain only zero level projections" (Sadler and Arnold 1994:213). As Sadler and Arnold (1994:216) suggest in passing, the idea that prenominal modifiers are weakly lexical in their sense could potentially be used in conjunction with the observation that *a*-adjectives are head-initial and the Right Hand Head rule to explain why *a*-adjectives cannot function prenominally. Suppose that the Right Hand Head rule is exceptionless: words must be headed by their right hand member, in English. Any

combination in which the head is not the right hand member must then be phrasal. *A-* adjectives (which, in fact, have origins in prepositional phrases) are therefore phrasal, and thus cannot be used prenominal. I leave it for future research to verify Sadler and Arnold's (1994) analysis and to show that *a-* adjectives are phrasal, but an explanation along these lines may be viable.

### 5.2.1.3 Characterization

According to Bolinger (1967:12), *a-* adjectives “have been restricted to predicative and post-adjunct position both by their adverbial origin and their sense of temporariness.” The idea that *temporariness* is at work is the question of interest in this sub-subsection.

Bolinger (1967) argues that in general, prenominal adjectives must be *characterizing* rather than temporary, and brings a wide range of evidence to bear in support of this notion. Bolinger does not really define the property of being “characterizing,” but it has been likened to the property of being an individual-level predicate (Svenonius 1994). One type of evidence comes from contrasts in interpretation between prenominal and postnominal adjectives. For example, compare *the only river navigable* and *the only navigable river*: the former has an ‘occasion’ reading in which “the temporary states of rivers are referred to,” and the latter has a ‘characteristic’ reading, referring to “classes of rivers” (Bolinger 1967:3–4). Another contrast in support of the idea that prenominal adjectives must be characterizing is that deverbal adjectives related to verbs describing processes that leave a mark are more acceptable as prenominal adjectives: While we might talk of a *scratched surface*, we would not talk of a *scratched head*. Leaving a mark is “the unhewn side of characterization, the most obvious means of stigmatizing a thing by what appears on its surface” (Bolinger 1967:9).

Bolinger’s idea can be cast in terms of *stage* vs. *individual level* predicates (Carlson 1980), as Svenonius (1994) points out.<sup>11</sup> The idea that stage vs. individual level predication is relevant to prenominal predication is found in several other places in the literature as well. DiSciullo and Williams (1987:50) describe a related contrast in meaning between compounds like *bank robber* and phrases like *man who is robbing a bank*: the former describes a permanent property, while the latter describes a temporary property. Words, including compounds, are “generic” in this sense, while phrases are not, according to DiSciullo and Williams (1987). They suggest that the genericity of words comes about because words may contain no references to time, or tense, unlike sentences. According to Kratzer’s (1995) analysis of the stage vs. individual level distinction, containing a reference to a spatiotemporal location is exactly what distinguishes stage-level predicates from individual-level predicates, so DiSciullo and Williams’s (1987) suggestion foreshadows Kratzer’s (1995) analysis of individual-level predicates. Sadler and Arnold (1994), arguing that adjective-noun combinations are word-like, take up DiSciullo and Williams’s (1987) suggestion and apply it to adjective-noun combinations, effectively claiming that prenominal adjectives must be stage-level in the Kratzerian sense. In general, Bolinger’s idea of the characterizing, generic, or individual-level nature of prenominal adjectives is “quite palpable and pervasive” despite the fact that “it is difficult to put a finger on what [it] amounts to” (DiSciullo and Williams 1987:50).

Several facts clearly temper the applicability of the broad slogan, “prenominal adjectives are individual-level and post-nominal adjectives are stage-level.” First,

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<sup>11</sup>Bolinger sometimes describes characterization in terms of *utility* of the concept, rather than temporariness. For example, Bolinger points out that while there are, for example, *fish-eating dinosaurs*, one would never call a secretary who erases mistakes a *mistake-erasing secretary* or a wife who wakes her husband a *husband-waking wife*; “These must wait the day when we have some interest in characterizing secretaries as mistake-erasing or wives as husband-waking” (Bolinger 1967:7). Bolinger also points out the contrast between *deposited money* and *withdrawn money*; the latter would be unusual because “withdrawing money does not put it in a situation that interests us” (op. cit.: 9). This insight is similar to the one developed by Goldberg and Ackerman (2001).

individual-level adjectives can follow indefinite pronouns, as in *something red* (Svenonius 1994), so individual-level adjectives are not excluded from postnominal position across the board. Furthermore, individual-level predicates with complements (e.g. *fond of children*) are not only allowed in post-nominal position, they are restricted to this position, as Sadler and Arnold (1994) point out. With these exceptions, however, it is generally the case that post-nominal adjectives are stage-level.

Prenominal position does not seem to be restricted to individual-level interpretations to the same extent that post-nominal position is restricted to stage-level interpretations. The prenominal construction *navigable river*, in fact, is ambiguous between a ‘temporary’ reading and a ‘characteristic’ reading; although postnominal adjectives do not generally have individual-level readings, prenominal adjectives are capable of receiving either type of interpretation.

Moreover, as Jacobsson (1996:210) points out, it is a “tendency rather than a rule” that prenominal modifiers are not stage-level: There are adjectives describing temporary qualities that are perfectly capable of functioning as prenominal adjectives, such as *naked*, as in *a naked man*. The difference in acceptability as a prenominal modifier between adjectives like *naked* and adjectives like *fine* (on the *How are you?* reading) cannot be explained on the basis of temporariness, because the states described by these two adjectives would seem to be equally temporary. *Naked* can be shown to be a stage-level adjective by application of standard diagnostics, such as the ability to function as the complement of verbs of direct perception like *see* (Carlson 1980), as in *I saw him naked*, and ability to occur in existential *there* sentences (Milsark 1977), as in *there were people naked*. Examples such as *naked* show that it possible for stage-level predicates to function prenominally.

The sense in which prenominal adjectives must be “characterizing” is therefore not entirely clear, although the idea is intuitively compelling. However this is worked out, it may be an additional factor contributing to the unacceptability of *a-* adjectives

as prenominal modifiers.

#### 5.2.1.4 Metrical factors

Another factor that has been proposed to play a role in the unacceptability of *a*-adjectives is their stress pattern (e.g. Schlüter 2005). Because *a*-adjectives consist of an unstressed schwa vowel followed by a stressed syllable, and they typically occur between an unstressed determiner and a stressed noun, they typically violate the general principle that stress should alternate (Chomsky and Halle 1968; Selkirk 1984). Obviously, metrical factors would not account for the contrast between those adjectives that contain *a*- as a prefix and those that happen to begin with an unstressed schwa (*astute*, *aloof*), but metrical factors may still play a role.

Evidence for the role of metrical factors in the domain of *a*-adjectives comes from the amelioration of their prenominal use by preceding modifiers. It appears that, as Quirk et al. (1985:409) claim, “*a*-adjectives can occur attributively when they are modified.” Here are two examples Jacobsson (1996) gives:

(39) “The bloke got triple-tapped,” a sargeant recounted one day about a luckless but still alive friend near the Zambian border. [*Time*, February 27 1978]

(40) Sometimes you got to feel sorry for Perry. He must be one of the most alone people there ever was. [Truman Capote, *In Cold Blood*, 335]

Schlüter (2005:84) shows that, although the adjectives *ashamed* and *aware* only rarely occur prenominally, they are much more likely to occur with a preceding modifier when in prenominal position. In non-prenominal position, *ashamed* occurs unmodified in 81% of cases (in British newspaper corpora), and *aware* occurs unmodified 63% of the time. In prenominal position, however, *ashamed* occurs unmodified 2% of the time, being adverbially premodified, compounded, or prefixed in the other 98% of cases; *aware*, similarly, occurs unmodified 7% of the time in prenominal position. Schlüter

suggests that this result can be understood on the basis of metrical considerations, perhaps in the following way: a preceding modifier allows stress to be retracted onto the modifier, allowing stress clash to be avoided.<sup>12</sup>

### 5.3 Conclusion

This chapter has provided an in-depth examination of Goldberg’s (2006) putative examples of arbitrary negative exceptions in the adjectival domain: *aghast* and *mere*. It has been shown that both of these adjectives are subject to “general facts about adjectives” and that the inabilities of these adjectives to function prenominal or predicatively are not idiosyncratic facts that must be memorized.

Examining these cases has led to a fuller understanding of the principles involved. The Predicativity Principle developed in §5.1.1 has sometimes been implicitly assumed, but has not been explicitly stated as a principle. Following the statement of the Predicativity Principle, §5.1.2 shows how it applies, by subclassifying prenominal-only adjectives into types of non-predicative adjectives, and showing, for each subclass, how its syntactic behavior follows from the Predicativity Principle.

In §5.2.1.1, competing explanations for the inability of *a*-adjectives to function prenominal were weighed. One hypothesis that can be ruled out is that their behavior is a consequence of their having originated as prepositional phrases. Under a purely historical explanation, restrictions on *a*-adjectives would be arbitrary exceptions, from the learner’s perspective. Instead, I have argued that adjectives like *aghast* are part of a productive class whose members are systematically restricted from prenominal position, defined morphologically by the inclusion of the *a*-prefix.

Although this generalization is sufficient to make the case against arbitrariness in this domain, I have identified and evaluated several even deeper explanations for the

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<sup>12</sup>This is not the only possible explanation for this result, however; it may have to do with issues of informativity such as those discussed by Goldberg and Ackerman (2001).

behavior of *a-* adjectives. Two approaches based on the observation that *a-* adjectives are head-initial are considered in §5.2.1.2: one based on the Head Final Filter, and one based on a requirement that prenominal adjectives be non-phrasal. Of these two, only the latter hypothesis, based on phrasality, can be shown to be viable. Other factors may also play a role, although these factors have limited explanatory power: Bolinger’s (1967) idea that prenominal adjectives must be “characterizing” (§5.2.1.3), and the principle of metrical phonology that stress should alternate (§5.2.1.4).<sup>13</sup>

Although several more general explanations for the behavior of *a-* adjectives have been considered, it has not been possible to find strong support for the existence of a general principle from which their behavior falls out as a consequence. If such an explanation is not to be found, the restriction on *a-* adjectives could be considered “arbitrary” in a certain sense, but not in the sense that is important for Baker’s Paradox. Whether or not a deeper explanation can be found, it remains the case that *a-* adjectives do not meet the criteria governing the productivity of the use of prenominal adjectives. In this sense, they are not arbitrary exceptions. It is thus possible to conclude that the “arbitrariness” premise of Baker’s Paradox in this domain – the claim that there are arbitrary negative exceptions in the realm of prenominal or predicative uses of adjectives – is not empirically well-founded.

Therefore, it is not necessary to assume that the learner must use word-specific negative evidence in order to acquire the properties of adjectives. Although the learner may initially overgeneralize and need to cut back, this cutting back process may involve learning generalizations, rather than constraints on particular words. For example, (41) shows an example of corrective feedback in response to an overgeneralization of *alive* to prenominal position from the ChiLDES corpus (MacWhinney and Snow 1985) by Mark (age 4;8.07). The dialogue pertains to a possible trip to

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<sup>13</sup>To the extent that these other factors do play a role, there is a smaller acceptability gap between *a-* adjectives and other adjectives to be explained, and the examples can be seen as “less arbitrary” in that sense.

the graveyard at night (Halloween night, it seems), and the ghosts rising from their graves:

- (41) Mark: I'll go [poking motion] then, then they would be dead.  
 Father: they are dead already.  
 Mark: Yeah but, yeah but even more stuff would come out of 'em and then they'll never even want come here and if they come alive again I'll stick my fingers in them again  
 Father: Do you think it'll work?  
 Mark: Um.  
 Father: Sure.  
 Father: Sure it'll work.  
 Mark: because it even ... **alive monsters** that like morning, ah, get, get killed from getting sticked in their tummy.  
 Father: **Live monsters?**  
 Mark: Yeah.  
 Father: What are, what are some **live monsters?**

In this instance, the caretaker provides the child with corrective feedback allowing him to infer that there was something ill-formed about his use of *alive* in *alive monsters*. Although the feedback concerns a specific lexical item, Mark may construe this feedback as indicating a general constraint. For example, after several experiences of this type, Mark may begin to hypothesize that words that begin with *a-* are not acceptable in prenominal position. A more articulated view of this process is developed in the following chapter.

# Chapter 6

## Conclusion

With the unknown, one is confronted with danger, discomfort, and care; the first instinct is to abolish these painful states. First principle: any explanation is better than none... The causal instinct is thus conditional upon, and excited by, the feeling of fear. The “why?” shall, if at all possible, not give the cause for its own sake so much as for a particular kind of cause – a cause that is comforting, liberating, and relieving.

–Friedrich Nietzsche, *Twilight of the Idols*

### 6.1 Goals

The aim of this dissertation has been to analyze the logical and empirical foundations of Baker’s Paradox. To review, Baker’s Paradox comprises three premises: *productivity*, *arbitrariness*, and *no negative evidence*. Under the premise of productivity, an unbounded number of lexical items can instantiate a given syntactic pattern, in principle. Under the premise of arbitrariness, there are certain lexical items that cannot instantiate the pattern despite meeting the criteria governing the productivity of the pattern (when there is no preempting form). Under the “no negative evidence” premise, language learners do not have access to evidence that such forms are

ungrammatical.

On the empirical side, the emphasis of this dissertation has been on denying the premise of arbitrariness. The goal has been to demonstrate that this premise is not well-founded, by showing that putative examples of arbitrary exceptions to productive patterns in a range of domains fall under larger generalizations delimiting the productivity of the patterns in question. Although it would have been impossible to address the universe of examples of arbitrary exceptions, I hope that this work has been able to show that the premise of arbitrariness cannot be taken as given. Upon detailed linguistic investigation into the studied domains, the arbitrary exceptions have disappeared; the lexical items failing to instantiate the patterns in question are all subject to general criteria governing the productivity of the pattern.

On the logical side, the focus has been on the implications of the existence of arbitrary exceptions, or the lack thereof, for the learning of restrictions on productive patterns. The existence of arbitrary exceptions is often taken to have deep implications regarding the nature of learning, and it is therefore important to establish what follows logically from their existence or non-existence and what does not. The relationship between the “arbitrariness” and “no negative evidence” premises is one of the issues under this heading. The tripartite structure of Baker’s Paradox might suggest that the three premises correspond to mutually exclusive solutions to the paradox, so denying arbitrariness requires asserting the absence of negative evidence. Baker’s Paradox can be doubly solved by denying both, however; these are compatible solutions to Baker’s Paradox.

Another issue under this heading is the relationship between arbitrariness and attentiveness by the learner to the use of individual words in individual constructions, which Culicover (1999) argues to be a consequence of idiosyncrasies in language. Indeed, the notion of attentiveness is more closely related to the issue of arbitrariness, and could in principle provide an explanation for why it should not hold. However,

in this chapter, I advocate a different view of learning, according to which learners prefer explanatory generalizations to arbitrary stipulations, namely, *the explanation-seeking learner*. This view is consonant with a large number of experimental findings in psychology, and explains why it is so difficult to find a good example of an arbitrary exception.

## 6.2 Empirical foundations of Baker's Paradox

### 6.2.1 Range of phenomena

Potential cases of arbitrary exceptions have been considered in a wide range of domains, one that is wider than the range of empirical phenomena that have heretofore been considered in relation to Baker's Paradox. Pinker (1989), and subsequent writers on this topic, have focussed on verbal diathesis alternations such as the causative, dative, and active/passive alternations. Recall Schütze's (1997:122) reasoning by which the premises of Baker's Paradox lead to a contradiction, which is stated in terms of subcategorization (emphasis added):

If *subcategorization* is unpredictable [Arbitrariness], then it must be learned for each *verb* individually. With no negative evidence available [No Negative Evidence], the child would have to limit herself to repeating *subcategorization frames* perceived in parental speech. But this contradicts [Productivity] (i.e., the child will use *verbs* with unattested *subcategorization frames*).

This dissertation has demonstrated that the problem extends beyond verbal subcategorization. Of course, issues of subcategorization cannot be ignored in a substantive discussion of Baker's Paradox, and the two verb alternations that have figured most prominently in the literature on this subject are addressed in this dissertation: Chapters 2 and 3 address the causative and dative alternations, respectively. However,

the empirical realm of Baker's Paradox has been expanded to include other aspects of grammar: preposition pied-piping and stranding (Chapter 4) and the prenominal and predicative uses of adjectives (Chapter 5).

The range of phenomena to which the central claim of this dissertation applies extends beyond the case studies addressed here. Many interesting cases remain even within English syntax. For example, the principles underlying the selection of *as* complements do not seem to be well-understood; some 'verbs of considering' allow them and others do not (Pollard and Sag 1994):

- (1) Mary regards/\*believes Sally as an acceptable candidate.

Another instance of Baker's Paradox concerns the determiners that allow the so-called "Big Mess Construction" (Berman 1974):

- (2) I got so/\*this big a raise that I stayed there.

The variation in the domain of such determiners was claimed by Van Eynde (2007:11) to be "a matter of lexical stipulation," counter to the central claim of this dissertation, assuming that the Big Mess Construction is productive.

There could in principle be instances of Baker's Paradox in the realm of morphology as well. A productive derivational affix that apparently arbitrarily fails to attach to certain stems would constitute an instance of Baker's Paradox in the morphological domain. The general claim that this dissertation aims to defend, therefore, extends far beyond the cases that have been addressed within it.

Along with expanding the range of empirical instantiations of Baker's Paradox, this dissertation has also delimited them. Some idiosyncrasies do not constitute arbitrary exceptions, and are therefore consistent with the claim that I am defending here: Any idiosyncrasy that does not constitute an arbitrary exception to a productive rule is consistent with the criteria-governed productivity solution to Baker's Paradox. One example of this type is the use of *rather* with sentential complements, for example:

- (3) I would rather (that) you stayed.

This sense of *rather*, meaning “prefer,” otherwise behaves as a comparative adverb, ending in *-er*, taking *than* (e.g. *I would rather stay than go*), and appearing before a bare verb phrase (e.g. *I would rather go*). The ability of *rather* to license sentential complements does not constitute a counterexample to the claim that arbitrary exceptions do not exist because this behavior is an *ability* to behave in a certain way (what can be called a “positive exception”) rather than an *inability* to behave in a certain way (a negative exception). *Rather* is similar to other “syntactic nuts” discussed by Culicover (1999) in this respect.

### 6.2.2 Consequences of the range of phenomena

Expanding the range of phenomena helps to distill the essence of the learnability problem: An instance of Baker's Paradox is found wherever there is a productive generalization and there appear to be arbitrary exceptions to it. When the discussion is limited to verb alternations, issues that are not related to the core of the issue take on unmerited importance – for example, the question of whether or not linking rules are innate is an important issue in domains of Baker's Paradox related to verb alternations (Bowerman 1990; Brinkmann 1996; Marcotte 2005), but this issue is not crucially related to Baker's Paradox in general.

Another way in which expanding the range of phenomena helps to distill the essence of the issue is by showing that having an alternative paraphrase is not a necessary property of an instance of Baker's Paradox. Verb alternations provide two alternative paraphrases (for example, the double object and prepositional dative forms of the dative alternation), but not all Baker's Paradox phenomena have this property. For example, the prenominal use of adjectives has no paraphrase as similar to it in meaning as the alternants of the dative alternation are to each other. Although *an*

*angry person* can be paraphrased, *a person who is angry*, the latter differs from the former in quite a few ways: it is much longer, it contains a tensed clause, etc. Because this type of case exists and falls under the scope of the problem, the solution must extend to such cases.

The model proposed by Schütze (1997) is an example of a solution that relies on an alternation between roughly equivalent paraphrases. Schütze describes a connectionist network whose output layer contains one node representing the double object construction and one node representing the prepositional dative construction. The input layer contains information about the verb and its arguments. The network as a whole functions as a probabilistic model of choice between alternants of the dative alternation (and in this regard is similar to the model described by Bresnan et al. (2007)). Schütze counts among the virtues of this model the fact that it predicts both productivity and arbitrariness: It can generalize to new verbs, but arbitrary exceptions can also be represented, as direct pathways from the input layer to the output layer. Of course, the main thesis of this dissertation is that predicting arbitrariness is not a virtue of any model, but Schütze's basic model could trivially be altered to rule out arbitrary exceptions. A non-trivial drawback of this model, however, is that its architecture relies on alternative paraphrases. Constraints on the double object construction are learned solely through repeated witnessing of prepositional dative constructions. Such a model would not work for learning constraints on prenominal adjectives, because there is no alternative construction that could serve as the "antagonist," as it were, for reasons described above.

A further drawback of a model that relies on the presence of alternative paraphrases is that, assuming that it is intended to explain contrasts of acceptability, the double object construction is predicted always to be as "bad" as the prepositional dative construction is "good," because the two alternants are yoked. For every increase in the strength of the pathway between a given verb and the double object

construction, there is a corresponding decrease in strength between that verb and the prepositional dative construction. Assuming that the strengths of these pathways represent levels of acceptability, this predicts that the prepositional dative construction should be less acceptable with alternating verbs than with non-alternating verbs. For example, *send something to someone* should be worse than *drag something to someone*, because *send* is alternating and *drag* is non-alternating. The results of Experiment 1 from Chapter 3 do not support this notion; prepositional datives were rated comparably among alternating and non-alternating verbs. In defense of Schütze's model, one might counter that it is intended to model probability rather than acceptability, but in that case it is not intended to account for the empirical phenomena that a solution to Baker's Paradox should account for, namely, contrasts in acceptability.

This is not to say that there is no connectionist network model that could provide a solution to the problem at hand. I believe that an appropriate connectionist model could be designed for this purpose if it had a somewhat different architecture. Such a model would encode *constraints on a syntactic position*. For a given syntactic position, such as "predicative adjective," this model would output "yes" (i.e., acceptable) or "no" (i.e., unacceptable) depending on various input features. The input features would include semantic features of the item to be placed in the position, such as semantic predicativity. In general, any *model of acceptability* for a syntactic position would avoid the problem of being reliant on alternative paraphrases.<sup>1</sup>

Where would negative evidence come from under this view? Negative evidence can come from explicit or implicit signals. Explicit negative evidence, by definition, arises in situations where an utterance or part of an utterance is explicitly said to be ungrammatical, or where caretakers offer corrective feedback. If the corrected utterance contains an instance of a given syntactic construction, then the learner can

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<sup>1</sup>This type of model may be equivalent in some respects to models of part-of-speech tag induction (see Klein 2005 and references therein).

hypothesize that the utterance contained an abuse of this syntactic construction. For example, if the utterance contains a prenominal use of an adjective, and is explicitly said to be ungrammatical, then the learner can hypothesize that the sentence contained a faulty use of the prenominal adjective position. As Chouinard and Clark (2003) point out, corrective feedback contains information about the locus of the problem, so this information is available at least on some occasions. Once the locus of the problem has been identified, the learner can identify possible sources of the difficulty. Semantic features of the word used in that position can be hypothesized as the causes of the difficulty.

For example, recall the corrective feedback given in response to an overgeneralization of *alive* to prenominal position, shown at the end of Chapter 5 on page 192. In this instance, the caretaker provides the child with corrective feedback allowing him to infer that there was something ill-formed about his use of *alive* in *alive monsters* (*Live monsters? What are some live monsters?*). As Chouinard and Clark (2003) would point out regarding this example, the contrast between *live* and *alive* tells Mark the locus of the error, and moreover what can be done to fix it. After several experiences of this type, Mark may begin to hypothesize that words that begin with *a-* are not acceptable in prenominal position (or he may hypothesize different explanations, or disregard the evidence entirely).

Implicit negative evidence would work similarly, although it would also require a mechanism for generating expectations, because implicit negative evidence arises when expectations are violated. Models of acceptability do not provide expectations; they merely discriminate acceptable from unacceptable uses of a given syntactic position. However, assuming there is a mechanism for generating expectations, implicit negative evidence could arise when those expectations are violated. For example, if a prenominal use of an adjective is expected in a given instance, and does not occur, then the learner may hypothesize that the expected sentence might contain an

abuse of the prenominal adjective position. The learner can then hypothesize potential causes of difficulty in the same way that he or she can when explicit negative evidence is available.

In summary, the breadth of the phenomena surveyed in this dissertation helps to distill the nature of the problem, and shows that models that rely on the presence of alternative paraphrases are not sufficient to capture the full range of phenomena. This does not imply that no connectionist or gradient model will suffice; a connectionist or gradient model of acceptability would avoid the problem of being reliant on alternative paraphrases.

### 6.2.3 Types of criteria governing productivity

The primary goal of the empirical studies has been, of course, to show that there are no arbitrary exceptions in these domains. In other words, it has been to deny the empirical premise of Baker's Paradox, "Arbitrariness." This type of approach can be called the "criteria-governed productivity" approach.

The type of analyses that have served as "criteria-governed productivity" solutions to Baker's Paradox have typically fallen in the realm of semantics. Indeed, the approach that aims "to look for semantic or perceptual characteristics that correlate with the syntactic distributions and to propose that these play a significant role in acquisition" is labelled the "semantics approach" by Wonnacott et al. (2008:167). The majority of the constraints and generalizations that I have given as explanations for the behavior of putative arbitrary exceptions have in fact posited relationships between syntax and semantics. For example, the linking rule given in Chapter 2 ("The Causative Alternation") constrains the relationship between the meaning of a verb and the syntactic expression of its arguments. In Chapter 3 ("The Dative Alternation"), some semantic constraints on the ditransitive use of verbs are invoked, such as the requirement that ditransitive verbs describe a transfer of possession. In

Chapter 4 (“Odd Prepositions”), restrictions on stranding are argued to follow from a constraint on the complexity of the event spanned in a long-distance dependency. The Predicativity Principle in Chapter 5 (“Adjectives”) establishes semantic restrictions on the type of adjectives that can be used syntactically as predicative adjectives.

However, the “semantics approach” would be a misnomer for the present approach, because meaning is not a critical feature of a solution under this approach. Some purely syntactic constraints have served as solutions. The fact that specifiers precede heads in English, for example, is used in Chapter 4 to explain the ordering of *ago* with respect to its complement. Also in Chapter 4, the fact that *ago* does not strand is argued to follow from the constraint against the extraction of specifiers also seen in “Left Branch Condition” violations such as *Whose did you read \_ book?* Explanations based on morphology have also been considered, and supported to some extent: Chapter 3 shows that the hypothesis that morphological complexity governs the productivity of the ditransitive use of verbs remains the most viable of the available hypotheses, and Chapter 5 argues that the inability of *a-* adjectives to function prenominally was due to a morphological property. What this implies is that my claim is weaker than the claim that “everything is predictable from semantics,” as it were. Such a claim is opposed to the “Arbitrariness” premise, but is stronger than the one I am advocating.

#### 6.2.4 Domain-specific findings

A benefit of taking a stance against the “Arbitrariness” premise is that one has the opportunity to develop a richer understanding of the phenomena that lie in the scope of Baker’s Paradox. The need to evaluate the existence of arbitrary exceptions motivates one to reevaluate both the criteria governing productivity in these domains, and how to establish whether or not these criteria have been met. Although there is more work to be done to fully understand these domains, I hope I have been able to

provide some additional light on the phenomena I have investigated.

The causative alternation is perhaps the best-understood of the phenomena I address, and the criteria for undergoing the causative alternation laid out by Levin and Rappaport Hovav (1995) are supported by the empirical investigations in Chapter 2 (“The Causative Alternation”). Levin and Rappaport Hovav’s (1995) theory is often described with respect to the distinction between *internally* and *externally* caused verbs, leaving out a third class, which I have labelled *non-caused*. This third class is important, because two of the most frequently cited verbs in the language acquisition literature on the causative alternation – *come* and *disappear* – fall into this class. The investigations in Chapter 2 also show how the distinction between internal and external causation applies within the class of verbs of cyclical motion. I argue that the non-alternating verbs in this class (*totter*, *revolve*) describe internally caused eventualities, and the alternating verbs (*spin*, *rotate*) describe externally caused eventualities. The argument is based on an observation regarding direction of force, which leads to the statement of a principle that can be used for distinguishing internal and external causation, namely, the Direction of Force Principle.

Chapter 3 addresses criteria governing the productivity of the double object construction having to do with form as well as meaning, focusing primarily on form. The experimental results reported in this chapter help to narrow down the set of possible ways of stating Gropen et al.’s (1989) “morphophonological constraint” on the dative alternation, a constraint that has been described in terms of prosodic weight (in terms of metrical feet), etymological origin, formality, and morphological complexity. All of these hypotheses except the morphological complexity hypothesis were tested directly, and none of the hypotheses tested were fully supported. This brings up an obvious question for future work, namely, whether or not the morphophonological constraint is in fact a morphological constraint.

Chapter 4 responds to Culicover's (1999) case study on the behavior of prepositions, primarily focusing on their ability to undergo pied-piping and stranding. Whereas Culicover argues for a highly stipulative view of preposition behavior, this chapter shows that all of the facts that Culicover describes in this case study fall into general classes of phenomena. The analyses offered in this chapter build on the insights of previous authors in many cases, but some new ideas arose from this investigation as well. For instance, I argued for the existence of the Marking Generalization as part of an explanation for the inability of prepositions like *off* and *out* to pied-pipe, and this was shown to be supported by the behavior of other prepositions as well.

Chapter 5 develops several generalizations regarding the predicative and prenominal uses of adjectives. The part of the chapter dealing with constraints on the predicative use of adjectives includes a detailed descriptive classification of the adjectives that fail to occur predicatively. Although this set is somewhat diverse, its members all share the semantic feature of being non-predicative. On the basis of this generalization, I propose the Predicativity Principle, which accounts for a wide range of restrictions on the predicative use of adjectives. The part of the chapter dealing with constraints on the prenominal use of adjectives argues that *a-* adjectives (*asleep*, *abuzz*, etc.) are ruled out from prenominal position because they synchronically contain the morpheme *a-*, which is a productive prefix. Crucially, new forms containing this prefix are unacceptable prenominally, so *a-* adjectives are subject to a general constraint on the productivity of the prenominal adjective position.

Investigating these putative exceptions is thus useful not only for evaluating the existence of arbitrary exceptions, but also fruitful for the study of language, contributing to a deeper understanding of the phenomena themselves.

## 6.3 Logical foundations of Baker's Paradox

The other major goal in this dissertation has been to analyze the logical foundations of Baker's Paradox. The purpose of doing so is not only to solve the paradox, but also to characterize the possible mechanisms by which restrictions on productive patterns are acquired, as discussed in Chapter 1. In this section, I will review the main points of Chapter 1, and go on to discuss possible explanations for my thesis of non-arbitrariness.

### 6.3.1 The theoretical landscape

In Chapter 1, I argued for the existence of two independent dichotomies, one between arbitrariness and criteria-governed productivity, and one between conservatism and negative evidence. These two dichotomies are orthogonal in the landscape of possible theories of how restrictions on productivity are acquired. Thus, it is possible to advocate criteria-governed productivity while at the same time assuming that negative evidence is used in language acquisition, as I do.

Although these dichotomies are orthogonal, they are not unrelated; the question of arbitrariness affects the type of negative evidence that it would be necessary for learners to use. The type of negative evidence that would be necessary for learning arbitrary exceptions would pertain to the use of individual words in individual constructions; if arbitrary exceptions do not exist, as I claim, then the learner may use negative evidence pertaining to general properties that words may have.

Chapter 1 also addressed how Baker's Paradox relates to Culicover's (1999) idea of the "Conservative Attentive Learner." According to Culicover (1999), the existence of arbitrary exceptions implies that the learner is conservative and attentive. As I argued in Chapter 1, conservatism is the flip-side of negative evidence. This means that the relationship between arbitrariness and conservatism, just like the relationship

between arbitrariness and negative evidence, is orthogonal, contrary to Culicover's (1999) claim.

However, I agree with Culicover that attentiveness follows from arbitrariness. If there are arbitrary exceptions, then the learner must be attentive to the use of individual words in individual constructions, and furthermore encode and store such information. Contrapositively, non-attentiveness implies non-arbitrariness. This means that non-attentiveness is one possible explanation for non-arbitrariness. However, there are other possible explanations for non-arbitrariness, which will be discussed in the next section.

### 6.3.2 Explanations for non-arbitrariness

Supposing that arbitrary exceptions do not, in fact, exist, what would this linguistic situation mean for learning? Several possible consequences of arbitrariness have been identified above (negative evidence, attentiveness), but what follows from its negation? The consequences of the negation are more indeterminate than the consequences of the assertion, but there are several possible theoretical views that would explain it: (i) limitations on the architecture of grammar, preventing word-specific constraints from being expressible; (ii) limitations on the nature of learning, in particular, non-attentiveness; (iii) a preference on the part of the learner for general explanations over stipulations, which I call *the explanation-seeking learner*. As I will discuss in more detail below, evidence from psychology suggests that humans are capable of learning word-specific constraints, i.e., attentiveness. I therefore posit the explanation-seeking learner as a way of understanding why arbitrary exceptions are so few and far between.

### 6.3.2.1 Architectural limitations

To explain the non-existence of arbitrary exceptions, one might imagine that the architecture of the grammar is such that it cannot accommodate the presence of arbitrary exceptions. I do not believe that there is one single architectural assumption about the grammar that could be used to rule out the possibility of all arbitrary exceptions. The phenomena falling under the scope of Baker's Paradox are heterogeneous in such a way that a variety of assumptions would be necessary to grammatically rule out the possibility of arbitrary exceptions.

For example, suppose that the inability of a preposition to strand constitutes a requirement that the preposition's complement be overt. This restriction could be encoded in Head-Driven Phrase Structure Grammar (Pollard and Sag 1994) as a constraint imposed by a preposition that the SYNSEM of its complement be of type *canonical*, as opposed to *empty*. Requiring that a grammar be *incapable* of specifying a constraint like this would amount to requiring the grammar to be such that a preposition cannot impose constraints on the overtiness of its complement.

The prohibition of constraint specifications could take on a very different form in the domain of diathesis alternations such as the dative alternation. How exactly this would work depends on how the problem is framed. If constructions are made part of the theoretical apparatus (Goldberg 1995), then the problem can be seen as identifying the constraints on what elements can fill the position of *V* in the *V NP NP* construction. To rule out the possibility of arbitrary exceptions under this view, it is necessary to rule out the possibility of stating restrictions on the ability of individual verbs to appear in the head position of a particular construction.

On the other hand, if argument realization is determined by individually linking participants to positions in argument structure such as "external argument," and linking those positions in argument structure to surface positions such as "subject," "indirect object," and "direct object" or their configurational equivalents, then the

items whose positions are in question are the arguments of the verb. In this case, one could rule out arbitrary lexical exceptions by preventing argument linking from being sensitive to the identity of the verb. If argument linking were an encapsulated process that could not be influenced by factors other than semantic features of the eventuality and its participants, then non-arbitrariness would follow as a consequence. This view may be too strong, however, in light of the fact that there seems to be a morphophonological constraint on the dative alternation.

Although the nature of the putative word-specific constraints would vary from domain to domain if they were grammatically ruled out, I believe that there is an abstract architectural assumption that could rule out word-specific constraints on acceptability. Recall the connectionist architecture described above, in which the output was “yes” (acceptable) or “no” (unacceptable) depending on various input features, for a specific syntactic position. In such a framework, word-specific constraints on a particular position can be modelled as hard-wired pathways from inputs representing particular words to the “no” output, if the identity of the word is a possible input feature. This type of system is a model of acceptability, which could be implemented using a regression-type model as well. The dependent variable would be “yes” or “no” (or perhaps a gradient acceptability scale), and the predictor variables might include components of the semantics of the item and the other participants, the type of interaction involved (formal vs. informal, for example), the nature of the situation being described, etc.

Word-specific constraints could be seen as fixed effects in such a regression model. Arbitrary exceptions could be ruled out by assuming that language learners and speakers are not guilty of the “language as fixed effect fallacy” (Clark 1973; Raaijmakers 2003). That is, learners assume that anything they may discover about the constraints on the syntactic position in question will be generalizable to new “items” (i.e., words).

### 6.3.2.2 Non-Attentiveness

A somewhat less restrictive explanation for the lack of arbitrariness would involve constraints not on representation, but on learning. Of course, if there were no way even to represent information about individual words in individual constructions because of the architecture of the grammar, then non-attentiveness of the learner would follow as a consequence, but one need not assume that word-specific constraints are unrepresentable in order to imagine that the learner is non-attentive. Another theory that would derive non-arbitrariness as a consequence is that the learner is simply not attentive to the use of individual words in individual constructions. If the learner does not attend to this information, the information is not encoded and stored.

There are several arguments against this idea, i.e., in favor of learners' attentiveness to the use of individual words in individual constructions. One body of evidence comes from research in sentence comprehension, which has reliably found effects of verb bias on parsing. For example, in an offline forced-choice interpretation study on preposition attachment, Ford et al. (1982) found that the locus of attachment for the prepositional phrase *on the beach* in the sentence *The women discussed/kept the dogs on the beach* followed the subcategorization preference of the verb: The verb *keep*, which prefers locative complements, yields "low" attachment (treating the prepositional phrase as a complement), and the verb *discuss*, with the opposite subcategorization preference, yields "high" attachment (treating the prepositional phrase as a VP or sentential modifier).

In a well-known eye-tracking study, Trueswell et al. (1993) found syntactic misanalysis effects ("garden path effects") in sentential complements following verbs that typically take direct object complements, like *find*, but not following verbs that take sentential complements, like *claim*. Garnsey et al. (1997) found the same effect in an experiment manipulating direct object plausibility. Trueswell and Kim (1998) used priming to find the same effect: the syntactic bias (sentential complement vs. direct

object) of a prime word had a significant impact on the magnitude of garden path effects for following sentences.

Studies such as these support a model of processing such as that of Jurafsky (1996) or Manning (2003), where verb-specific subcategorization probabilities, which can be estimated from corpora and which are presumably derived through exposure, are mentally stored and deployed in parsing. These models are in tension with the central claim of this thesis (“no arbitrary exceptions”), because they do claim that subcategorization preferences are to some extent arbitrary, although these models do not stipulate arbitrary “exceptions” in the grammatical sense; there are no statements of the form, “Verb X is ungrammatical in Construction Y.”

The results from sentence comprehension are not the strongest possible indications in favor of arbitrariness, however. Apparently verb-specific subcategorization probabilities could in principle be driven by semantic factors. Hare et al. (2003) and Hare et al. (2004) show that verb subcategorization preference effects in comprehension are conditioned by verb sense. For example, the verb *find* has a direct object preference in its ‘locate’ sense, and not in its ‘realize’ sense. When context is used to promote one or the other sense, temporary ambiguities are interpreted in a manner consistent with the sense-determined preference. This implies that if verb-specific subcategorization probabilities are stored, there is a parameter for each separate word sense, rather than for each word form. As Wonnacott et al. (2008:170) point out, “[Hare et al.’s] findings at least raise the possibility that structural preferences may be entirely driven by verb semantics.” They continue: “The strong correlation between verb distribution and verb semantics, which hold in each natural language, make it impossible to determine whether verb biases are a result of the verb’s own distributional history or of its membership in some more general semantic classes.” This quotation eloquently captures why verb-bias effects in comprehension are not necessarily even in tension with the central claim of this thesis. The verb senses that prefer direct

object complements, such as the ‘locate’ sense of *find*, may share a semantic feature that is itself the cause of the parsing expectation for a direct object. In that case, the human parser would not need to store a parameter for each individual sense of each individual verb, but only for each relevant semantic feature.

In order to eliminate the confound between distribution and semantic class, Wonnacott et al. (2008) use an artificial language, in which the distribution and semantics of each word can be controlled. This artificial language had an alternation between two constructions: *Verb Agent Patient* (VAP) and *Verb Patient Agent* followed by the “particle” *ka* (VPA\_ka). There were three verb classes in this language: VAP-only, VPA\_ka-only, and alternating. Participants witnessed the verbs in non-alternating classes only in their respective constructions, and the alternating verbs were shown in both. Each verb was assigned to an action, such as PUSH, STROKE, TICKLE, etc. and the assignment of verbs to actions was different for every participant. This counterbalancing method was used to ensure that the acquired subcategorization preferences would not be attributable to the verbs’ semantics. After training, participants demonstrated sensitivity to these class distinctions in their grammaticality judgments, production, and on-line comprehension. These results strongly suggest that verb-specific constraints are learnable (and learned). This militates against an explanation for non-arbitrariness on the basis of inattentiveness on the part of the learner.<sup>2</sup>

### 6.3.2.3 The explanation-seeking learner

An even more modest explanation is possible. It is not necessary to assume that arbitrary exceptions cannot exist, or cannot be learned. An *explanation-seeking learner* would potentially be capable of memorizing arbitrary exceptions, but would avoid

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<sup>2</sup>It must be kept in mind that the participants in these experiments were adults, however.

doing so if possible. According to this explanation, learners prefer explanatory generalizations to stipulative facts (just as linguists do). This idea could be called the “theory theory” for language development (see Gopnik and Meltzoff 1997 for an articulation and defense of the “theory theory” for child development more generally, and many additional references): Learners develop causal explanations for linguistic evidence, which help them to understand their linguistic environment. Under this view, the child collects evidence about the acceptability of sentences and attempts to develop a theory of which sentences are acceptable and which are not.<sup>3,4</sup>

Like scientific theories, a child’s theory can make predictions, which can be contradicted by (positive or negative) evidence. When the predictions of the theory are violated, the child has the opportunity to revise the theory to make it more accurate. For example, imagine that a child has a theory of the causative alternation according to which transitive *break*, for example, is formed from intransitive *break*, via a productive causativization process that applies to any verb describing any eventuality that can be conceptualized as being caused. This predicts, erroneously, that *fall* should be usable as a transitive verb. Corrective feedback would provide an opportunity for revision of this theory. For example, suppose a child utters, *Don’t fall me down!* and hears *Don’t worry, I won’t drop you* in response from his or her caretaker. The child has received a bit of negative evidence, and can infer that for some reason, *drop* is more appropriate than *fall* in this situation. That the evidence tells the learner a fact about a specific word does not imply that the learner must posit a word-specific explanation.

What could this reason be? To account for this piece of linguistic evidence, a

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<sup>3</sup>Such a theory could be understood either a theory of the language itself, or a theory of the caregiver’s linguistic competence. See Marcotte (2005) for further discussion of this issue.

<sup>4</sup>The reader might be reminded of Chomsky’s (1965) “Language Acquisition Device,” but the idea here is not the same. Here, “hypotheses” take the form of constraints on syntactic positions, whereas under Chomsky’s view, a “hypothesis” corresponds to a grammar. More importantly, Chomsky makes very specific assumptions about the nature of grammars and the innateness of linguistic knowledge, which are unnecessary here.

variety of explanations could be given. One explanation lies in the meaning of *fall*: perhaps it is not really a verb that can be conceptualized as being caused. Alternatively, the child might posit that there is a constraint on the use of lexical causatives that the verb *fall* violates – under this scenario, the meaning is right, but the constraints are wrong. An arbitrary lexical stipulation is another viable explanation for this particular data point. In particular, perhaps *drop* is a suppletive form for causative *fall*.

This learner is not necessarily attentive: this learner may not encode and store every aspect of the data, but only the potentially explanatory aspects, e.g., *fall* started with the sound /f/, it was a short word, it had to do with downward motion, etc.. In other words, attention and encoding could be affected by the type of explanations the child is currently capable of making.

Recent support for the idea that learners are not *always* attentive in language learning comes from another result of Wonnacott et al. (2008). Item-specific learning was not found across the board. Recall that their participants were taught an artificial language with an alternation between two constructions: Verb Agent Patient (VAP) and Verb Patient Agent followed by the “particle” *ka* (VPA\_ka). All of the participants were taught a version of the language in which some verbs alternated between the two constructions and some were limited in their distribution to one construction or the other, but the proportion of verbs in the lexicon of the artificial language differed across participants. For some participants, there were four alternating verbs, four VAP-only verbs, and four VAP\_ka-only verbs (12 in total). For other participants, there were *eight* alternating verbs (out of 12 in total), and 2 VAP-only verbs and 2 VAP\_ka-only verbs. Only in the former condition (with a 4:4:4 ratio of verb types) did the participants acquire word-specific constraints; in the latter condition (with an 8:2:2 ratio), participants did not acquire verb-specific constraints. Thus, whether or not verb specific constraints are acquired depends on the overall

frequency distribution of verb types in the language. Granted, the participants in this experiment were adults rather than children, but it is possible that the same effect may emerge with child participants as well.

A possible interpretation of this result is that learners need to become sensitized to the possibility of non-alternating verbs in order to learn that a given verb does not alternate. Sensitivity to such a feature would allow learners to generate hypotheses about the alternating or non-alternating status of a given verb, which can in turn generate predictions that can be falsified. If a learner hypothesizes that such-and-such a verb is an alternating verb, evidence against this hypothesis could come from the relative rarity of one construction. If no such hypothesis is ever developed, then no such predictions can be generated and falsified – failure to generate such predictions may be what occurs in the case where non-alternating verbs are rare.

The idea that learning, as theory development, depends on the prior establishment of an earlier theory is put forth for child development more generally by Karmiloff-Smith and Inhelder (1974). In their experiments, children played with blocks and learned strategies for building towers. Based on their observations, they concluded (*op. cit.*: 203–204):

Frequent counterexamples do not alone induce a change in the child's behavior. If they did, then progress could be achieved by simply providing a large number of counterexamples. The child must first form a unifying rule based on regular patterns he has observed . . . . Only when this theory is really consolidated and generalized, is he ready to recognize some form of unifying principle for the counterexamples which he earlier rejected as mere exceptions.

The fact that negative evidence is sometimes ignored by children fits nicely into this framework. Children may not always be ready to absorb contradictory evidence and revise their explanations, as shown by the following dialogue from Braine (1971):

- (4) Child: Want other one spoon, Daddy.  
 Father: You mean, you want *the other spoon*.  
 Child: Yes, I want other one spoon, please, Daddy.  
 Father: Can you say 'the other spoon' ?  
 Child: Other ... one ... spoon.  
 Father: Say ... 'other'.  
 Child: Other  
 Father: Spoon  
 Child: Spoon  
 Father: Other ... spoon  
 Child: Other ... spoon. Now give me the other one spoon.

This dialogue has been taken to show that learners simply do not make use of negative evidence, but a less radical interpretation is possible. The dialogue in (4) can be taken as support for the view that evidence is not automatically and mechanically absorbed, but rather is taken into account only when old explanations are questioned and new explanations are sought.

Moreover, children may develop different explanations for the same data. This partially explains the finding by Hudson Kam and Newport (2005) that children regularize inconsistent input in different ways. Whereas adults in their experiments produced determiners alongside nouns in an artificial language at a rate proportional to the rate at which nouns were presented with determiners, children tended to regularize the artificial language, producing determiners either completely consistently or never. One child participant found an even more creative strategy, marking nouns in transitive sentences but not intransitive sentences (Hudson Kam and Newport 2005:182). This result can be understood under the view that language learning is not blind number-crunching, but a process of theory formation and revision.

In the realm of scientific theory formation, there is evidence that children prefer explanations that are not *ad hoc*. In an investigation of the kinds of explanations that children seek, Samarapungavan (1992) presented children with pairs of alternative theories and asked them which of the two theories they preferred and why. One

experiment asked children to choose between theories in the domain of chemistry. In this experiment, there were five buckets: two with blue liquid labelled “Cold,” two with red liquid labelled “Hot,” and one with clear liquid labelled “Cold.” The buckets labelled “Cold” (two blue and one clear) were alkaline, and litmus paper turned blue when dipped in them. The two red buckets, both labelled “Hot,” were acidic and turned litmus paper red. Children were asked to choose between two theories of why the paper turned color: (i) the paper turns the color of the liquid in the bucket, except sometimes the liquid gets old (the *ad hoc* theory); (ii) the paper turns color based on temperature (the non-*ad hoc* theory). Thus, both accounted for the “data” accurately but one required an *ad hoc* stipulation to account for all of the evidence. Samarapungavan found that children prefer the non-*ad hoc* theory to the *ad hoc* theory across several domains, although this preference was not found at all age levels: Third and fifth graders dispreferred *ad hoc* theories, although first graders did not. This result suggests that, in general, humans prefer explanatory generalizations to arbitrary stipulations, although this preference may take some time to develop.

Finally, the idea that humans possess an innate drive to find explanations is found frequently in writing in philosophy and psychology, perhaps beginning with Thomas Hobbes (*Leviathan*, Part I, Chapter 6, 1651):

Desire, to know why, and how, CURIOSITY; such as is in no living creature but Man; so that Man is distinguished, not only by his Reason; but also by this singular Passion from other Animals; in whom the appetite of food, and other pleasures of Sense, by predominance, take away the care of knowing causes; which is a Lust of the mind, that by a perseverance of delight in the continual and indefatigable generation of Knowledge, exceedeth the short vehemence of any carnal Pleasure.

The drive for explanation is ubiquitous, as shown by the fact that explanations are found in every human culture, regardless of how scientifically “advanced” it is (Sperber et al. 1995). Gopnik (1998, 2000) even argues that “explanation is to theory

formation as orgasm is to reproduction: the phenomenological mark of the fulfillment of an evolutionarily determined drive” (Gopnik 2000:300).

These findings and observations support the idea that there is a human drive to find explanations that are not *ad hoc*. This drive may play a role in language acquisition as well, which would help to explain why arbitrary exceptions should be so difficult to find in language. Under this view, language learners do not blindly and passively absorb data, but implicitly develop, test, and refine linguistic theories.

## 6.4 In a nutshell

Where does all this leave Baker’s Paradox? As I argued in the first chapter, Baker’s Paradox is a paradox in the sense that one cannot maintain all of the premises simultaneously, but it is not a paradox in the stronger sense that all of these premises appear to be true. The “No Negative Evidence” premise can easily be denied. The interesting question is, therefore, not how to solve the paradox, but how many of its premises are true, and what follows from those conclusions about how restrictions on productivity are learned. My principal claim is that the “Arbitrariness” premise is not well-founded, and I have laid out a possible view of learning that explains why this might be.

In a nutshell, my conclusion is this: For the scientist interested in language and language development, it is a fruitful strategy to seek general explanations for apparently idiosyncratic facts of language, as such explanations can be found. I propose that this orderliness comes about because the language learner, likewise, seeks to develop models of linguistic acceptability with general explanatory power.

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